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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT WAVE Magazine

EDITORIAL

Schemes *While the whole British Railways electrification project (as distinct from the proposed administrative reorganisation) is going through the process of an " agonising reappraisal "— which could well lead to the electrification plan being abandoned altogether — the Government is being vigorously lobbied on yet another communications scheme involving the expenditure of many millions of public money.*

This is the idea of a Satellite Communications System — on the ultimate success of which its proposers are being so incredibly optimistic. The project has been so widely discussed in the press and elsewhere that all one need say about it here is that on the basis of present knowledge it is technically feasible. Indeed, the Americans hope to be doing their own first tests quite soon, and there is no reason why they should not be successful.

But what has been overlooked (or is not understood, or has been forgotten in the excitement) by the protagonists for a similar British network is that such a system is wide open to (a) Deliberate jamming, and (b) Physical interference, by any " ill-intentioned competitor." Jamming by radio of a Communications Satellite would present no great problem, irrespective of the mode or method of transmission used on the Satellite links; it would certainly be easier than trying to interfere with cable circuits. Secondly, it would not be too difficult, in the present state of his art, for our " ill-intentioned competitor " to destroy, or deflect into outer space, the satellite itself — merely by launching a projectile, about the size of a grape-fruit, on a collision course. After all, if " they " can hit the Moon in one shot, it is a fair assumption that they could pick off a satellite at a range of a few thousand miles and moving on a known orbit, even it it meant firing a pattern of projectiles fitted with homers.

In other words, by either of these two methods, a Communications Satellite could be disposed of from the ground at any convenient moment. If the commercial communications system based on Satellite relay were allowed to develop and expand to the stage at which it had become an essential factor in the Commonwealth communications network, then the damage at the moment of destruction would be all the greater. And this is just what any " ill-intentioned competitor " would aim to achieve.

A Communications Satellite System, as at present conceived, is the sort of project on which it would be well worth spending many millions if the whole world was in harmony and at secure peace. In the meantime, it is to be hoped that the Government will be advised to rely on modern multi-channel cable techniques for the development of our essential communications.

Austin Forbes G6FO.

Improvements for the BC-348(Q)

NOISE LIMITING, MORE AUDIO OUTPUT, AND CONTROLLABLE RF GAIN

P. F. LINSLEY

This article will add to the bibliography on the BC-348 series of receivers, of which there are a great many in current use. It is an American surplus type which has been written about for the last 15 years. The circuitry suggested here could also be applied to any receiver of similar design, in particular those that are noisy or have insufficient audio output.—Editor.

HAVING used a BC-348Q receiver for a while, it was decided to make a few modifications to improve the performance. The receiver is quite good as it stands after the usual modifications—such as converting to mains power supplies—but a few extra refinements were considered desirable. Although the chassis is rather cramped, the space on the front panel is quite adequate for the modifications described here.

It was found that the receiver was noisy on some bands. This was overcome by putting in a noise limiter of simple design at the AF end. The audio output, while being sufficient for headphones, was insufficient for a loudspeaker, particularly when the noise-limiter was added. Consequently, an extra audio output stage was put in next to the output stage. Sideband signals are easily resolved when the function switch is in the MVC position, but as an aid to ease of operating a separate RF gain was added.

Noise-Limiter and AF Stage

The AF stage follows the detector directly—*see* Fig. 1. The screened lead is removed from pin 5 of the output valve holder and taken to the audio gain control, R1. The two valves, V1, V2, can be mounted on a small sub-chassis above the bevel gears which drive the band-change switch. The connections to the valve should be made before this chassis is mounted in position, as space is very limited. The noise-limiter circuit is similar to that described in the March 1960 issue of *Short Wave Magazine,* but with some values changed to suit the BC-348Q. The potentiometer R8 is fitted beneath the dial light control in the removable panel. The audio gain control R1 is placed to the left of this control. R8 is the manual control for the degree of limiting. Here care should be taken to avoid shorting of connections between the case of the potentiometer with the bases of the 2nd RF and output valves. The HT supply for V1, V2 is taken from the

Table of Values

Fig. 1. Noise Limiter and Audio Stage

C1	= 25 μF, 12v.	R8	= 500-ohm 2w. w/ wound
C2, C3	= .01 μF	V1	= 6C4, or similar triode
C4	= .05 μF	V2	= 6AL5, or any double diode
R1	= 1 megohm, var.	V3	= 6F6/6V6 as fitted in BC-348
R2, R5	= 100,000 ohms		
R3	= 2,000 ohms		
R4	= 47,000 ohms		
R6, R7	= 33,000 ohms		

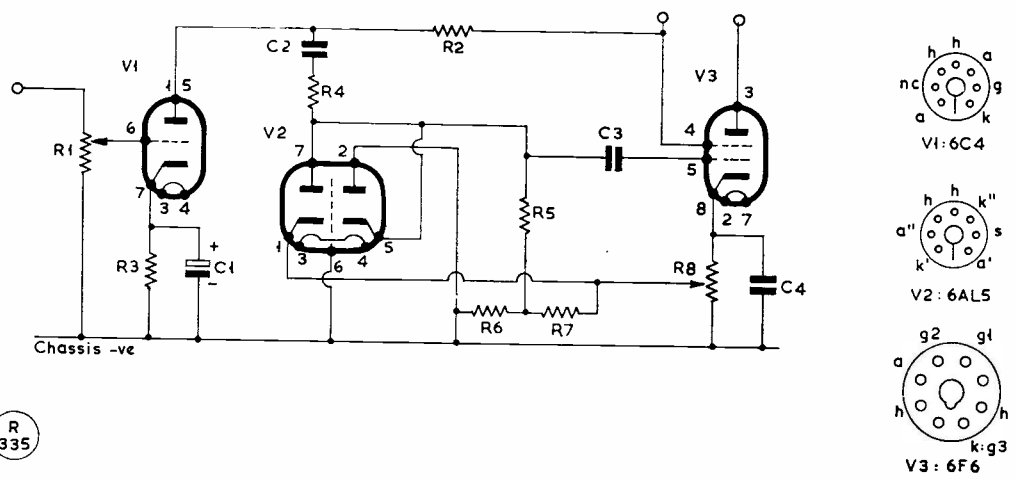

Fig. 1. Circuit for a noise-limiter and additional audio stage for the BC-348(Q), as described in the text. The existing audio stage in the receiver is left undisturbed, as the function of V1 is to provide more drive for the output valve V3. The double-diode V2 functions as a noise-limiter.

screen (pin 4) of the 6F6 output stage, and the heaters from pins 2 and 7.

The RF Gain

The RF gain is fitted in the screen of the 2nd RF stage—as in Fig. 2. The lead to this is disconnected and connected to Rg, and the screen (pin 6) to the slider on this potentiometer. The existing decoupling condenser C1 is left connected. The other connection to Rg is taken *via* R1 to the chassis.

Alternatively, as the 6SK7 is a vari-*mu* pentode, the gain resistor may be put in the cathode. Here, all connections to pin 5 are removed and a 10K variable resistor and a 0·05 μF condenser are connected between this and the chassis.

When these modifications have been carried out, a marked improvement will be evident in overall performance and ease of operating. This will make the little time and trouble involved well worth while.

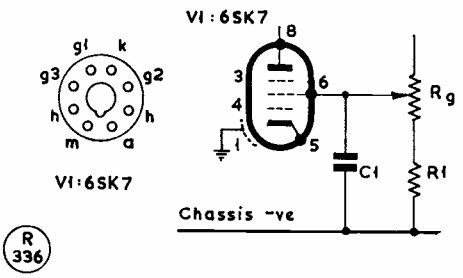

Fig. 2. Fitting the separate RF gain ; values are : C1, existing capacity ; Rg, 50,000 ohms ; R1, 5,000 ohms ; V1, 6SK7 2nd RF stage. As explained in the text, the RF gain can also be inserted in the cathode lead.

Simple Auto-Key

GIVING ELECTRONIC DOTS WITH MANUAL DASHES

S. WOOLLEY (G8RQ)

Though expert manipulators can do very well on a pump-handle key — still the recognised instrument commercially—there are easier ways of sending Morse. These vary from the elegant, automatic electronic keyer, complete with variable speed control and panel meter, down to the humble side-swiper, made from Meccano strip and old razor blades. Our contributor describes a key which lies somewhere between these two extremes — it works sideways, for thumb-and-forefinger action, and the dots come automatically.—Editor.

THE purpose of this article is to enable those operators who are interested in CW, and who still do not possess a bug key, to construct one at low cost and with the minimum of mechanical skill.

The current list price of the latest mechanical bug keys is not inconsiderable, while home-construction of these types is difficult and beyond the ability of the average amateur.

The writer suggests that the simple key described here will be found to compare very favourably with the commercial mechanical bug. If any reader has doubts, then he can listen on the 80-metre band for G8RQ, who is using the key, and decide for himself on its merits. A number of operators have commented on its performance in recent QSO's, hence this article.

Very severe TV interference can be caused by electronic keys. The instrument to be described is completely free of this trouble. Fig. 1 shows the basic circuit of the key. However, if the key were to be used in this form serious interference would be caused and, further, the key clicks and thumps will be heavy.

The writer is of the opinion that few amateurs realise the importance of correct key-click filtering. With this key, a suitable click filter and supply leads filtering should be used, as shown in Fig. 2.

If monitoring is required (a " must " in the case of bug keys), then this filter is the minimum that should be fitted, to all keys—straight or bug—where cathode or plate keying is employed. [over

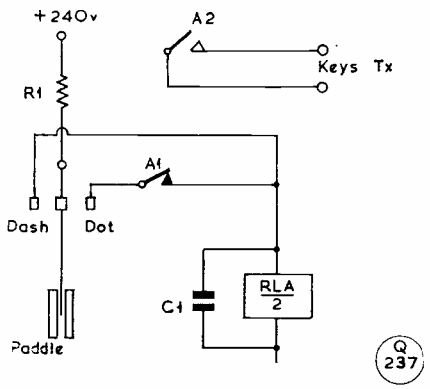

Fig. 1. Basic circuit for the auto-keyer described by G8RQ. Dots are made automatically, depending upon the HT used, the value of R1 and the capacity of C1. The relay can be a standard G.P.O. type of about 10,000 ohms resistance.

Construction

The instrument is built on a small chassis, and all parts except the paddle and LFC are mounted below chassis, with the paddle and audio choke on top. An " Oxo " tin, suitably camouflaged, is cut down to cover and screen completely the paddle mechanism.

The lid of the tin is secured to the chassis top and the box is slotted over the top of the paddle, for easy access and adjustment of key, and a hole is cut in the end of the box to allow the paddle handle to protrude.

A simple paddle can be easily constructed, as shown in Fig. 3.

It will be found that this paddle, for all its simplicity, is quite efficient and capable of sending good Morse. However, the writer suggests that those who require a really first-class paddle should use adjustable compression springs, but this does call for some mechanical ingenuity.

The construction of the paddle shown here could be best explained as follows :

If one end of four inches of hacksaw blade is secured firmly in a vice and a paxolin handle fitted to the other end—with two contacts—the paddle is complete ; the shaft provides its own spring. This is the principle of its operation ; the vice is, of course, replaced by two holding

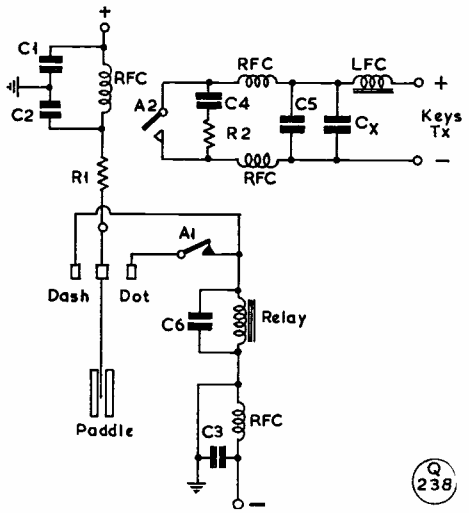

Fig. 2. The keyer as actually used at G8RQ. Condensers C1-C5 are all .001 μF ; C6 is 2 μF; the value of Cx depends upon several factors — see text. R1 is 10,000 ohms for a 240v. DC supply and a relay of 10,000 ohms ; R2 is 100 ohms. All RF chokes are standard 2.5 mH. C6 can be varied (by switching) from 0.5-2 μF to change the dot speed. LFC is a 30-Hy. choke and the relay should be a G.P.O. type having one set of contacts closed (A1) and one pair open (A2) in the " rest " position.

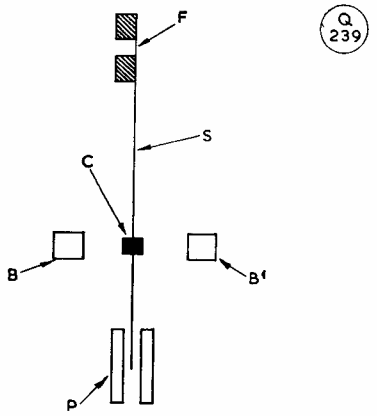

Fig. 3. Paddle for the auto-key described by G8RQ. F, angle brackets securing arm at one end ; S, 4 in. of $\frac{1}{2}$ in. strip steel, or phosphor bronze ; C, contacts fitted to paddle arm ; B, dash contact ; B', dot contact ; B'B are mounted on angle brackets to register with contacts C ; P, paddle handle, two pieces of paxolin fitted on paddle arm, and shaped to taste. For the circuit of Fig. 2, holding the paddle to the right, closing B'C, will make automatic dots ; dashes are made manually, against contact B. The spacing B-C-B', the clearance of the relay contacts A1, A2 (see Fig. 2) and the spring tension will have to be adjusted for correct mark-space ratio on dots.

angles, as shown in Fig. 3.

It will be noted that with this type of key, as compared with the mechanical bug, paddle construction is very simple, because no " ditherer " is necessary. The dots are produced electronically by the circuit shown in Fig. 2. Dashes are made manually, as with a Vibroplex type of key.

Adjustment

A 30-Henry choke is used in the main keying lead (*see* Fig. 2), and this will be found ample to cover a wide range of keyed stages, from PA to buffer amplifiers. LFC will be large, possibly the full 30 Henry, in the case of a stage taking small current. However, the inductance can be reduced by shunting the choke with a 10K-20K resistor if a larger current is to be keyed.

The value of Cx likewise will depend on the current keyed, and will be between 0·1 and 2 μF. The network C4, R2, C5, Cx and LFC will affect the quality of the note, and it is possible to make the note sound " hard," " soft " or chirpy.

The writer has been the user of a straight key for a quarter of a century, but at last has found an easier and better way of sending Morse. The key has been used for the past twelve months with entirely satisfactory results, and there is no possibility of returning to the old pump-handle. Power supply requirements are very small and 240-300 volts at low current will be suitable.

THE TUNNEL DIODE

THEORY, AND SOME APPLICATIONS

P. R. Weston

For the last year or so, there have been rumblings about a revolutionary new semi-conductor device, of quite extraordinary potentialities, called the Tunnel Diode. Briefly, it is a two-terminal (diode) oscillator in the transistor category — but it is unaffected by transit-time as we know it in valves and transistors. The tunnel diode as at present in production will function at frequencies up to about ten kilomegacycles (10,000 mc) or 3 centimetres wavelength. It is unaffected by temperature over a very wide range, and is virtually indestructible. And, of particular significance, the tunnel diode is easier and cheaper to produce than the transistor. All this added together means that tunnel diodes have become of immediate and fundamental importance in the world of radionics and computery. Hence, you should read this article carefully, for it is in the next year or two that the tunnel diode will make its greatest impact.—Editor.

THE tunnel diode is a new semi-conductor device which is still in the fairly early stages of development. Many experts consider that in due course it is likely to become almost as widely used as the transistor. It will be especially useful in very high frequency work where compactness, reliability, simplicity and low power consumption are important Several companies, both American and British, are now carrying out intensive research on the device[1] which was discovered in 1958 by Esaki of Japan.

The name "tunnel diode" is derived from the way in which the electrons tunnel their path through an energy barrier which exists between *p* and *n* types of semi-conductors. Various semi-conductors such as germanium, silicon and indium antimonide have been used, but gallium arsenide appears to be the best material which has yet been investigated for tunnel diode manufacture.

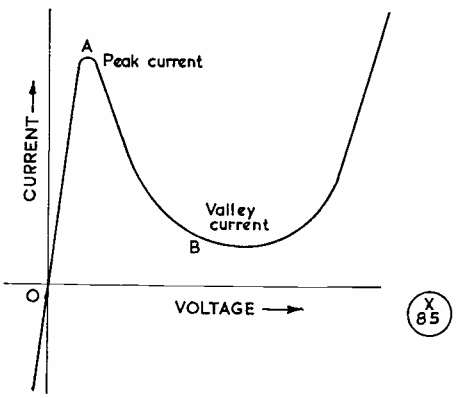

Fig. 1. Characteristic curve of a typical Tunnel Diode.

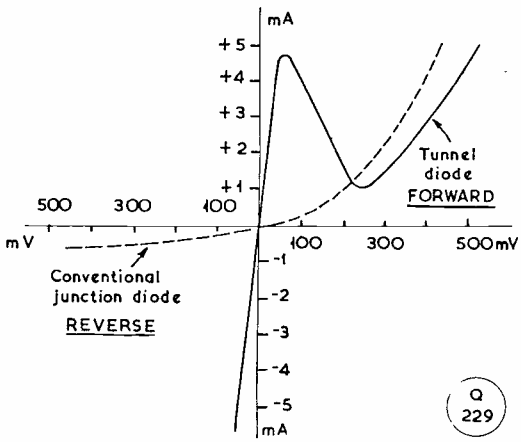

Fig. 1A. The static characteristics of a typical Tunnel Diode, compared with a conventional diode. It shows a marked negative-resistance condition; this phenomenon was first noted in 1958, and is the basis of Tunnel Diode development.

The voltage-current curve of the tunnel diode (Fig. 1) enables its basic performance to be ascertained. The most important region is that between A and B in Fig. 1, in which an increase of applied voltage produces a decrease in the value of the current flowing through the device. The incremental resistance is therefore negative in this region; this enables the tunnel diode to amplify, oscillate, act as a frequency converter, and function in other RF applications.

Although signals take an appreciable (but very short) time to travel through a valve or transistor, there are, for all practical purposes, no such transit-time effects in the tunnel diode. The signal passes through it at about the speed of light and consequently the *maximum operating frequency of the tunnel diode is very high* — certainly above 10,000 mc — and is probably limited only by the capacitance of the *p-n* junction of the diode and by the inductance of the diode leads. The passage of a current through a tunnel diode is a majority carrier effect; conduction

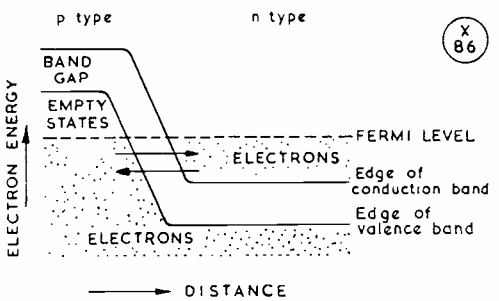

Fig. 2. Electron energy level diagram for an unbiased Tunnel Diode.

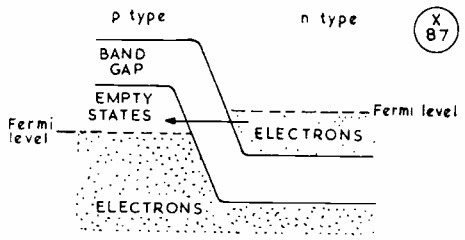

Fig. 3. Energy level diagram for a Tunnel Diode having a small forward bias (region 0-A in Fig. 1.)

through transistors depends on minority carriers (holes or electrons) with consequent frequency and other limitations.

Tunnel diodes are essentially low-power, low-voltage, very high frequency devices.

Basic Theory

The tunnel diode consists of a semi-conductor *p-n* junction, but the semi-conductor materials contain about a million times as many impurity atoms as those which are contained in the same volume of the ordinary *p* and *n* types of semi-conductors employed in the manufacture of transistors and the normal type of semi-conductor diodes. The junction between *p* and *n* types must be very abrupt. Under such conditions, electrons in the conduction energy band of the *n* type material come opposite, *i.e.* have the same energy as, certain empty energy levels in the *p* type material.

From a consideration of the Laws of Classical Physics, it would be expected that no movement of electrons or holes between the *p* and *n* types of semi-conductor materials would be possible owing to the very large electrostatic energy barrier across the junction. The electrostatic field strength in a typical tunnel diode across the very narrow junction region is of the order of one million volts per centimetre. According to the Laws of Classical Physics, an electron striking such a barrier will always be reflected, as it will not have enough energy to pass over the barrier.

Modern Quantum Mechanics approaches the problem in a rather different manner, however. In 1928, Quantum Mechanical calculations were undertaken on the probability of the ejection of an *alpha* particle from an atom during radioactive decomposition. It was shown that there is a certain probability

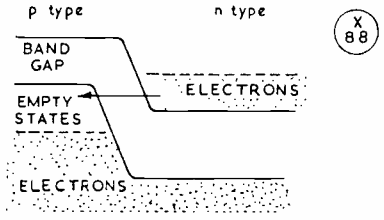

Fig. 4. Energy diagram for a Tunnel Diode biased in its negative resistance region.

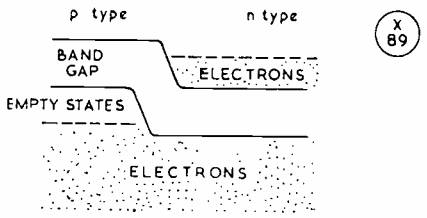

Fig. 5. When a Tunnel Diode is biased in the valley region, little current flows — this is the energy diagram.

that an *alpha* particle which does not possess enough energy to leave an atomic nucleus (owing to the energy barrier over which it would have to climb) can leave the nucleus by a process, which, in ordinary non-quantum mechanical language, can be called "tunnelling underneath the energy barrier." It was recently shown by Esaki[2] that the same kind of process can operate under certain conditions at the barrier between the *p* and *n* junctions of a semi-conductor device — hence the name "tunnel diode."

An electron, according to Quantum Mechanical ideas, consists of a kind of probability wave — a mathematical idea which merely conveys information about the probability of finding an electron at various places. This probability becomes extremely slight at places which are even a small distance away from the electron, but there is always a certain finite probability

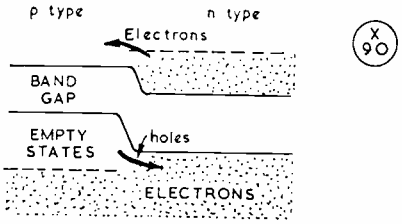

Fig. 6. A large current flows when a Tunnel Diode is biased with a greater forward voltage than that required to reach the valley region.

of finding any particular electron at any stated place in the universe — however small that probability may be. Therefore, for an electron approaching a *p-n* junction, there is a certain probability that it will be found on the other side of the barrier[3], although it does not have enough energy to pass over the barrier. The more abrupt the barrier, the greater is the probability that the electron will be able to tunnel through it.

If it is assumed that tunnelling can take place, it is not difficult to explain the shape of the current-voltage curve shown in Fig. 1 by means of electron energy level diagrams.

Fig. 2 shows an energy level diagram for the electrons in an unbiased tunnel diode. The dotted lines in the *p* and *n* materials are the Fermi levels — a sort of reference level of electron energies; there are as many vacant states below the Fermi level as there are states which are filled with electrons above

it. At zero bias the Fermi levels in the *p* and *n* types of semi-conductor materials line up as shown in Fig. 2. Electron tunnelling currents occur to the same extent in each direction and therefore no net current passes at zero bias.

A small forward bias (*p* type positive) will cause a current to flow in the forward direction as shown in Fig. 3. Fermi levels are no longer at the same height in the two materials and the bias helps the forward current to flow.

A further increase of bias leads to the energy states shown in Fig. 4. Here the AC resistance of the device is negative, and this region is the most important one, in which the operating point of the tunnel diode can be situated. It can be seen from Fig. 4 that the number of electrons in the *n* type material which are opposite to vacant energy states in the *p* type material will become less as the bias increases further. The tunnelling current therefore becomes smaller with increasing forward bias when the diode is biased in this region ; this causes the negative resistance effect.

A larger forward bias causes the current to move into the valley region of Fig. 1 where it is a minimum. This can be explained by the electron energy level diagram shown in Fig. 5. No electrons in the *n* type material are opposite vacant states in the *p* type material, and therefore no tunnelling current can flow. The valley current is not quite zero, however.

Yet a further increase of the forward bias leads to the energy level diagram of Fig. 6. The electrons in the *n* type material are then raised far enough for them to spill over the barrier into the *p* type semi-conductor. A large current can therefore flow without any tunnelling taking place.

If the junction is given a backward bias (*p* type negative), the diagram of the electron energy levels is as shown in Fig. 7. A large tunnelling current flows in the reverse direction.

The various parts of the current-voltage curve shown in Fig. 1 can thus be explained by the electron energy level diagrams for the semi-conductor junction. The whole of the forward region shown occurs at a bias of less than 1 volt.

In actual practice the picture as described is complicated by the existence of very high frequency ultra-sonic vibrations of the crystal (" phonons ") which can assist the tunnelling process[4].

Special Features

The tunnel diode is much smaller than the transistor and is, in fact, the *smallest known device which is capable of oscillating or of giving amplification.* Tunnel diodes are extremely reliable, and some silicon types can operate at any temperature, from a few degrees above absolute zero to over 400°C. Transistors are much more sensitive to changes of temperature.

The only amplifiers which generate less noise than the tunnel diode are the complicated maser and parametric types. The valve and the transistor generate much more noise than the tunnel diode. Tunnel diodes can operate on a power input of about

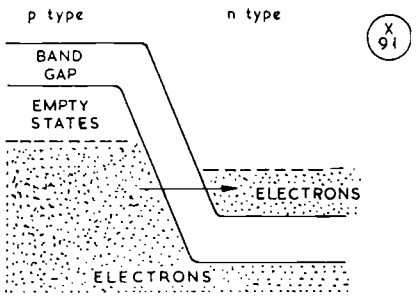

Fig. 7. Energy diagram for a reverse-biased Tunnel Diode.

a microwatt and therefore produce little heat. As they are much less sensitive to nuclear radiation than are transistors, they may find a useful application in atomic physics research.

The part of the voltage-current curve on which the tunnel diode operates is determined by the bias voltages and the circuit impedances[5]. As an amplifier or oscillator, the DC working point must be on the negative resistance part of the curve. In addition, the total AC resistance (including the negative resistance of the tunnel diode) must be negative for oscillator operation and positive for working as an amplifier.

If the DC circuit resistance is greater than the negative resistance of the tunnel diode, the circuit will function as a switch. Switching times of less than a thousand millionth of a second are possible — which is nearly a hundred times faster than the best transistors yet made. During the next few years this fast switching capability will doubtless lead to the use of tunnel diodes in many new computer designs.

Practical Uses

Using a tunnel diode, an FM transmitter about 1½ inches square has been constructed in the laboratories of the General Electric Company of America *(see* circuit Fig. 8). This transmitter has a range of nearly a mile. The resistance of the tuned circuit is cancelled by the negative resistance of the tunnel diode. The audio frequency voltage from the microphone affects the frequency of oscillation by altering the working point of the diode on its characteristic curve. Such circuits will probably be extremely useful in future " walkie-talkie " equipment. They may also find their way into the miniature radio transmitters which espionage agents place in the clothing of unsuspecting diplomats or under the blotting pad in their embassies!

The wide frequency response of most tunnel diode circuits allows one diode to perform several functions at once. For example, a single tunnel diode has been used simultaneously as an RF amplifier, mixer and oscillator — all for a very minute power consumption. It will probably be some time before new circuits are developed especially for tunnel diodes and before their full potentialities are recognised in all these applications.

One of the main disadvantages of the tunnel diode

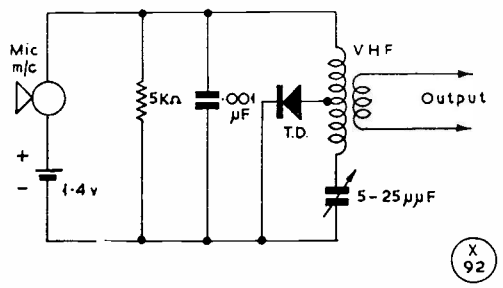

Fig. 8. An FM transmitter circuit at VHF constructed round a Tunnel Diode, from the G.E.C. of America laboratories — see text.

is that no circuits have yet been devised which will enable them to be used in several successive stages operating at the same frequency, *e.g.*, a high gain IF amplifier. This difficulty is derived from the fact that the device has only two terminals, whereas most other amplifiers such as the triode and transistor have a separate control electrode.

Tunnel diode characteristics are usually expressed in terms of peak current and of peak-to-valley current ratio, as the voltages at which the peak and valley currents occur are virtually constant for all diodes made from the same semi-conductor material. The negative resistance can be decreased by increasing the area of the junction; this will also increase the peak and valley currents whilst leaving the peak-to-valley current ratio unchanged. A value for the maximum permissible current is usually quoted for each type of tunnel diode.

The tunnel diode is undoubtedly a device of the future. Time alone will tell how important its contribution will be to the modern electronic age.

Tunnel diodes are expected to be on sale in this country quite soon. They are simple devices and will probably become quite cheap, as it is expected that they will eventually be much easier to manufacture than the transistor!

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Brian Rix, G2DQU, who opened the 1960 Exhibition, stops to see what's happening on the Avo stand; the demonstration seen here was of the assembly of Avo instruments, which always attracted attention during the Show.

TUNNEL DIODE TRANSMITTER

From a note in the October 1960 issue of *Break-In*, the New Zealand radio amateur journal, we get it that ZL1AAX has a microwatt tunnel diode transmitter radiating on the 80-metre band, powered by solar (photo-electric) cells. On this, he has succeeded in working ZL1AOF over a distance of about 160 miles. In this sort of context, it is worth recalling that the first solar-powered milliwatt transistor transmitter results (over distances up to 30 miles or so) were obtained by G3HMO/G6FO in 1954, as reported in the October-November-December issues of SHORT WAVE MAGAZINE of that year. The ZL results, of course, represent a greater distance covered with even lower power, and using a newer "semi-conductor device" — so congratulations to ZL1AAX/ZL1AOF on a remarkable achievement.

SIZE OF THE INDUSTRY

According to some statistics in the recently published *Structure and Future Prospects of the Electronic-based Industries in the United Kingdom*, there are now over 1,700 firms in Britain, employing more than 350,000 people, operating within the broad field of electronics. The value of the gross output of the industry is around £475m. and exports for 1960 are expected to exceed £100 million. Copies of this most interesting and comprehensive survey can be obtained from: Heywood & Co., Ltd., Drury House, Russell Street, Drury Lane, London, W.C.2, at 5s. 9d. post free.

MAKING THE MOST OF METERS—4

VOLTMETER APPLICATIONS—AND SOME TEST PROCEDURES

J. R. Bradshaw

THE design and construction of the voltmeter was considered in the third part of this series in the November 1960 issue of SHORT WAVE MAGAZINE, and this article considers its practical applications.

Logical fault-finding starts with an effort to localise the faulty stage or circuit, and voltage checks successfully localise 90% of apparatus faults, be they in receivers, amplifiers or transmitters.

Voltage checks in faulty apparatus are second in importance only to valve tests, as any severe variation in voltage at a given point will frequently pinpoint a fault, even though further investigation may be necessary to find the cause of it.

The great advantage of such tests, of course, is that they can be carried out merely by gaining access to the test point without disturbing the circuit wiring in any way—and this is important, particularly when RF is involved.

Voltage tests, to be effective, must be thorough and logical, following a fixed drill which starts at the power supply stage and works back through the final stages of the faulty apparatus to the first stages. The results should always be noted and checked against any test information that is available, and it may be appropriate to mention at this juncture that noting the working voltages of your apparatus when it is functioning correctly will pay dividends if you have to make a voltage check when it goes faulty. Any large discrepancies should be investigated after all the voltage checks have been made, when you are in a position to consider the apparatus as a *whole* — a fault never being presumed to exist in one particular stage when only half or even less of the complete circuit has been checked.

During such tests it must be remembered that bias voltages in low-resistance grid circuits can be checked by connecting the negative of the meter to the control grid of the valve, with the positive lead connected to cathode, thus proving also the continuity of the bias circuit between the two points.

If the grid circuit resistance is high, it is still possible to obtain a useful voltage reading with a high-opv voltmeter or an electronic voltmeter; or a true reading with a high input impedance valve voltmeter.

Oscillator Checks

A useful check can be carried out on an oscillator by measuring the change in anode voltage which results from the cessation of oscillations when the control grid is shorted to earth.

In a receiver employing a frequency-changer, shunting the cathode bias resistor (where one is used) with a voltmeter and earthing the oscillator control grid will also result in a slight voltage change on the meter when oscillation is stopped — conversely, of course, if no change occurs when the grid is shorted, then the oscillator is not working.

If the oscillator grid resistor is connected to cathode instead of earth, care must be taken not to short the grid to earth, as doing so will cause a voltage change even if the valve is not oscillating. In such a case, the grid must be shorted to cathode.

AGC operation can be checked by measuring the change which results in screen voltage of an IF valve when the receiver is detuned from a strong signal to a no-signal condition.

Receiver Alignment

A voltmeter can also be employed as an alignment indicator instead of the more conventional output meter; the latter is primarily a specialised servicing instrument of limited value which many amateurs may not have available. Other advantages of the method are that alignment can be effected using a broadcast signal with varying modulation, since only AGC bias is used as an alignment indication, and no precautions are necessary to avoid AGC interference with the controlled stages, as may be necessary when using an output meter.

The method of alignment makes use of the fact that, as signal strength increases due to improved alignment of the receiver, the AGC feedback increases, and a 0-10-volt meter is connected across the cathode bias resistor (in a mains receiver) of the final AGC-controlled stage — usually the final IF

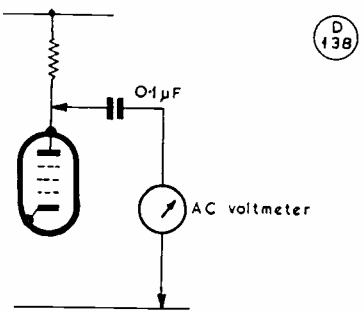


Fig. 1. Extracting the AC component from an HT voltage.

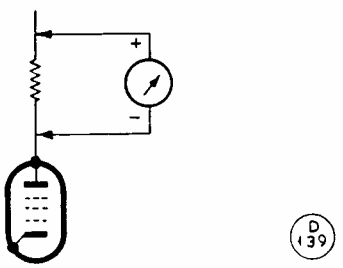


Fig. 2. Measuring the voltage drop across a resistor prior to calculating the circuit current.

amplifier — alignment peaks in any stage being indicated by the resulting increase of AGC bias ; this reduces the anode current and hence the voltage drop across the bias resistor, alignment being aimed at *minimum* bias volts.

In battery receivers with common biassing, the above method is impracticable, but measuring the screen voltage of the final AGC-controlled IF stage will indicate alignment by the increase due to the reduced valve current resulting from AGC action. Alignment in this case must aim at *maximum* screen volts.

If the AGC diode is fed direct from the final IF anode, a modified technique is necessary to tune the final IF transformer secondary ; this is because resonance will draw power from the primary winding, so reducing the signal applied to the AGC diode— resulting in an increase of bias resistor volts in a mains receiver, or a decrease of screen volts in a battery set. This is the opposite effect to that produced when aligning other stages, and must be remembered. If the AGC is taken from the IF secondary or the signal diode connected to it, then the alignment technique will be uniform throughout the receiver.

Any transmitted signal used for alignment purposes should, of course, be strong enough to overcome the delay bias if one is used in the AGC circuit.

Checking Alternating Voltages

Whilst a valve voltmeter is essential for the accurate measurement of audio and radio-frequency voltages, the AC ranges of an ordinary voltmeter will readily check the presence, or otherwise, of audio signals, hum, etc., and when they might be superimposed on DC (as in an anode circuit) they can be observed by using a 0·1 μF condenser as a blocking device in series with the meter, as shown in Fig. 1, to separate the unwanted DC from the AC to be measured. The AC meter range should initially be equal to that of the DC volts present in the circuit, to avoid damaging the meter rectifier by the current surge of the condenser charge.

After the current surge, the AC range can then be reduced to a convenient one. As mentioned in Part III, the accuracy of these measurements will depend on the ohms-per-volt sensitivity of the meter, due to its shunting effect on the circuit — which is also present for AC measurements.

The AC content of an HT line or the smoothed output of a power pack can be ascertained in this way, the AC/DC volts ratio usually being quoted as a percentage — which can, incidentally, increase with increased current consumption from the power pack.

If a heater/cathode breakdown occurs in a valve, a heavy 50-cycle hum is imposed on all signals, and is tunable in a receiver when the valve failure is prior to the detector stage. The presence of hum on the cathode due to this objectionable and occasionally difficult fault can be checked by earthing the input of individual stages and testing for the presence of AC on the cathodes, again with the circuit of Fig. 1. The test must be made with a sensitive, low-range voltmeter and, as the meter resistance is likely to be higher than the circuit resistance in any case, accurate measurements should be possible. The only solution to a heater/cathode breakdown is to replace the valve, although if the fault occurs in the first stage of a microphone amplifier — when it can be particularly obnoxious — it is possible that the valve itself can be used in a less sensitive circuit with complete satisfaction, because when dealing with microphone-level amplification, it only requires the heater/cathode insulation to fall to 5 or 10 *megohms* to impose a hum on the very small input signal.

Current Measurements

It would appear that by making current measurements with a voltmeter, the wheel has turned full circle but, although current measurements are obviously best made directly with a milliameter, there are occasions — as when testing " hot " circuits, those employing miniature valves or components, or printed circuits — when it is preferable to check currents without disconnecting components to insert a milliameter into circuit.

Using Ohm's Law, the value of any current can be determined quite quickly by measuring the voltage drop across a resistor whose value is either known or has previously been determined ; the voltmeter negative is connected to the point of lower potential, as shown in Fig. 2.

For extreme accuracy, the current drawn by the meter must always be taken into account, and this is done by first ascertaining the FSD current of the voltmeter if it is not already known, and then roughly calculating the meter current when the voltage is measured, *e.g.*, if the voltage deflects the meter to quarter-scale, then the meter current is one quarter of the FSD value.

The current through the resistor is then :

$$I = \frac{V}{R} - Im.$$

where Im is the meter current (in milliamps) ; R is the resistor value in kilohms and V the voltage reading on the meter, I also being in milliamps.

There are few occasions when such extreme accuracy is necessary (although the FSD current and

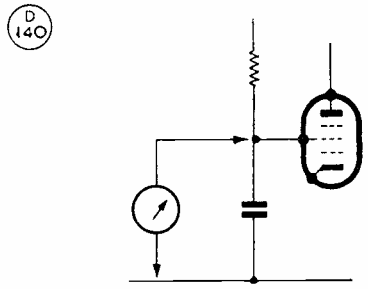


Fig. 3. The measurement of screen voltage — there is more in this than meets the eye, as the text explains.

opv sensitivities of all meters should always be known), and it is normally quite sufficient in fault-finding to apply simple Ohm's Law (I = V/R) to determine the circuit current.

Routine Voltage Monitoring

In any apparatus the provision of metering facilities is an undoubted advantage, and current metering has already been mentioned. Voltage metering is, of course, just as important whilst being confined to different parts of the apparatus circuitry.

Voltage metering is only necessary, however, where current metering does not exist or where the measurement of voltage will be a positive advantage, such as power supply rails and the voltages applied to screen grids of various stages — the voltages in the latter being possibly rather more informative than the screen current.

Screen voltages should be checked at the valve pin (Fig. 3), so taking advantage of any decoupling that might be provided for the screen circuit. Needless to say, voltage metering must never take place in " hot " circuits.

Voltage checking points in a power unit can be quite comprehensive and can also include, by virtue of a blocking condenser, the invaluable facility for checking the AC component present on the smoothed HT line — so permitting the efficiency of the smoothing circuits to be checked for deterioration— which is, in the main, usually due to the ageing or failure of electrolytic capacitors.

Voltage metering can be combined with the current metering switch, using the same meter for the purpose, and Fig. 4 shows current metering facilities which include three current checking points (and utilising the universal shunt) and three voltage checks. The system is easily expanded to suit individual apparatus requirements, a position on the metering switch being used to transfer the meter to a second metering switch if the first switch will not accommodate all the metering points.

Ideal Meters

With the exceptions that voltmeter resistance should be as high as possible, and that of a milliameter as low as possible, the desirable features of both instruments are identical, even when the meter movement is built into a universal or multi-range meter, and no treatise on meters can possibly be complete without mentioning the desirable features to look for when purchasing a meter.

The meter movement, of course, must be highly sensitive to permit any degree of multiplication as a milliameter and a high ohms-per-volt sensitivity as a voltmeter, and thus good basic movement is of first importance. Accuracy should be B.S.S. or B.S.1, particularly for basic movements. B.S.2 is less expensive but also less accurate. Ungraded meters can be cheap, but will require calibration against a B.S. meter before reliable readings can be obtained.

Whatever the accuracy grading, the physical appearance of the meter also demands consideration. The scale should be as large as possible — both wide,

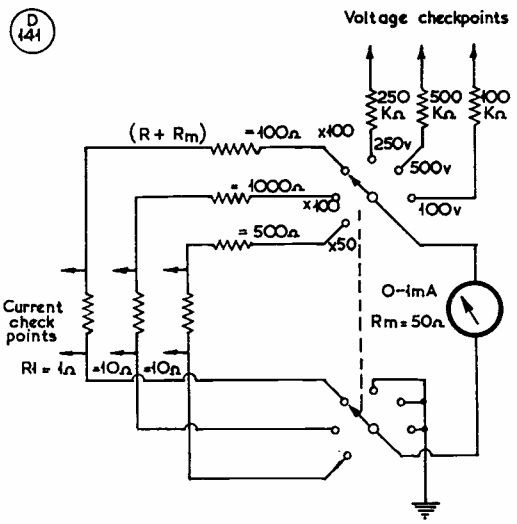


Fig. 4. Comprehensive metering circuit with three current and three voltage checks.

long and clearly marked; preferably incorporating illumination so that it can be used in dark corners without difficulty. The pointer should be knife-edged, with an anti-parallax mirror in the meter face and the meter movement should be dead-beat, with positive action.

If the movement is part of a multi-range instrument, then range-changing should be accomplished by a single rotary switch, having an " off " position, without the need to transfer connecting leads, and ranges should be an easy multiplication of the basic ranges marked on the meter face.

Additionally, each scale should have its own colouring matched in the lettering of the range-switch designations, so that both can be readily associated for setting-up and reading. An automatic overload, giving a positive indication and readily reset, is another very desirable feature.

(To be concluded)

EARLY ISSUES OF THE " CALL BOOK "

We would be very glad if any reader could let us have—either by sale or on loan—a copy of the *Radio Amateur Call Book* dated any time between 1926 and 1930, and between 1933 and 1938. Replies should be addressed for the attention of The Editor.

COMMERCIAL MOBILE RADIO

It is announced by the Post Office that recommendations to reduce channel width to 25 kc in the 165-173 mc commercial mobile band have now been adopted, and the change-over to the new channelling system began January 1st, 1961. When all obsolete equipments have been replaced or changed over, for which a reasonable period is being allowed, some 90 more channels will become available in the 165-173 mc mobile band.

Improved Two-Metre Converter

CRYSTAL CONTROLLED, LOW NOISE, HIGH GAIN

F. W. HATTEMORE

THE present design has been evolved after a considerable period of experimentation with different circuit techniques in an effort to obtain the maximum attainable sensitivity consistent with lowest possible noise and maximum stability. The general arrangement consists of the well-proven cascode RF amplifier using a valve combination that represents the best possible obtainable, in the U.K. or the States. A triode mixer is followed by a cathode-coupled double-triode head IF amplifier operating over the band 24 to 26 mc, feeding another triode as a cathode follower to provide a good match into any communication receiver.

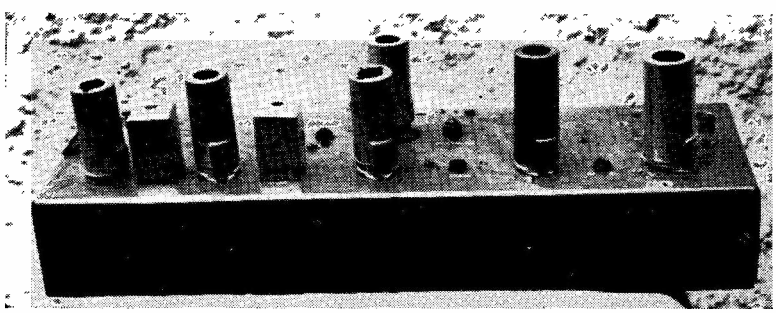
The oscillator is crystal controlled, a necessity if any really serious work is to be undertaken at VHF. Three triode sections are used. The first is an adaptation of the well known Squier overtone circuit using a 6666·66 kc crystal oscillating directly on its 3rd overtone, to 20 mc. This particular arrangement is due to W6EFT, and is known as the " Robert Dollar " circuit, having the great advantage of avoiding the necessity for tapped inductances, and the consequent cut-and-try methods. A capacitive potentiometer is employed instead which makes initial setting up simplicity itself. The remaining two triodes are trebler and doubler respectively, to give the necessary injection frequency of 120 mc.

Some considerable thought was given to the choice of IF, but any choice must in some respects be a compromise. Only three ranges are worth considering, in order to have the advantage of a direct reading scale and accurate frequency logging. These are 4-6, 14-16, or 24-26 mc ; 14-16 mc was ruled out at once, due to the difficulty likely to be encountered in trying to eliminate QRM from the high powered BC stations operating in that band ; 4 to 6 mc would give an excellent tuning rate but it was considered that to maintain even gain over the whole 2 megacycles at this frequency might involve unnecessary complication of the circuitry in the head IF amplifier and, furthermore, the mixer may be flooded with oscillator voltage due to proximity of the oscillator frequency. So 24-26 mc was automatically the choice. The head IF section here is of particular advantage, as most receivers, particularly of the vintage types, show a falling off in performance above 20 mc or so. The 34-36 mc range would also be possible, but is outside the range of many receivers.

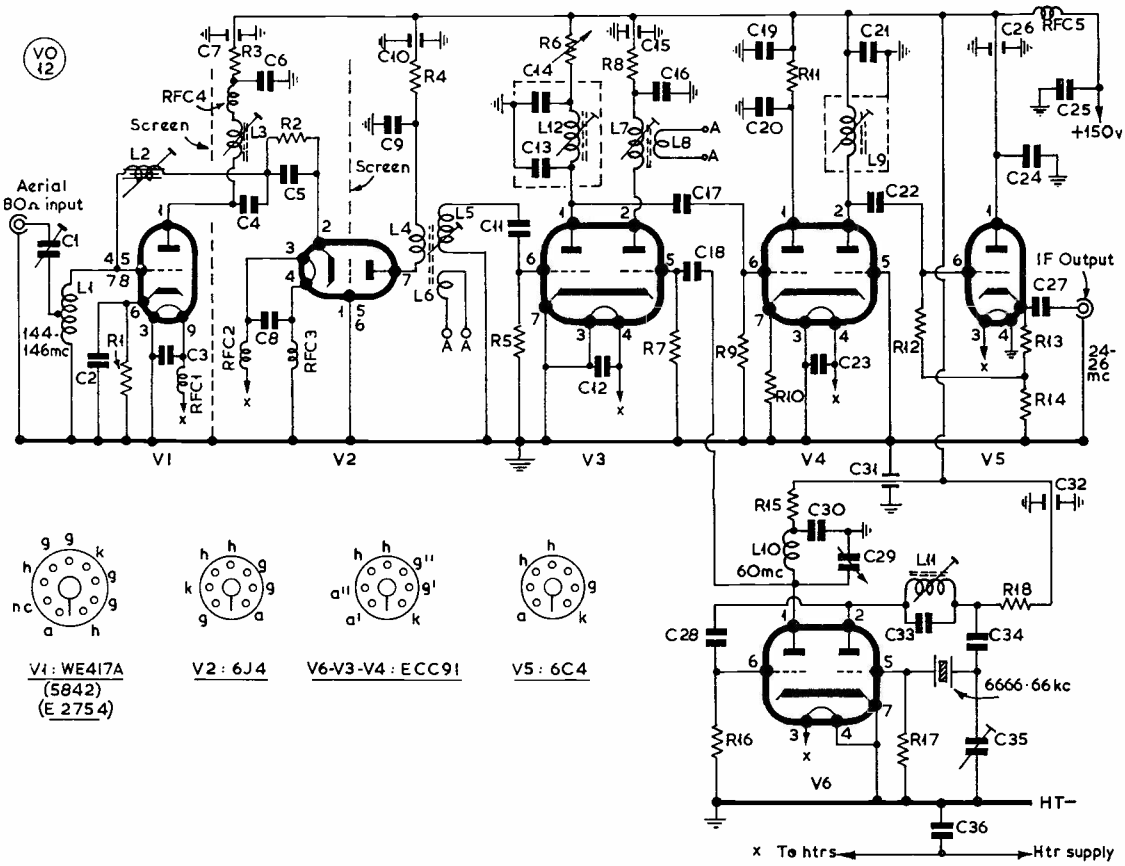
Cascode Section

The obvious choice for this stage is a triode having the best obtainable figure of merit, and the only one known to the writer that meets all the requirements and which at the same time can be considered as obtainable at a reasonable price is the Western Electric 417A (5842). It has a *gm* of 25 to 30 ma/v. and its self capacitances are : Input 1·6 $\mu\mu$F.; output 0.5 $\mu\mu$F ; grid/plate 1·5 $\mu\mu$F. It has an equivalent noise resistance of only 105 ohms. This valve was designed as a low-noise wide-band amplifier for use in the head IF section (at 70 mc) of microwave radar systems, and is suitable as either a grounded grid or grounded cathode RF amplifier right up to 500 mc.

In the present application the 417A is used as a grounded-cathode RF amplifier, V1, and therefore requires neutralisation. A second 417A in the grounded-grid stage was considered an unnecessary luxury as the overall noise-figure is determined by the 1st RF stage, so a 6J4 was used here, V2, as this valve has excellent characteristics for this function (*gm* of 9 ma/V, and R*eq.* of 230 ohms). The 6J4 has no *direct* equivalent, but the EC91 is a near one. A



General appearance of the two-metre converter described in the article. The RF Stage is at the right-hand end, and the two cans towards the left contain coil assemblies L9 and L12—see circuit and text. The RF, mixer and oscillator sections are separated by screening partitions in the sub-chassis space.



One of the features of this converter for the two-metre band is the use of a WE-417A (or 5842) in the RF stage. The crystal multiplication is through the three triode sections V6 and half-V3, producing an injection frequency of 120 mc from a 6.66 mc crystal in the Squier circuit. Coupling from oscillator into mixer is by single-turn link windings L8, L6. The cathode follower V5 ensures a good match into any communication receiver tuning 24-26 mc. (*Note: In this circuit, C6 should be shown from the junction of RFC4 and L3; the by-pass condenser C8 should be on the input side of heater chokes RFC2, RFC3.*)

TABLE OF COIL DATA

L1 = 3 turns 16g. tinned, ⅜-in. int. diam., turns spaced over one, inch, tapped at 1½ turns.
L2 = 15 turns 24g. enam. close-wound on ¼-in. former with brass slug.
L3 = 4 turns 16g. enam. on ¼-in. former with iron-dust slug.
L4 = 3 turns 20g. enam on ¼-in. former with iron-dust slug.
L5 = 3 turns 30g. DSC interwound with L4.
L6 = Single-turn link at earthy end L4.
L7 = 5¾ turns 18g. enam. over 1-in. on ¼-in. former with iron-dust slug.
L8 = Single-turn link at earthy end L7.
L9 = 16 turns 26g. enam. close-wound on ¼-in. TV-type former with iron-dust slug, in can.
L10 = 7½ turns 18g. enam., 1¼-ins. long, self-supporting.
L11 = 15 turns 28g. enam. on ⅜-in. former with iron-dust slug.
L12 = 17 turns wound to same specification at L9, in can.
RFC1, RFC2. RFC3 = 6 turns 18g. enam. on ½-watt, ½-megohm resistor body.
RFC4 = ½-megohm resistor body wound full of 30g. enam.
RFC5 = Standard 1.5 mH RF choke.

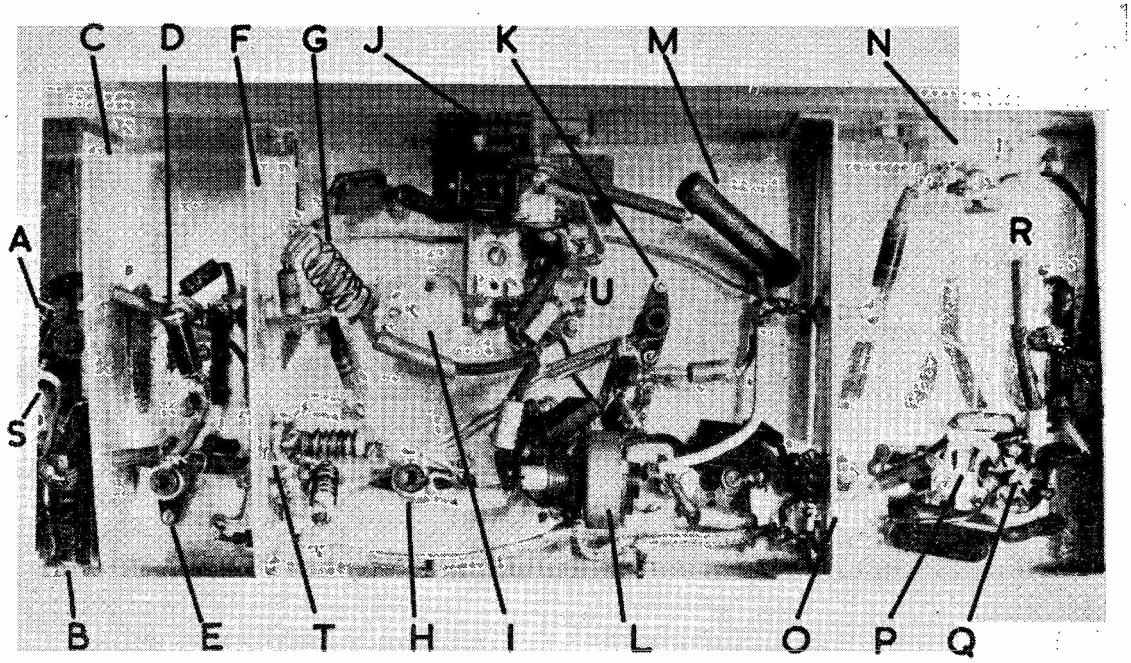
6AJ4 or 6AM4 would do equally well, as also would the Continental EC80.

Let it be mentioned at this stage that at no

Table of Values

Circuit of the High-Gain Converter

C1 = 50 μμF, min. trimmer
C2, C11, C17, C18, C28 = 50 μμF, disc ceramic
C3, C5, C6, C8, C9, C12, C20, C23, C24, C27 = .001 μF, ceramic
C7, C10, C15, C26, C31, C32 = 500 μμF, feed-thro'
C13 = 22 μμF, silver mica
C14, C19, C21 = .005 μF, mica
C4, C16, C22, C30, C34 = 500 μμF, mica
C25, C36 = .01 μF, mica
C29 = 25 μμF, min. trimmer
C33 = 15 μμF, silver mica
C35 = 100 μμF, air trimmer
R1, R2 = 100 ohms, ½w.
R3, R4 = 2,200 ohms, ½w.
R5, R7, R16 = 100,000 ohms, ½w.
R6 = 50,000 ohms, preset
R8, R15 = 6,800 ohms, ½w.
R9, R12 = 0.25 megohm, ½w.
R10 = 330 ohms, ½w.
R11, R13 = 1,000 ohms, ½w.
R14 = 10,000 ohms, ½w.
R17 = 50,000 ohms, ½w.
R18 = 30,000 ohms, 1w.
V1 = WE-417A, or G.E.C. E.2754
V2 = 6J4, or 6AJ4, 6AM4, E80, EC91
V3, V4, V6 = 6J6, or ECC91
V5 = 6C4, or EC90



Underneath the two-metre converter described in the article. The chassis is 13¾ ins. long by 4¾ ins. wide, by 2½ ins. deep. Items identified are: A, RFC1, heater choke V1; B, neutralising coil; C, screen isolating V1 input; D, RFC4, V1 anode; E, L3; F, screen across V2 base; G, L10; H, coil assembly L4, L5, L6; I, C29; J, L11; K, L7, L8; L, R6; M, R18; N, power input socket; O, screen across V4; P, L9; Q, V5 base; R, output socket; S, V1 base; T, V2 base; and U, V6 base. If this general layout is followed, the performance will be up to that of the original model.

time during the setting up of this converter was any instability from this RF end encountered, as might have been expected when using such high-gain valves.

The choice of cathode by-pass capacity, C2, may seem a little odd to the experienced VHF man, but it has been shown that with a more conventional value of 500 $\mu\mu$F the input impedance of the 417A grid at 145 mc is only 300 ohms; decreasing this capacity to 30 $\mu\mu$F immediately improves this figure to 18,000 ohms, without degrading the noise figure. This is believed to be due to a series-resonance effect resulting in low impedance cathode return. Reducing the value below 50 $\mu\mu$F is not, however, recommended as there is then the likelihood of instability being encountered. The quoted noise figure for this arrangement is under 3 dB, a value which can hardly be bettered with any valves at present available to the amateur.

The 417A Valve

Although these have not yet been seen in any quantity on the surplus market, they can quite readily be obtained from any importer of U.S.A. equipment, although they are rather expensive. A direct equivalent is, however, now made in the U.K. as the G.E.C. E2754, and is described as a direct plug-in replacement for the 417A.

Consequent upon the very high *gm* of this valve, the grid is wound to a fine pitch and the spacing from the cathode is very minute. It is therefore most important to protect the valve from high RF voltages from the transmitter. The makers advise an arrangement on " transmit " that effectively short-circuits the grid to earth at 145 mc. It should also be noted that the absolute maximum DC anode voltage is 150 volts, a normal operating condition of 125 volts being advised.

Mixer

An ECC91 V3 performs as a triode mixer in one half, the other half being employed as the final multiplier of the oscillator chain. A single-turn link is used for oscillator injection L5, L6, L8, its position being adjusted for optimum results. It will be noted that the mixer decoupling resistor R6 is a preset type potentiometer; this is to enable the anode volts to be

set quite precisely for best operating conditions of the valve as a mixer. Its setting will be found to have quite a well defined optimum value.

IF Amplifier

Another ECC91 is used here, V4, with the first triode as a cathode follower, its high input and low output impedances giving an excellent match into the second triode operating in the grounded-grid configuration. The overall gain obtained from this arrangement is as good as if a pentode were used and the noise generated is very much less.

Use of such a low noise head IF amplifier will not affect the absolute noise figure of the converter as this is determined by the first stage alone, but it will enable the main receiver to be used with less gain, which is helpful if it is one of the less efficient types at the 25 mc IF. A 6AK5 was first tried as the head amplifier and although results were good, they were improved considerably by changing to the present arrangement.

Efficient coupling to almost any type of communication receiver is provided by the inclusion of a cathode follower output stage V5; a high *gm* type of valve is recommended for this application, a 6C4, or EF91 (as triode) being perfectly satisfactory.

Oscillator Section

A 6J6 performs the function of overtone oscillator and multiplier to 60 mc. A 6666·66 kc crystal might be rather difficult to come by through surplus channels, but a crystal designed for overtone operation can be obtained very reasonably from firms who specialise in quartz crystals. The writer used an FT-243 type with a marked frequency of 6650 kc, etched it up with ammonium fluoride, and was lucky enough to get it zero-beat with WWV on 20 mc when oscillating in the overtone mode !

Construction

The size of chassis selected was 13¾ins. x 4¾ins. x 2½ins. deep. The general layout underchassis is four compartments divided by screens with each section of the circuit in one compartment. In the case of V2 and V4, the valve bases are positioned across the screens, to give leads of minimum length ; if this is not done throughout the converter will not tune up correctly.

In the writer's model, after laying out all the components and wiring the heater circuit, assembly was commenced at the output end first, testing, and tuning up each section as completed, before passing on to the next earlier stage. By this method any mistakes are found as they occur, and final alignment is then simplicity itself.

In lining up the head IF section the coil slugs are adjusted to give an even response over the 24-26 mc range when fed into the station receiver ; this can easily be done on background noise with an aerial loosely coupled to the frequency changer anode. A final touch-up will of course be necessary, when the entire converter is finally checked. It will be found quite easy to secure even response over the 2 mc bandwidth without the need for any additional damping.

Setting Up

Having got this working, the mixer stage and oscillator sections can be completed. To adjust the oscillator for correct operation, set the oscillator coil slug so that oscillation is indicated, making sure that it *is* a crystal beat. If it is not, the circuit will go on oscillating when the crystal is pulled out ! Too much feedback will produce this effect, which can be corrected by increasing the capacity of the preset capacitator C35 in the feedback network; reducing this capacity increases feedback, if oscillation is difficult. When the hand is brought near to the crystal there should be negligible change in the beat note. Another point to check is that oscillation commences readily when the HT is broken and remade. In other words the crystal should pick up without hesitation.

With the oscillator working satisfactorily tune up the multiplier anodes for maximum grid current in the mixer stage ; the actual stage frequencies should be checked with an absorption wavemeter or GDO. With the values of inductance and capacity given it should be virtually impossible to tune to any but the correct harmonic.

With the IF and oscillator sections of the converter working the RF section can be completed and wired. The 80-ohm aerial coax input socket and V1, with the cathode bias components, heater choke and bypass condenser and the neutralising coil (mounted well clear of the aerial coil and at right angles to it) should be in the last screened compartment. The second RF compartment contains only V1 anode coil, the blocking condenser and V2 cathode bias components and heater chokes. All power supplies entering these compartments are brought in *via* feed-through type decoupling condensers. The entire heater supply line is wired in screened cable. HT and heater supplies

are fed through RF chokes and liberally by-passed at the point of entry to the converter; this assists materially in reducing IF break-through and obtaining stability.

Final Alignment

With the oscillator and IF section already aligned the setting up of the RF section should be quite straightforward. It is quite possible to put the unit into operation, tune in a local signal and complete the alignment on this. In the absence of a suitable signal some sort of signal generator will be required. (The CO stage of the transmitter could be used for this purpose.) A method often used by the writer is to tune the station CR-100 to 28·545 mc ; this will give 29 mc from its oscillator and the 5th harmonic of this is 145 mc.

Peak L1, L3 and L5 for maximum response at 145 mc. If you have been lucky there will be no instability, and the neutralising of V1 should now be given careful attention. With a local signal tuned in, after adjusting for optimum signal open-circuit one side of the heater supply to V1, and then adjust the brass slug in the neutralising coil L2 until the signal disappears or is at minimum strength. Reconnect the broken heater supply. The RF grid and anode coils should now be rechecked, preferably on a weak signal. The anode coil will be found to tune fairly flat as it is heavily damped. The input coil is adjusted by squeezing or opening the turns with an insulated tool.

It is very important to set the aerial trimmer C1 on a *weak* signal as the purpose of this is to tune out the feeder line reactance, it will be found to have quite a marked effect on signal strength.

The oscillator-multiplier circuits should be finally peaked and a slight adjustment might be needed on the mixer anode first IF coil. If gain seems not quite even through the band a final balancing-up can be effected by adjustment of the mixer grid circuit inductance slug.

To obtain the absolute maximum from this converter final adjustment of the input circuit should be carried out with the aid of a noise generator, if such is available. An expensive instrument is not required, one of the silicon diode type will suffice as all we wish to know is if our adjustments improve or degrade the noise factor. A considerable amount of time can be spent on this, and will be amply repaid in the form of results. It should be noted that adjustments to the input circuit which give maximum *gain* do not necessarily coincide with those for the *best noise-factor*, and preference should be given to the latter, as ample gain is available anyway from this unit.

If everything is working correctly and adjustments are at optimum it will be noted that removal of the aerial plug produces a marked diminution in background level ; reconnecting should give a rise in background level. The ideal state of affairs is when the only noise in the receiver is that brought in by the aerial. On most "ordinary" converters the noise generated by the input stage is sufficient to mask noise generated by the radiation resistance of the aerial and external noise picked up on it. This pick-up can be at a very low level at 145 megacycles.

Note on FM Break-through

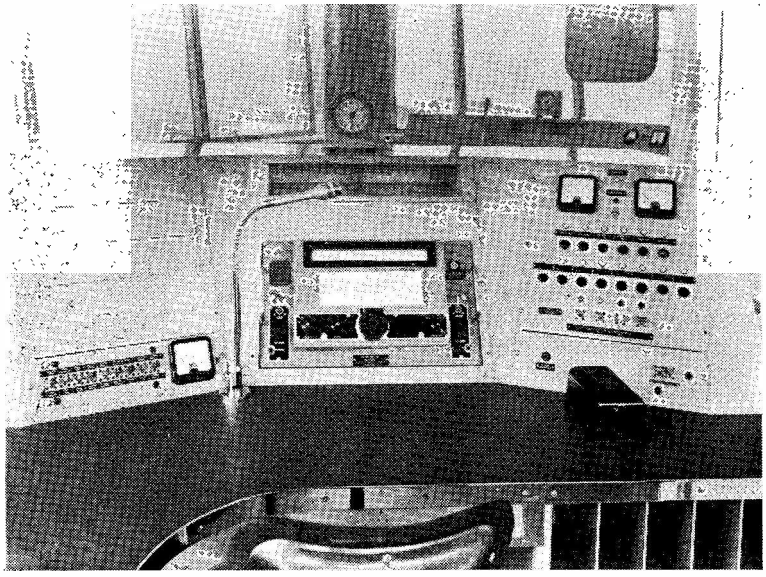
As the oscillator frequency is 120 mc, the second channel response band will be 94-96 mc. Normally the RF tuned circuits offer sufficient protection from FM break-through, but the writer's QTH is within sight of a BBC transmitter on 94·3 mc and some break-through was at first encountered ; however, this was readily cleared by fitting an external screened trap between aerial and the converter.

LONG-WAVE FREQUENCY STANDARD

For those interested in accuracy of frequency calibration, it should be remembered that in addition to the standard-frequency transmissions by MSF and WWV, the BBC's long-wave (Light Programme) transmitter on 200 kc, 1500 metres, is maintained to a very high order of accuracy, and can be used for calibration purposes. If the second harmonic of your 100 kc bar does not give zero beat with the BBC signal on 200 kc, you can take it your crystal is at fault, and not the BBC transmission!

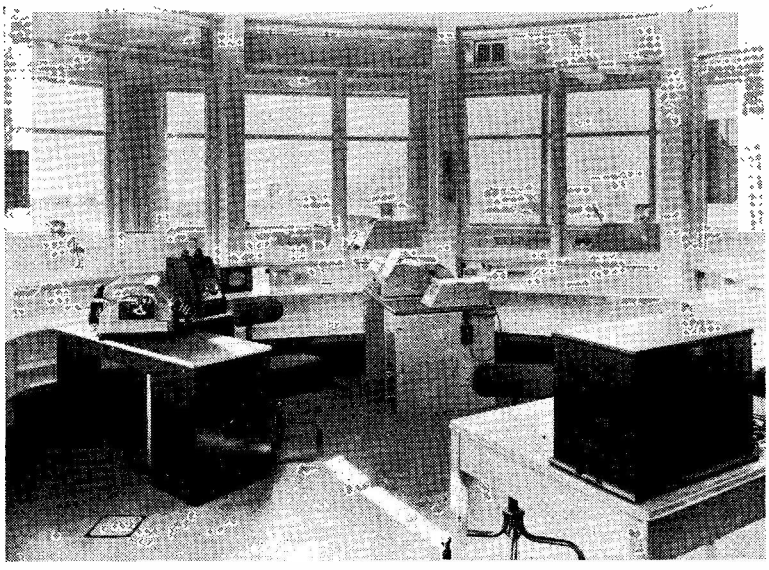
The Amateur Radio Mobile Society's stand at the Amateur Radio Exhibition, with G3AGP at left and G3KVF on the right. An interesting display on this stand was of their home-constructed whip aerials.

G.P.O. COAST STATION — ANGLESEY RADIO, GLV



The operating console at the new G.P.O. Coast Station known as Anglesey Radio — signing GLV and replacing the old Seaforth Radio — features a Marconi "Mercury" receiver, at centre. The transmitting frequencies are selected on the panel at right, which gives choice of two transmitters with high- or and low-power positions, and MCW, phone or CW on either ; the frequencies, press-button controlled, relevant to GLV are : 410, 447, 499, 1618, 1715, 1911, 2182, 2381, 2754, 2796 and 2831 kc. The meters on the right-hand panel read "radiation" for the transmitters. The left-hand panel is for line control and setting up in phone-patch working, with a power-level meter calibrated for a 600-ohm line.

Photograph by courtesy Postmaster-General



The landline room at Anglesey Radio. From here telegrams and other traffic are printed out into the G.P.O. landline system, over which messages to be passed to ships are received. The normal effective radiotelephone service range of Anglesey Radio, which is sited near Amlwch, overlooking the Irish Sea, is about 250 miles.

Photograph by courtesy Postmaster-General

DX COMMENTARY

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

A HAPPY NEW YEAR to all our readers—regular, casual and accidental alike. May the year 1961 be full of interest to you all, whatever your special interest may be! And perhaps we might start right away with a few Old Moore-ish predictions.

There will be a lot of stations on the bands during 1961 (that's safe enough for a start). Most of them will be calling CQ (not much doubt about that, either). Most of the CQ's will be unanswered, because the chap who would have liked to answer was calling CQ on the same frequency at the same time. Many T6 and T7 notes will be heard, but they will all get the usual report of RST 579. There will be a lot of good DX on the LF bands, together with a lot of QRM. On the 7 mc band, the number of stations will increase, average power will go up, operating hours will lengthen, and the band will compensate for all this by getting smaller.

The American accent will be heard on all bands, even with the beam headed in the most unlikely directions. Mom and Sis will still be permanently occupying several frequencies on the phone-patch organisation. The-Man-With-the-Chirp will still be tweeting his way across 14010-14030 kc. Ten new countries will be created out of nothing and the Top People will score over 310. W1BB will be the strongest and most consistent DX signal on Top Band. Phonetics will became even more fanatic. Phone-ethics will become even less ethical.

With the increasing popularity of LF-band DX, long wires will become longer. Beams will become rustier. Power packs will hum louder. QSL cards will be gaudier.

G2CBN

CALLS HEARD, WORKED and QSL'd

Correspondents will become ruder. Your conductor will become older. And 1962 will arrive at approximately 2359 hrs. on December 31st, 1961.

And after all that, for which there are no apologies, let us take a slightly more serious look at Things to Come. It's obvious that the HF bands will fall off more and more, although there will be no shortage of DX of some kind or another. Openings will be less frequent, but should be pretty interesting when they occur. And when the bands are really open for DX, the short-skip nuisance should be far less noticeable.

Interest in the 7 and 3·5 mc bands is already well on the increase, with some spectacular DX on the latter to report in the right place. Top Band will be well in the news, too. So there is not the slightest cause for depression.

Please remember, too (we keep on saying this, but no matter) that

"DX" is a relative term and is there for everyone. This Commentary is *not* written for the chasers of rare ones who have no interest in anything else; it is for all whose chief interest in Amateur Radio is *communication*. We should like to introduce the personal element into it more and more, since it must be more interesting to read about what the DX man uses, and how he goes about things, and what hours he operates, than just to scan a list of call-signs that he has entered in the log during the month.

Please—let us have all possible details of *(a)* Your rig; *(b)* Your aerial system(s); *(c)* Your chief interests as regards times and bands; and *(d)* Any news and views that you get together, either over the air or through the mail. We will do the sorting out at this end.

Finale, 1960

The last month has been extremely interesting from all points of view. The bands have been changing their behaviour very frequently. Activity has been shifting restlessly around, and the rare-DX boys have had their fill of DX-peditions and unusual turn-ups.

Many more interesting developments are promised, and those who keep their eyes on *Forty* and *Eighty* will find that a lot of wasted time is eventually rewarded by something unusual and possibly even thrilling.

There is a high level of activity to report on all bands, but owing to the long delays in Christmas mail and the very late arrival of some of our regular correspondents' letters, you may find the presentation a little different this month. Some who wrote may be disappointed to find that their letters didn't even arrive in time to be commented on, but they will be in the file for next month.

And so to the news . . .

DX Gossip

The month opened with quite a bang (and by "the month" we mean the period starting around November 15). Within a few days we had 6O1AA, ZS6IF/9 and HKØHCA all being chased on 14 and 21 mc, and coinciding with one of the finest general openings of the year. On November 22 the conditions on 14 mc were quite fantastic; around 1700 GMT we heard S9 signals from VU, YV, VK and W6 all at once, and the phone band seemed to be full of ZS's. And *no* short-skip at the time!

On the 28th, or thereabouts, Gus, W4BPD, had transferred from 6O1AA and was signing "FL9" from French Somaliland. Obviously a joint "do" with Rundy, W3ZA, since FL8ZA was on at the same time, and most stations worked them both in consecutive QSO's. From the 27th to the 29th, Bryan of MP4BDA was putting out SSB from ZB2A.

The "Gus and Rundy" partnership will probably have broken up by the time this is in print; but in mid-December they were leaving Bahrain for Kuwait and hoping to operate from the neutral zone between Kuwait and Saudi Arabia—possibly with a new prefix (9K7 had been mentioned). After the FL9 operation, they worked jointly as MP4QAQ/4QAR, and then as MP4TAI/4TAK; SSB and CW in all cases.

And during all this time the Top-Band boys were chasing ZC4AK, who has been coming through consistently from 2100 onwards on Saturday evenings, using a DX-100U and 150 watts. Naturally, not everyone who has heard him has been able to work him, but quite a number have made it.

YA1BW hopes to be on again by January, having in the meanwhile returned to Germany and been married. He promises activity on Fridays, Saturdays and Sundays, 1700 GMT on 14080; also Sundays, 1330 on 21075; QSL *via* DL8AX. *(QTHR.)*

Another *Malpelo Island* operation is planned for mid-January, by W6HAW and some of the HK's. The call will be HKØTU and dates uncertain, but January 13-19 hoped for . . . Various notes about possible activity from Viet-Nam and Laos are doubtless out of date by now in view of the political situation.

Nigeria is said to be awaiting a new block of calls to replace the ZD2's, but it seems likely that the British Cameroons will continue to sign ZD2. At present the latter counts as a separate country, but eventually it will join either Nigeria or Cameroun (FE8). February 11 is the date for the plebiscite, until which it is independent.

The *Socorro* (XE4) expedition is still planned for mid-January . . . *Norfolk Island* is now represented by VK9ANB, operated by Ray Baty, formerly VR3A . . . Yet another *Marcus Island* expedition is planned, this time by a W7, and promised for February.

There has never been much operation from *Oman*, and there has been some discussion about which ops. were legitimate; VS9

Short Wave Magazine
DX CERTIFICATES

The following have been issued since the publication of our last list, in the October, 1960 issue:

FBA

No.	193	OZ2NU (Aalborg)
	194	OE6RS (Eisenerz)
	195	EA8AI (Santa Cruz de Tenerife)
	196	SM2BQE (Skelleftea)

WABC (Top Band only)

No.	223	G3KGM (Chelsea, S.W.3)
	224	GM2HIK (Forfar)
	225	G3NVO (Middlesbrough)
	226	G3NQU (Southend-on-Sea)

WBC (Overseas only)

No.	183	VE2IL (Valleyfield, Que.)
	184	SM3BCZ (Bollnes)
	185	DL9NM (Nurnberg)
	186	OZ5WJ (Randers)
	187	K8GHG (Euclid, Ohio)
	188	KP4CC (Santurce, P.R.)
	189	VE8PB (Vancouver)
	190	DJ2SR (Nuremberg)
	191	W2TP (Leonia, N.J.)
	192	SM7CNA (Ljungby)

WNACA

No.	255	G3NUY (Gatley, Ches.)
	256	DL3ZA (Heilbronn/N-Sonth.)
	257	G2DF (Warrington)
	258	KH6DKA (Hilo, Hawaii)
	259	G3JHZ (Wallasey)
	260	DL9DB (Cologne/Rhein)

Details of MAGAZINE DX AWARDS and CERTIFICATES and the claims required for them appeared in full on p. 474 of the November, 1960 issue.

Overseas claimants may send either *(a)* A check list, without cards, duly certified by the Hq. of their National Radio Society, or *(b)* An uncertified check list, from which any or all cards may be called in for scrutiny by us. U.K. claimants must send the relevant cards for each award.

All claimants must include sufficient return postage for the cards and Certificate — five IRC's in the case of overseas claims.

and MP4 calls have both been used in the past, and may have been "irregular." Now we gather that 9C2 has been allocated.

The Overseas Mail

MP4BBW (Awali) puts in his usual fine list of SSB DX, which appears in the appropriate section. He has found the bands somewhat down on last month, and in particular the propagation to Europe has been unpredictable. News items from 'BBW as follows: *Laccadives*—VU2NRM scheduled to be active roughly from January 4-18 . . . VQ9TED hopes to be covering the *Amirante-Aldabra-Farquhar* circuit, probably December 30 to January 15 (so you may have missed one by now!) . . . UAØLA is on SSB from Vladivostok . . . VP8EI, EA8CT and UC2KAB all on SSB.

VU2XG (Bombay) had quite a hectic time during the *CQ* DX Contest on CW, but will only be sending in a check log for four bands. He found 14 mc disappointing but 7 mc very lively; on the latter, he says "the QRM in Europe must have been terrific —it was bad enough here!" He has a dipole up for each band, 7 to 28 mc; despite the low height of the 28 mc affair, the end of which he can reach out of his window, he gets 599 reports from G's and intends to leave it where it is. Before leaving VU-land, next year, Peter hopes to collect the FBA and the WBC for his work in Bombay.

9M2GA (Muar) says that openings to Europe are very erratic, especially on 21 mc, and signals have never been really strong, even on the good days. He misses his former regular contacts with G's on that band. But he has been on 14 mc with SSB, and during November things were looking up again. He works G's at about 1400 GMT, and W's *(via* the long path) around 1100; two countries he needs, but has never yet heard on any band, are OX and VO.

MP4BDA, the globe-trotter, managed to get his SSB on from Gibraltar, but found that he could not add the call ZB2AE to his long list after all. Apparently British amateurs can only collect a call if actually *resident* in Gib. Since Bryan was a bird of passage, he had to collaborate with ZB2A (the RAF Club) and, of course, used their call. In Germany he used DJØBF, actually the call held by his friend G3OOH out there, so don't be surprised to find that DJØBF is still active (he uses 45 watts CW only, on 7, 14 and 21 mc) and welcomes chats with G's on 7 mc, especially from his home area of South-East London.

To return to Bryan—he has operated SSB from MP4Q, MP4T, MP4M, ZB2, 4W1 and YI, but still needs contacts with all those countries himself! And he concludes: "There is absolutely *no* truth in the rumour that I plan to visit Rockall, but if someone will lend me a destroyer and a helicopter . . . !"

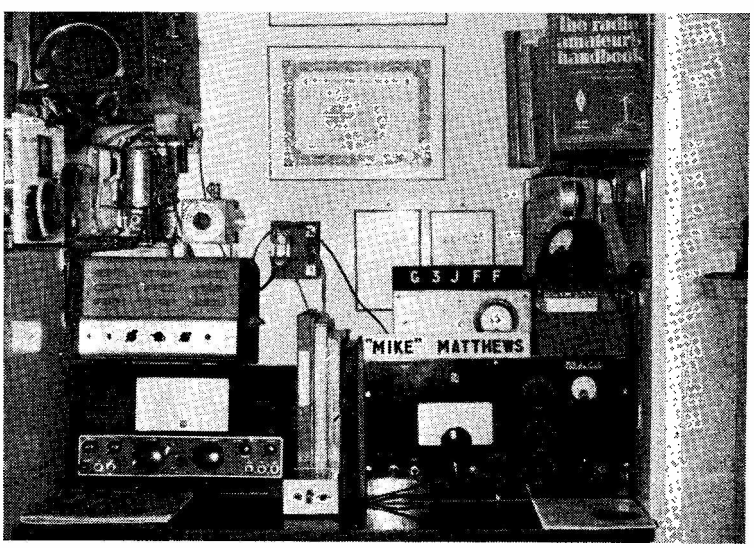
Quads and All That

There is some danger that the word "Quad," before long, will have yet another meaning—neither quadruplets nor that beloved form of aerial used by so many. The "Quads" scheme mentioned last month is "taking," with a vengeance. (To refresh your memory, it was suggested that the map of the world be divided into sections 10 deg. by 10 deg.; someone misguidedly called them "quadrants" and this became shortened to "quads.") However —even the brief and guarded mention of this last month aroused so much interest that some people have already produced Mercator maps, suitably marked, and started investigations to see how many they have worked. And one or two are pretty livid at not having entered in their logs the exact positions of all the /MM stations worked!

G3WW (March) mentions that he heard this idea being discussed when he was at the meeting of the New Jersey DX Association, and they all seemed to be taken with it.

Bush Telegraph

G3WW goes on with some remarks about "Channel Two" over there; he discovered that this is the local name for a two-metre crystal-controlled channel used by the Association to ensure that all members were fully genned-up on new pieces of exotic



The rig at G3JFF, Kingswear, Devon, is in a corner of the dining-room, the transmitter being a modified Panda "Cub" running up to 50w., and the receiver an Eddystone S.640. Aerials are a 100 ft. wire coupled through an ATU, and a Mosley tri-band vertical. As an R.N. W/T operator, G3JFF (who is also hon. secretary of the R.N. Amateur Radio Society) prefers CW on the amateur bands, for which he uses an El-bug "to take the hard work out of operating in this mode." Equipment includes a BC-221, xtal band-edge marker, and various items of test gear. During 1956-59, G3JFF was signing VS1HU, VS2MA and 9M2MA, and his main interest from the home station is in DX working, 116C having been accounted for, with 20 major DX operating awards held.

DX. And now note this, to show How Keen Can You Get . . . When a new DX station is expected to show up, members keep a one- or two-hour watch; when the operator on watch first hears the station concerned, he dials all the DX gang on the land-line, letting each bell ring three or four times before "killing the line" and going on to the next one. Then the DX'ers (getting out of bed, if necessary) switch on their two-metre rigs and obtain the full gen. from the Man on Watch, who (presumably) has worked the DX between dialling the gang and broadcasting the news on two metres. So . . . if you are a typical free-lance and manage to snaffle that rare piece, you can glow with pride at the thought of the competition you are taking on every time!

The Country Business

W6YY (La Canada) mentions that the DXCC Awards Section of ARRL has ruled that the British Sovereign Area of Cyprus shall *not* count separately from the rest of the Island. (Anyone ever worked Guantanamo Bay, Cuba—KG4? Marvellous, isn't it!)

Incidentally, we have received a surprising number of congratulatory notes on dropping the country-counting and going over to prefixes for 1961. Some folk admit to a bit of trouble going through the log, but everyone seems to agree that prefixes are entirely satisfactory for those in a competitive mood, not being subject to anyone's whims. (The same remark applies, of course, to these mysterious Quads . . .) And on the subject of Prefixes, they bring their own little difficulties with them; as G3OGO enquires, has anybody tried to work GD8? The chief attraction of the scheme is that there are always some gaps which it *might* be possible to fill. We'll see how this "P and Z Ladder" works out during 1961.

Top Band Topics

This winter's DX Tests have opened uneventfully, as far as we over here are concerned. On most Sunday mornings W1BB and a few of the regulars from the other side have been audible, but pretty weak as yet. We expect the peak to occur in February—but it might well come sooner. ZC4AK's efforts have put Cyprus on the map rather more effectively than it has ever been done before, and strings of G's have been working him when conditions have been right. With G3BMY acting as "conductor," there has been little difficulty in getting through for those with respectable aerial systems, but, of course, reports have been on the weak side. Even when ZC4AK has been 569 himself, most G's have collected 339 and 449 reports from him. Saturdays at 2100 GMT have been quite busy!

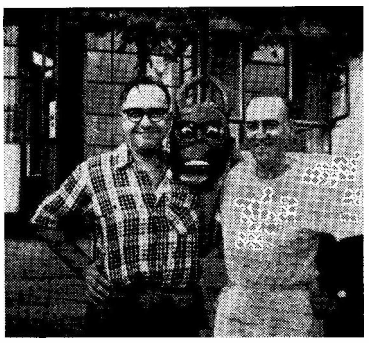
G3FS (Sidcup) says that most of his QSO's have been with the locals, but he's been on the key quite a bit and raised several OK's. G3NJQ (Norwich) found things good for general G working and also raised ZC4AK (with a 90-ft. end-fed wire).

G3OHX (Alnwick) noted extremely good conditions on November 27, when he worked five OK's, getting 569 and 579 reports. He joins the Table with 49 counties worked. G3NXQ (Worcester) heard another station commenting on his strong signals and saying "Bet he doesn't half use some power." So he called the said station and gave him the line-up: EF91, EL91, 5763 PA. *And*, of course, 264 feet of wire! He worked ZC4AK and HB9T, but wants to know about the oft-threatened Top Band activity from ZB2 . . . we have no news.

If anyone wants *Fermanagh*, get in touch with GI3MCZ and arrange a sked; and if it's *Kirkcudbright* you need, GM2MP, the only active operator there, will be on at 2300 most nights and will be pleased to hand out QSO's.

G4JA (Baschurch) says that his comments on the HF bands would be unprintable, so he turned to Top Band for the first time since 1930, when he was G2JA. He was delighted to meet many old timers for longish ragchews, and winkled out his first 20 counties towards WABC, *plus* a couple of OK's; this with his "all-band wet string"!

SWL Peter Day (Sheffield) covered the band on December 4



We don't know who the chap in the middle is, but he is supported by ZD2AMS (left) and ZD2ATU.

and found conditions very poor for USA, but heard HP9QA, DL1FF, DL3GZ and ZC4AK. On the 11th he logged W3IU (0525), peaking at 569, and a K1 who was not fully readable. The USA Loran (1845 kc) was S7 on this occasion.

"CQ" Top-Band Contest

This CW Contest will be held in February—2100 on the 24th to 0900 on the 26th. Primarily for VE's and W's—last year 286 stations took part. They gain substantial bonus points for con-

WPX MARATHON, 1960

(Final scores will appear next month)

CW Only		Phone Only	
G6VC	352	G3GHE	339
G8DI	350	MP4BBW (*SSB*)	330
G3JVL	310	G3LAS	261
VU2XG	283	GB2SM	252
G3LAS	257	G3DO (*SSB*)	246
G4JA	218	G3LHJ	211
G8VG	208	G3MCN	167
G3JUL	200	G3NFV	163
G3WP	189	G3BHJ	152
G3LHJ	188	GM3NQB	107
G3LZF	187	G8VG	103
G3DQO	157	GM2DBX	92
G3NWF	151	G2FQW	84
G3JVU	151	G6VC	77
G3DNR	128	G3DNR	55
G2BP	125		
G2BLA	125	G4JA	49
G3MGL	108	G3NWF	47
G3JFF	103	G3MGL	17
G3GMK	94		

P & Z TABLE

CW Only	PREFIXES WORKED	ZONES WORKED
G3WP	356	36
G3IDG	222	28
G3LZF	187	29
Phone Only		
GB2SM	370	37
G3MCN	324	38
G3NWT	281	38
G3WP	80	25

tacts outside W/VE, so it will be well worth keeping an eye on things and calling them, although the QRM on the other side must be diabolical.

Another news flash from W1BB —OD5LX should be on every *Saturday* at 0300 GMT, 1800 kc—a good chance for a new one. The latest W1BB bulletin shows a tremendous increase in the number of really interested stations on the other side—spread all over the States and including KH6. Unfortunately, KP4KD and the other KP4's cannot operate on the band.

Eighty Metres

Both on CW and (at the other end) on SSB, the DX-minded types have been going to town. G4JA, on the night of December 12, found himself in a queue of East Coast W's, on CW, and exchanged 579 signals for a couple of hours, with, apparently, no other G or European station there to help him out. He doesn't mention the time, but adds that on the 13th there was absolutely nothing doing.

Up at the other end there is a regular Trans-Atlantic net between 0700 and 0900 GMT, with the G's around 3795 kc SSB and the W's in the region of 3820 kc. W1, 2, 3, 4, 5 and 8 have been worked, and one G is reputed to have been heard in W7. W1BU acts as spokesman and has a terrific signal, usually peaking around 0800 and often remaining well in the picture until 0845. SWL Peter Day says that on December 11 W1BU was still S7 at 0930! G2HX and G2PU worked ZL1AAX and 1AIX, and a KH6 has been heard over here. At the other end of the band, on CW, ZL4IE has been worked by G's around 0800.

Forty Metres

Plenty of DX has been raised, and heard, practically all on CW, and the lists appear under the heading "CW DX Worked" further on. SWL Peter Day's list is worth quoting as a guide, because no one manages to work it all. He logged VQ4HT, 4GQ, VS1FW, VU2XG and SVØWK (all between 2000 and 2100); VS9OA, HZ1AB, KV4CI, UAØKAE, TF5TP and ZC4AK (2100-2200) and KG4AG (2340). Good signal-strengths all round—and note the times.

The HF Bands

This month we leave the lists of AM and CW DX worked on the HF bands to speak for themselves. Most of the comments in the letters accompanying them fall under other headings and will therefore be found elsewhere. Sufficient to say that *all* bands—even *Ten*—have been quite interesting at some time or another.

We have pruned some of the lists pretty ruthlessly on account of length, and the DX tabulated here represents only the best of the bunch. Some quite nice pieces will be noticed by the connoisseurs!

CW DX WORKED

28 mc Band

G3FXB: FQ8HO, VQ8BC.
G5BZ: VU2XG, UA9SB, 7G1A, SVØWZ.
G3IGW: ST2AR, SVØWZ, VU2RM, 2XG, ZS7R, 7G1A.
ZC4CT: JA1YL, 1ALC, 3AG, 3VG, OA4ME/7, VK5NQ, VU2XG, 7G1A.

21 mc Band

G3FXB: CR5AE, HC8VB, VQ1HT.
G3LHJ: VQ1A, 3V8CA.
GW3AHN: HKØHCA, FL9, FL8ZA, VP8BK, 9Q5SF (Katanga).
GI3NPP: AP2MR, ET2US, FL9, FQ8HO, HKØHCA, MP4QAR, TA2BO, VP2LD, ZS6IF/9.
ZC4CT: CX7CO, ET2US, 3AZ, FQ8HD, 8HO, 8HP, JA, PY7LJ, VK, VS9MB, ZE, ZL, ZS, 3V8CA, 9G1CW, 9K2AD, MP4QAQ, 4QAR.

14 mc Band

G5BZ: KL7AOA, 7PJ, VE7APX, LA2DE/P, FQ8HP, MP4BCV, VQ2EW.
G3FXB: CR5MA, OR4TZ, PY7LJ, VQ1HT, VQ9A, 9U5MC.
G3WP: EQ2AT, FQ8HO, OY2H, 7G1A, PJ3AK, OX3M, VE4, 6, 8.
GI3NPP: EP2AY, FB8XX, 8ZZ, FL8ZA, FL9, FY7YF, KH6, KZ5, MP4QAR, OA4KF, PJ3AD, VK9XK, VP8EZ, VQ1A, VQ8BC, VU2SL, ZS6IF/9, 6O1AA.
G6VC: EP5X, VQ1A.
ZC4CT: FL9, 6O1AA.
G3LPS: ZS7M, UAØAH, ØKAE, ZS6IF/9, CN8JR, VQ8BC, LA8YB/P, OR4TZ, UA1KAE/6, VE8RW.

7 mc Band

G3FXB: KV4CI/KP4, PY7LJ, UJ8KAA, VQ4CC, VK5JE, VU2XG, VQ1A.
G5BZ: UD6, UF6, UG6, UH8, UI8, UM8, W's, 4X4DH, VK5LD, SVØWQ, ZB2AD, VS9OA.
G6VC: UG6KAA, VQ4GQ.
GI3NPP: FF8BF, HZ1AB, KP4, LA1NG/P, MP4QAR, OD5CT, PY7LJ, VQ4DT, VS9OA, ST2AR, 7G1A.
G3DNR: SVØWQ, CN8JR, ZB1FA, ZB2AD.
G3IGW: HZ1AB, JA1LZ, OD5LX, SVØWQ, UD6, UG6, VQ2CZ, YN4AB.
G3LPS: LA1NG/P, HZ1AB, VQ4HT, MP4TAK, JA3AS, VO1DX, PY2 and 5.
ZC4CT: KP4AMT, KV4CI/MM, JA9NB, UAØAG, W's.

AM PHONE DX WORKED

28 mc Band

G3LHJ: CX3FR, VQ8AV, VU2BK, 2PS, VP6AM, YN3LBV, YV3DP, 6O2GM.
G3NAC: VP9AK, KP4GN, 4AKB.
G3MCN: FQ8AE, HP1AC, VQ8AV, 6O2GM.
G3FXB: FF4AB.
G3NOF: CR7LU, GW3ITD/MM, KP4AOO, TI2RFT, VP9AK, YN1JK, ZD2JKO.
G3DNR: FA3JR, VQ2BK, ZD2JKO, ZE3JJ.
G2BLA (NBFM): CR6CA, MP4BDC, TI2OE, VP9AK, VP6, ZD2.
G3GHE: CR7's, CX1VD, EL2U, ET2US, 3MA, FF7AG, HR2MT, KG4AO, PZ1AY, SVØWZ, VK6QL, VP9AK, VQ3PBD, XEØKH, ZB2AD, ZP5CK, 9G1DQ, 9Q5AO, 9U5PD.
ZC4CT: DL3RO/EP, MP4BBA.
G3NWT: CR4AX, VQ4DT, ZD2JKO, 2ATU, ZE, VP6, VQ2.

21 mc Band

G3GHE: AP2Q, CR9AN, EA6AY, EP2AT, FB8CO, KR6's, LX1DE, VP3MC, VQ8AM.
G3DNR: MP4BCP, VQ4RF, ZD2ATU, 9QAG.
G2BLA (NBFM): EA6AR, EA8BB, ZD2.
G3NOF: FF7AG, VQ4RF, ZD2ATU.
G3FXB: CR9AN, AP2Q, EL4B, ET2US, FB8CM, FK8AU, FQ8HZ, FR7ZD, HC1KA, HH2RS, KØTFP/KW6, PJ3AJ, PZ1AP, VP8DW, 8FM, VQ8AM, VP2DQ, ZS7R, 6O2GM, 9U5PD.
G3NAC: VS9MB, VQ8AM, EP2AT, 9Q5's, 9Q7ZZ, 9U5NC, 9G1DH, EA6AR, 6AY.
G3LHJ: EP2AT, FR7ZD, VQ8AM.
G3NWT: VP6PV, VQ8AM, KR6KQ, 6O2GM, ZL3UY (2050).
ZC4CT: KG6AJF, MP4BBA.

The DX on SSB

The W4BPD/W3ZA sorties, more generally known as the Gus-Rundy phenomena, made available quite a few new ones, such as VQ1A, FL9/FL8ZA and the various MP4 departments. That part of the world seems to

be quite a paradise for SSB operation, with MP4BBW probably one of the best-known operators in the world on the high end of 14 mc. Some news from him appears under "Overseas Mail."

Globe-Trotter MP4BDA also reports on his ZB2A operation, and says that things are certainly difficult now that the W's have moved into the top 50 kc of 14 mc. He wishes they had been given 14150-14300 kc for phone, leaving 14300-14350 for the rest of the world's SSB men—it would have been better for everyone, including the W's.

Evidence that they are finding things difficult appears in an open letter (in the WGDXC *Bulletin*) from two W's and two K's. They appeal to all USA stations to agree to set aside 14295-14300 kc (yes, all 5 kc!) for the exclusive use of amateurs outside the American continent.

Meanwhile, we most strongly recommend that sidebanders in Europe should begin to use 14150-14200 kc, as the Canadians are already doing. A little activity here would soon spread the message and maybe we could establish ourselves in a small slice that would always be free of phone-patches.

TOP BAND COUNTIES LADDER

(Starting Jan. 1, 1952)

Station	Confirmed	Worked
G2NJ	98	98
G3JEQ	97	97
G6VC	96	96
G3APA	85	90
G3ABG	81	82
G3NFV	75	78
G3JVL	73	83
G2DF	73	75
G3LHJ	71	77
G3FS (Phone)	69	72
GM2H1K	67	74
G3MXJ	67	74
G3NTI	66	68
G3NNO	65	82
G3OCA	65	69
G3NBT (Phone)	61	65
G8VG	59	67
G3OAG	56	62
G3NJQ	55	56
G3NNF	54	59
G3NPB (Phone)	49	52
G3JFF	47	59
G3NNF (Phone)	47	49
G3NAA (Phone)	45	57
G3NMZ (Phone)	45	55
G3LZF	42	61
G3NXQ	42	52
G3IDG	41	45
G3NNO (Phone)	32	52
G3NOW (Phone)	30	40
G3MXJ (Phone)	25	43
G3OHX	21	49
G3ABG (Phone)	17	33

(Failure to report for three months entails removal from this Table. New claims can be made at any time.)

DL1SP (right) and G3OOB (Leeds), who is now serving in Germany, share a station at Lage/Lippe. W/O II Buckley is a Foreman of Signals with the 4th Signal Regt. at Herford, BFPO-15.

SSB DX WORKED

14 mc Band

MP4BBW: EQ5X, VQ9TED, XE1ZE, KC4USH, 9G1CN, VP2AB, UL7JA, HV1CN, 9M2GA, 9Q5AG, ZS7P, VQ8AD, VQ1A, 9N1SM, HKØHCA, KW6DG, FL9, FL8ZA, ZB2A.

ZB2A (Op. MP4BDA): PZ1AX, ZD2PJB, VQ5FS, UP2CG, 5A5TA, KV4BQ, TI2HP, CX2CO, YO3GK, VQ4ERR, 9M2DB.

G3NOF: EA8CT, MP4TAI, OD5CT, PZ1AX, ZB2A, 5A3TX, 9Q5AG.

G3NWT: CN2JX, CR6CA, CR9AH, ET2US, FL8ZA, HZ1AB, KG1, MP4TAI, PZ1AX, SVØWV, UA9CM, UC2KAB, VE, VK, VQ5FS, VQ8AD, VQ9TED, VU2NR, VS6AE, VS9OA, YO3GK, YV5APP, ZS7P, 9N1GW.

21 mc Band

G3NOF: BV1US, FF8CW, HKØHCA, HZ1AB, KG6AJB, KR6RN, KV4AA, OAØHIA, ZL1AU, ZL2AVA, 3V8CA, 5A5TA.

G3NWT: KR6RN.

28 mc Band

G3NOF: HKØHCA, OA4ED, VP7NT.

Our Heading Photograph *(p.584)*

G2CBN (J. W. J. Tyrell, 30 Hamilton Road, Hayes, Middlesex) started in 1928 under AA call 2BLX. Joining the Royal Signals and being posted to India in 1929 brought him on the air under VU2XX (North-West Frontier), VU2MN, and VU2BM (Rawalpindi and Murree). In those days the gear consisted of a TPTG transmitter, run on CW, and an O-V-2 receiver, but from good locations world-wide DX was worked. Nowadays, the Tx has a pair of 807's in the PA, in the conventional line-up, modulated by a pair of KT66's, and the Rx is an SX-17—not new, but good. As the main interest now is 20-metre phone, the aerial is a dipole for that band. G2CBN is also /M on 40 metres. And he often meets on the air old timers worked under VU2BM nearly 30 years ago.

More recently, G2CBN was indirectly involved in the "Ethiopian Crisis" of December

14-16 last; he heard the emergency transmissions made from Addis Ababa by one of the ET3's on the 21 mc band, reporting that a *coup d'etat* was being attempted, that Ethiopia was "cut off from the outside world," and that anyone hearing the message should pass it to the Ethiopian Embassy.

G2CBN is now employed in the freight department of B.E.A. at London Airport.

Quotes in Brief

"Can't imagine anything worse than a Top Band phone contest, as suggested in this month's *Magazine*. Judging by the pile-ups encountered in 'peace-time' Top Band phone, I shudder to imagine it" . . . (G3MXJ). "Two good things were *(a)* tuning across Ten one evening and hearing an LU calling 'CQ Sandiacre,' and *(b)* going into the local super-stereo showrooms to ask if they had any 9-volt grid-bias batteries" . . . (G3NWT). "The rumour concerning a new prefix for Cypriot nationals is false" . . . (ZC4CT).

"W2CTN says he can't act as QSL manager for FG7XF any longer, as he has never received any logs" . . . (G3ALI). "This month's banner headline should be 'Clear the African Muddle' . . . the whole of that dark continent seems to be one welter of new 'democracies' that want to be independent of everything, including call-signs" . . . (G3OGO). "ZD2AMS visited me recently and is anticipating SSB activity on his return. He still holds a licence for FD8AMS and hopes to operate from Togoland in 1961, perhaps on SSB" . . . (G3NOF). "Fifteen was dead—then one signal came up for five minutes, I worked him, and he faded right out again. The *listener* certainly scored during the sunspot blackout, and I raised VS9MB, CR7CI and 9U5NC that way" . . . (G3NAC).

"The prefix-counting system holds no interest for me—the fault is the number of non-DX QSO's one has to make in order to have a reasonable score. For instance, approximately 20 QSO's with Germany—hardly DX-citing!" . . . (G3IGW). "The criterion of whether conditions are good or bad is whether they come up to the level to be expected at any given period of the sunspot cycle, which I should suggest they have failed to do of late" . . . (G3GHE). "The powers-that-be have decided to recognise UA2 (territory that used to be East Prussia) as a new one; UA2KAA and UA2KAW were both very active from Kaliningrad a year or so ago" . . . (GW3AHN).

"Have now worked UAØBP and UAØIK, both Zone 19, and now QRX for a card for my WAZ" . . . (G6VC). "Shall be more or less QRT for some months, as I move into 'digs' in Rickmansworth on January 2" . . . (G2YS). "Quote from a W: 'I am only running 400 watts, an HT-32 with a small pair of boots'" . . . (G3NWT).

Contests

The Sixth European (WAE) DX Contest takes place in one week from our publication date. Duration is as follows: 0500 GMT, January 14, to 2300 GMT, January 15. Rules as before: 3·5 to 28 mc, contacts between Europeans and non-Europeans. Full rules available from DARC DX Bureau, Fuchsienweg 51, Berlin-Rudow; but they are identical with those of last year.

The *ARRL DX Contest* is booked for the customary four week-ends. CW event: February 17-19 and March 17-19. Phone event: February 3-5 and March 3-5. Midnight-to-Midnight, 48 hours' duration in all cases. The W/K/VE stations send their State or Province abbreviations, and outside stations send three figures representing their power in watts. Multiplier is the Call Areas *(not* States) worked on each band—maximum of 21 per band. Log forms available from ARRL.

Our Tables

The new Prefix and Zone table has got off to a very slow start, on account of the necessity for checking back through logs in many cases, but we are already promised plenty of support for it.

There has, however, been quite a bit of disappointment at the temporary shelving of the Five-Band Table—we are only "resting" it for a year—mostly because of the interest in the LF bands, which found an outlet in that way. We are therefore starting a new table, beginning next month, which we will call the **LF Bands Ladder.** Send in your total of Countries Worked on 7, 3·5 and 1·8 mc and we will do the rest. It is suggested that the order of merit should be decided by, first, the total of all three figures, and then by each band in rotation. If you don't work Top Band at all, you can still enter with a zero under that heading. Don't forget, then, for next month — countries worked on each of the three LF bands; and with Forty and Eighty becoming more DX-worthy all the time, this should awaken quite a lot of interest.

And so, once more, to the signing-off procedure. Thanks and acknowledgments to all our sources of information, including the WGDXC *Bulletins,* the Polar Bears' Radio Club *DX-er,* the Northern California DX Club's *DX-er,* the *Western Radio Amateur* and, of course, all our own correspondents. If you have written in this month and can find no reference to your letter, blame the Christmas mail chaos — it caused *us* quite a lot of trouble, too! And next month's deadline will be **first post on Friday, January 13, 1961.** All addressed, as usual, please, to "DX Commentary," *Short Wave Magazine,* 55 Victoria Street, London, S.W.1. 73, BCNU and a Happy New Year.

AMENDMENT OR CORRECTION

One or two readers have noticed that, in the physical diagram Fig. 2 on p.467 of the November issue, the positions of C1 and C4 should be transposed to correspond with the circuit at Fig. 1.

EI QSL BUREAU

We are asked by EI9U to draw attention to the fact that the Bureau address for EI cards is now: I.R.T.S. QSL Bureau, 24 Wicklow Street, Dublin, Eire.

S W L • • • • • •

COMMAND SETS AND Q5'ers — LEARNING TO FIND THE DX — READERS' IDEAS AND OPINIONS — THE HPX LADDER

THERE can hardly be a single piece of ex-Service equipment that has been turned to more uses than the very popular Command Sets, which are now in somewhat short supply if you are looking for one in new condition. However, second-hand specimens change hands over and over again, and there are quite a few lying around on shack benches or in junk cupboards which have not yet been brought into any sort of use.

The original "Command Set" was flown over from the USA in huge numbers when bombers (mostly Fortresses and Liberators) were being delivered across the Atlantic, from 1942 onwards. Most of them were ripped out on arrival, as not being suited to the operational requirement. The full equipment consisted of five transmitters and five receivers, but the most usual form in which they were met was a rack in which were mounted one transmitter and four receivers.

The four best-known, and most useful, receivers are listed in Table I; there was also a very rare specimen known as the BC-454, which covered 1·5-3·0 mc with an IF of 705 kc (ideal for Top-Band mobiles!), but all the BC-454 specimens which we have ever come across have had the suffix —A or —B and have been of the variety listed, covering 3·0-6·0 mc.

All sorts of modifications and conversions are possible on these receivers. If used as designed, they are, of course, highly efficient and selective, but lacking in bandspread and requiring 28 volts for the heater supply. Each one of them originally carried its own little rotary converter, running on the 28-volt aircraft supply to give the necessary 250 volts of HT. So, as we once heard some humorist say over the air, "all you want is a car with a 28-volt battery and you're away."

Fortunately for everyone, the valves used are standard 12-volt types with their heaters wired in series pairs; it is a simple matter to dig into the chassis and re-vamp the heater wiring so that they are all in parallel across the supply line.

Fig. 1 shows the block diagram common to all the receivers, and Fig. 2 the wiring of the heaters before modification. Having re-routed this wiring so that all the heaters are in parallel, two courses are available. You can either use a 12-volt transformer (or two 6·3 volt windings in series—preferably the right way round !) or you can substitute 6-volt valves throughout. The 12SK7's in the RF and IF stages are replaced by 6SK7's; the 12K8 mixer by a 6K8, the 12SR7 detector/BFO by a 6SQ7 (more easily obtainable than a 6SR7) and the 12A6 by a 6K6, 6F6 or 6V6. No wiring changes are involved.

If you are the owner of a BC-454 or a BC-455, carry out the above changes and you have a perfectly efficient receiver for the 3·5 and 7 mc bands respectively—with, of course, additional coverage over sundry short-wave broadcast bands. If you have a BC-453 you are the fortunate owner of a ready-made Q'Fiver or Q5'er—provided that you also have a receiver with an IF of 455-465 kc.

Using the Q'Fiver

The original scheme which came to be known in this way was simply an "outboard" addition to conventional superhets, making use of the 85 kc IF of the BC-453 to turn many indifferent receivers into double-conversion jobs. It entailed the very minimum of work and was therefore highly popular !

Wire up the BC-453 so that the heater circuit is as you want it—leave it as it is and use a 24-volt transformer, or parallel the heaters and use a 12-volt transformer, or do this and also change to 6-volt valves for a 6-volt transformer. Do one or the other, get the receiver working, and instead of putting it on an aerial, tune it to 455 kc (or 465 kc, whichever is appropriate) and just give it a whiff of IF from your normal receiver, and you're off.

Take a coax lead from the aerial terminal of the BC-453 (or replace the terminal with a proper coax socket); lead the coax into the receiver; earth the outer, and bring the inner into fairly close proximity with the secondary of the last IF transformer, and you will have a double superhet operating within a few minutes. Some favour the use of a "prod" down through the top of the IF transformer can, but we have found the simplest method is to take one turn of insulated wire round the grid or cathode pin of the detector.

Very little IF transfer is needed, since the first valve in the BC-453 is now an IF amplifier at 465

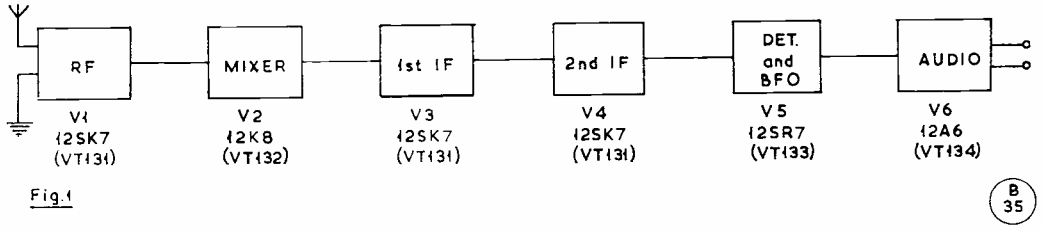


Fig. 1. Block diagram of the "Command" series of receivers. In the original, these sets are fitted with 12v. valve types, connected to operate from a 24v. supply (see Fig. 2.). It is a simple matter to modify the circuitry either for a 12v. LT feed, using the original valves, or to fit standard 6.3v. types — as suggested in the article— for the normal LT supply.

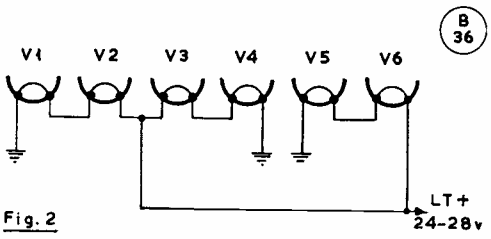


Fig. 2. How the heater supply is connected in unmodified "Command" receivers — see Table for types. Having traced the LT wiring under-chassis, it can be re-arranged either for 12v. with the existing valves, or for 6.3v. with new valves.

(or 455) kc. The second conversion is to 85 kc, and the three IF transformers at this frequency are adjustable for selectivity by pulling up or down the small insulated rods which will be found underneath the insulated knobs on top of the cans.

Full selectivity is ideal for CW work but often a little too sharp for AM phone. We have not actually used one on SSB, but the full selectivity should be usable for this purpose.

For CW you can use either the BFO in your existing receiver, or the one in the BC-453—don't try using both ! And the tuning of the BC-453, over a very small range round about the actual IF, will give an effect similar to the crystal phasing control on some receivers. With this, the choice of BFO's, and the variable selectivity, you will find that you have a very versatile unit. Furthermore, you have one which will revolutionise the performance of many indifferent receivers.

The foregoing has been addressed mainly to the novice who didn't even know what a Q'Fiver was before he started reading. For the more experienced, there are many uses for these Command Receivers (and, indeed, for the transmitters that go with them). For details of many interesting modifications and conversions we cannot do better than refer them to the handbook entitled *Command Sets,* published by the proprietors of *CQ* and obtainable from our Publications Department at the price of 12s. 6d., post free.

LEARNING TO LISTEN

(*How to find the Rare DX*)

One might well say, at the start, that *anyone* can listen; but not everyone will hear the same things. Learning to listen with an expert ear is a process that takes time and practice, but will eventually convert the mere listener into a "hearer" of transmissions that the novice will probably miss.

The ranks of SWL's have their "DX Kings," just as the transmitting fraternity have theirs. Incidentally, the transmitter with an impressive list of DX worked has also to be an extremely good listener, a point which is sometimes overlooked.

Naturally the first requirement is a reasonably good receiver, coupled to a reasonably good aerial; but we are not talking at the moment about technical matters so much as the training of the operator himself.

Find the Weak Ones

If you just swish your dial nonchalantly round the bands and log the stations that stand out above the others, you will obviously just be hearing the stations that *everybody* hears. If you *are* able to enter a "rare piece" in your log, then you can be pretty certain that most of the other listeners heard him too.

If you want to go in for a bit of "one-upmanship" and collect a few stations that are seldom heard by everyone else, you will have to dig deeper than that. In fact you will have to ignore the easy catches completely and get down to the weak ones in the cracks, and those that appear to be buried beneath the QRM. It makes your listening a more difficult affair, and it demands concentration, but it leads to success in the DX field—if that is what you are after.

A few simple rules :

(*a*) Never swish perfunctorily round the band, passing over a handful of weak signals and saying "The band's dead." One or more of those very signals may be the one you've been after for weeks. The band can more often be described as "dead" when it is full of strong signals, all of whom turn out to be Europeans !

(*b*) If you find *Twenty* in poor shape, don't necessarily switch off in disgust. *Fifteen* may be good even when the lower-frequency bands are poor. And even *Ten* may be capable of yielding something new for you.

(*c*) Don't give in to preconceived ideas about the best time for listening. If you listen on *Twenty* for three evenings running at 11 p.m., and find practically nothing there, don't miss the fourth evening—it may turn out to be the one you have been waiting for !

(*d*) Even if there seem to be no transmissions around except from Europe, listen to some of the strong stations and find out who they are working. As often as not you will come across one who is working some nice DX, which will not, of course, be transmitting at the time

TABLE I

Receiver Type	Frequency Range	IF	Alternative Nomenclature
BC–453	190–550 kc	85 kc	
BC–946 B	520–1,500 kc	239 kc	
BC–454	3–6 mc	1,415 kc	*R26/ARC5*
BC–455	6–9 mc	2,830 kc	*R27/ARC5*

you tune in. Wait until your station goes over, and you should have a chance of hearing the other end of the contact. (But don't be disappointed if you don't, because an SM or OH station, for example, may be getting strong signals from Australia or South Africa when the distant station is not audible in the U.K. at all.)

Most phone contacts take place on a single frequency these days, and this applies especially to SSB stations. If, therefore, you hear someone working that VQ9, or FB8 that you desperately want to log, hang on like grim death and see if you can't detect the other end of the QSO.

Use headphones if you are easily distracted from the job in hand. Speaker-copy is all very well if you are alone in the room, but you won't hear much DX if you are trying to carry on a conversation or keep the children quiet at the same time ! The mere act of putting headphones on seems to make the wearer ready for some concentrated effort, and this psychological effect is added to the undoubted fact that weak signals are easier to copy on the phones.

Technical points that will help you are (*a*) Good bandspread on the receiver; (*b*) Sufficient selectivity for modern requirements on crowded bands ; and (*c*) A reasonably good outside aerial, with an aerial tuning unit if possible.

Non-technical essentials are (*i*) The ability to concentrate; (*ii*) A certain amount of " craftiness " which can only be acquired by frequent practice, and (*iii*) An almost superhuman amount of patience !

Collect all these essentials together and you will make a Good Listener.

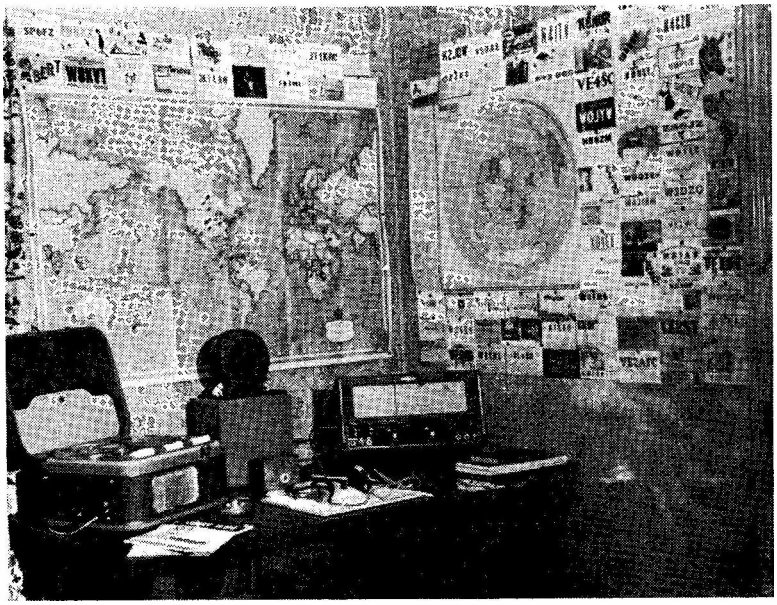
SWL • • • • • •

continued

READERS' FORUM

Quite a number of SWL's are getting into the habit of listening mainly to SSB these days, having found that in the evenings (when most listening is done) the HF end of *Twenty* can be pretty interesting. One or two of them ask for a special HPX Ladder covering Sideband only, but we think it's a little early for that. However, we will mention such scores as and when they come along.

P. Wooding (Ewell), for instance, has an HPX score of 285 on Phone, with 120 on SSB. He wants to know just which and what countries count for DXCC, but the whole thing is in such an unsatisfactory state for the moment that we are dropping " country-counting " as a DX yardstick and will be sticking to Prefixes until further notice. He also asks whether the *Magazine* QSL Bureau may be used by SWL's . . . it certainly can, but read the rules first ! And, finally, a remark from P. Wooding that rings a few bells ; " What can an SWL find in listening if he has a commercial receiver and a beam ? Surely the fun in SWL'ing is in *searching* for DX, not dodging it! "



This efficient-looking station, with its fine display of QSL cards, is run by SWL R. Kissick, of Brookside, Brookside Road, Freshwater, I.o.W., who has an Eddystone 680X as main receiver, a Philips AG-8108 tape recorder and a Morse oscillator ; the tape recorder is electrically connected to the receiver, for immediate recording of transmissions heard. The switching brings in a monitor speaker. SWL Kissick, who is learning the code and has already got some interesting CW confirmations (seen on the left in this photograph) would be glad to exchange tape recordings with other SWL readers.

D. Evans (Denton) has logged 200 prefixes on SSB, and 111 of them on *Forty* CW only—good going. He mentions a collection of stations around 5·4 mc with queer callsigns, sounding neither amateur nor commercial. From the evidence we imagine them to have been one of the notorious " pirate nets," which have a merry life but a very, very short one!

R. Baines (Gillingham) is yet another Sideband convert, and he has had a special QSL card printed for reporting on SSB transmissions. He uses an HRO Junior and an R.208, finds Twenty the best band for DX. Fifteen and Ten best for USA ; he has logged 230 countries on Phone, 205 of them confirmed ; 150 heard and 140 confirmed on SSB. Apart from chasing DX, R.B. is kept quite busy acting as " QSL manager " for Bryan Bisley, who runs the calls MP4BDA, MP4MAB, MP4QAO, MP4TAE, EA5AI, ZB2AE and G3OFI !

J. R. Hey (*Leeds*) has now finished his home-built receiver, using double conversion with IF's of 2 mc and 120 kc; the five amateur bands, 3·5 to 28 mc, are covered and all track well. There are sixteen valves in all and the layout, though conventional, is quite ambitious for a home constructor. The chassis size is only 12in. by 8in. by 2½in., so there can't be much wasted space. Apart from this, J.R.H. has been busy modifying and improving £5-worth of CR-100, and he says there's new life in the old dog now. Does anybody know where the prefix "SA3" hails from? SWL Hey would like to know—we have never heard of it.

G. Brown sends in two HPX entries—one from his home at Bishop Auckland and one from "digs" in Durham City. He remarks that his R.107 is very stable as regards both local oscillator and BFO, and sideband listening with it is a pleasure. He has logged 100 prefixes on SSB. Useful tip from him, to those troubled by unstable oscillators—the Crystal Calibrator No. 10 can be used instead of a BFO, injected into any convenient point from the aerial coil onwards, and gives trouble-free reception. This is one of those ingenious dodges that come only from experience.

A. J. Frey (*Cambridge*) is another listener covering SSB with an R.107; he finds that there is little pleasure to be derived from AM phone when once you have become proficient in copying sideband.

J. Wooden (*Kingston*) still heads the HPX list for CW, and says that some time this year he "hopes to change over to WPX"—it's only a matter of the Morse test.

J. Bolton (St. Helens) has an R.208 and a home-built job using the coil-pack and IFT's from a CR-100, but he is anxious to build a good converter for Fifteen and Ten. If anyone has modified an RF-24 to variable tuning and an IF to match the R.208, J.B. would be very pleased to hear from them. (*QTH*: 40 Moss Bank Road, St. Helens, Lancs.)

T. Priestley (Manchester) does things the other way round, using his R.208 as a converter with 2 mc output feeding into a TCS receiver, and strongly recommends this combination. He would like to hear from anyone interested in tape correspondence, having just acquired a recorder. Incidentally he must be one of the few listeners to receive two-metre signals on an R.208, but admittedly he was touching the grid cap of the mixer at the time, and the two-metre station proved to be visible from his window!

Bob Griffiths (Ventnor) recently changed his AR88 for an HRO, but now finds he can't listen on Ten without blotting out the family TV set! (Yes, the older HRO's had pretty fierce oscillators and some of them could cause TVI at quite long range.) Probably the only easy cure is additional screening. He has a problem with SSB—the HRO is OK for it, but when he uses an RF-24 as a ten-metre converter he can't resolve anything. Most probably the answer is that the beat has now been transferred to the wrong side and he is trying to resolve the lower sideband instead of the upper.

C. N. Rafarel (Poole) writes more about his actual listening than about his gear or technical

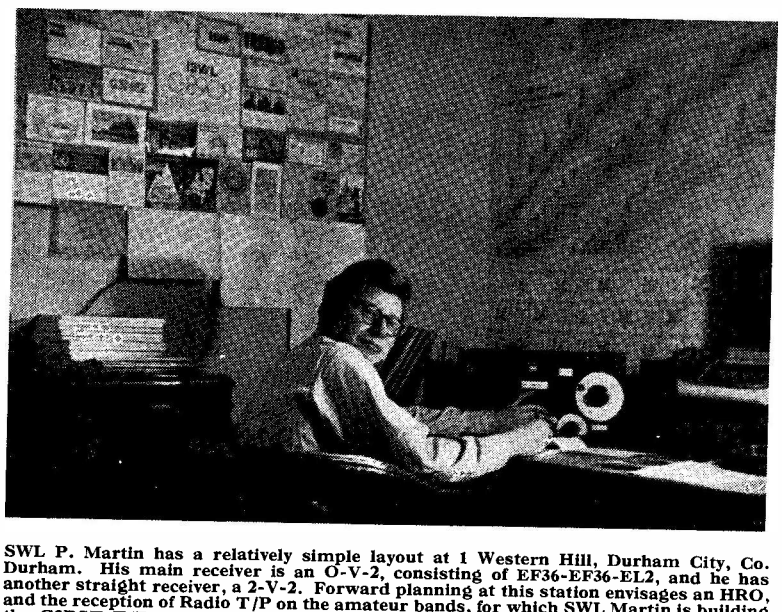
HPX LADDER

(Starting January 1, 1960)

Qualifying Score — 100

SWL	PREFIXES
PHONE ONLY	
Bob Griffiths (Ventnor)	512
H. G. Shaw (Heswall)	470
J. Wooden (Kingston)	427
J. E. Kennedy (Widnes)	392
C. N. Rafarel (Poole)	384
A. W. Nielson (Glasgow)	372
G. V. Moss (Greenhithe)	364
J. H. Roskell (Harrogate)	363
D. Evans (Denton)	353
G. Brown (Bishop Auckland)	350
C. D. Barr (Harrow Weald)	305
M. T. Bland (Oakham)	293
B. M. Crook (Abingdon)	287
P. Wooding (Ewell)	285
N. D. Gordon (Swansea)	255
G. E. Myers (Felixstowe)	253
R. M. Nixon (Liverpool)	245
M. H. Davies (Narberth)	241
W. J. Atherfold (Southwick)	238
A. Griffiths (Solihull)	232
J. Farrar (Penzance)	217
M. Higgens (Sutton Coldfield)	198
A. J. Frey (Cambridge)	198
D. Quigley (Cowes)	194
I. K. Gurney (Chalfont St. Peter)	192
J. Forsyth (Alvaston)	190
M. J. Cunningham (Luton)	180
D. Bell (Woodthorpe)	180
C. J. Smith (Huddersfield)	156
D. F. Catherwood (Huyton)	151
H. M. Davison (Ashtead)	122
D. Hanson (Whitehaven)	115
R. Ashby (Hinckley)	102
G. Brown (Durham)	100
CW ONLY	
J. Wooden (Kingston)	274
P. Day (Sheffield) (7 *mc only*)	208
D. Evans (Denton)	185

(NOTE: *Listing includes only those who reported for this issue or the November* 1960 *issue. Failure to report for two consecutive issues will mean removal from the list. Next list — March* 1961, *continuing as above from January* 1960).



SWL P. Martin has a relatively simple layout at 1 Western Hill, Durham City, Co. Durham. His main receiver is an O-V-2, consisting of EF36-EF36-EL2, and he has another straight receiver, a 2-V-2. Forward planning at this station envisages an HRO, and the reception of Radio T/P on the amateur bands, for which SWL Martin is building the G3BST T/P converter (as described in the March-April, 1960 issues of "Short Wave Magazine"). He also has a straight receiver for the 2-4-6-10 metre bands, and what he describes as "a lot of other half-made things."

SWL • • • • • •

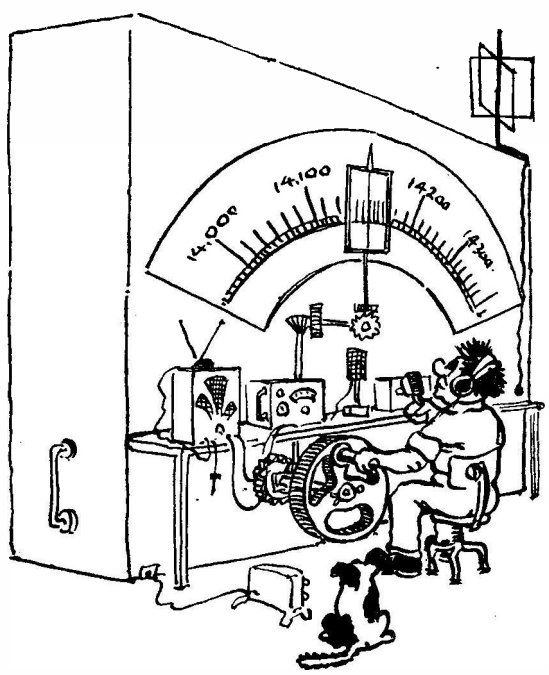
continued

matters. He thinks conditions have fallen off badly since the early part of November, and the aurora has disturbed the bands more than once. On one occasion it was even visible as far south as Poole. He, like many others, is finding the DXCC business terribly confusing, and asks that we should publish an up-to-date list. (The trouble with this is that it is no longer up-to-date when it appears in print!) We suggest that he forgets the whole thing and starts using prefixes as a yardstick, especially as he has heard 384 of them during 1960.

H. G. Shaw (Heswall) mentions CN3AQ, and wonders whether the CN3 prefix was really correct. As far as we know, it was—there *are* some CN3's now on the air.

J. E. Kennedy (Widnes) has an unusual claim to make, and a very creditable one, we should say. He has heard 392 prefixes on phone this year, all on an unmodified broadcast receiver! It gives bandspread varying between one inch and a quarter-inch for the various amateur bands. He is interested in exchanging tapes between England and the U.S.A.

H. M. Davison (Ashstead) would like us to start an HABC table (British Counties, of course) and would also like an all-band DX table for SWL's. He has just acquired an R.208 and is chasing SSB despite some slight difficulty with the oscillator.



". . . . Have wide-scale mechanical bandspread here . . . ."

Correspondence from short wave listeners is welcomed for this feature, the next appearance of which is in the March issue. The closing date is Jan. 27 and all mail should be addressed: "SWL," c/o The Editor, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

A. W. Nielson (Glasgow) is doubly unfortunate. He has a home TV set which blots out the entire 21 mc band, and the Glasgow-Helensburgh railway, running very near and providing a six-minute service each way, has just been electrified! This blots out both TV and CR-100. Regarding the first, the fault probably lies with the TV set rather than the CR-100, and would be the same with another receiver . . . it's the TV that should be changed. Regarding the second—a change of QTH would seem to be the only solution. With widespread electrification going on all over the country, we are expecting quite a lot of sad letters.

A. Griffiths (Solihull) has acquired a Collins TCS receiver to which he has added a long and medium-wave "front end" which can be switched in at will. He wants to get some good gen. on loading coils for mobile whips, as he intends to use the receiver mostly as a mobile. The trouble here is, of course, the spread of wave-bands to be covered. Transmitters use a loaded whip resonated at the frequency they intend to use. For all-band receiving a straightforward whip without any form of loading would probably be preferable. He quotes from a QSL recently received from HK3LX: "I am not interested in SWL reports and I reply only if there is a true report and with IRC for mail." A small lesson here for SWL's in general, but we should like to know exactly what is meant by a "true report"!

Finally—

Closing date for the next instalment of "SWL," in the March 1961 issue, is January 27. Address your mail to "SWL," c/o The Editor, *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Meanwhile 73, Good Listening and a Very Happy New Year to all SWL's.

DELAYED "SUBJECT No. 55" APPLICATIONS

Following the note on p.492 of the November issue of SHORT WAVE MAGAZINE, the Sales Section of the City & Guilds of London Institute received so many requests for details of Subject No. 55 (the Radio Amateurs' Examination) that extra staff had to be employed in dealing with the applications, and there was some delay in satisfying the demand. We are also asked to say that it would help the Sales Section considerably if applicants would confine their letters strictly to requests for the R.A.E. question papers and the syllabus for the Examination, as the Sales Section is *not* organised to deal with general queries on the R.A.E. itself!

CONGRATULATIONS TO "QST"

With the appearance of the December 1960 issue, our American contemporary *QST*, published by the American Radio Relay League — the U.S. radio amateur organisation—celebrates its 45th anniversary. Started in December 1915, and with only a short war-time break from October 1917 until May 1919, *QST* has appeared regularly every month ever since. It is, as the December Editorial says, "the only radio magazine published with just one purpose for such a long period of time." On this, we congratulate them, and acknowledge *QST* and our friends of the ARRL as the source of much inspiration in the world of Amateur Radio on this side of the Atlantic.

G3WW ON "VOICE OF AMERICA"

In the course of the Radio Amateur Programme (Program) over the "Voice of America" transmitters on December 9, one of the items was a tape-recorded discussion between G3WW and W2SKE, who conducts the programme. The recording was made during G3WW's recent visit to the States, as reported in the November 1960 issue of the *Magazine*.

WERE YOU LISTED THEN?

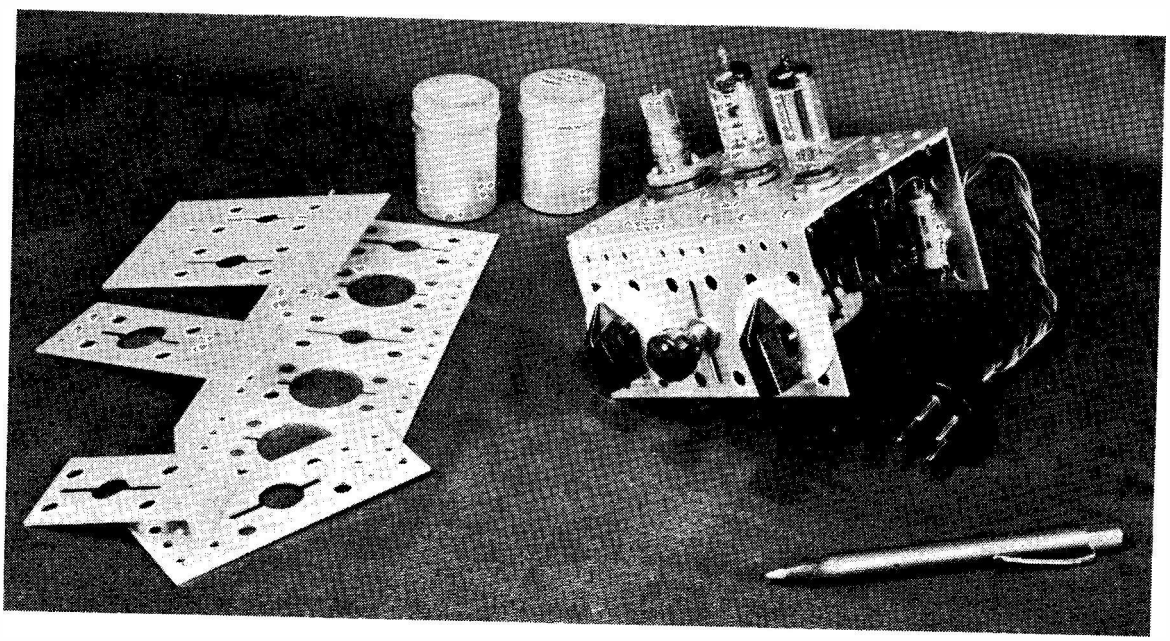
According to the first issue of *Popular Wireless*, dated June 3rd, 1922—a copy of which we have had recently from G2FWA (Cheltenham)—there were at that time, 38 years ago, "280 amateurs in the United Kingdom licensed for the transmission by wireless of speech and music." Most of them would have been on 1,000 metres, with a few intrepid souls juggling with the intricacies of 440 metres. Some, at least, of these pioneers must be with us today. We would very much like to hear from them, with whatever details they can give.

THANKS TO MANY READERS

By Christmas time, our mail was full of the season's greetings from a great many readers, and the Office was well decorated with cards from many countries. We are sincerely grateful for this expression of readers' kindness and goodwill, and hope that they will accept this acknowledgment of our thanks—and our good wishes for their happiness and prosperity in 1961.

RUSSIAN PROPAGANDA SLIP!

On the launching of the 5-ton Russian space vehicle on December 1st—the one with two dogs on board, and which was ultimately lost — the Tass Agency issued a number of photographs, which were widely reproduced in the papers. One of these was of members of the Moscow University Radio Club "recording signals from the space ship." The receiver they were using was clearly an AR88!



Construction of a two-valve receiver of the O-V-1 variety using "Radstrip" chassis items produced by Southern Radio & Electrical Supplies (Sorad), of Salisbury. "Radstrip" consists of pre-punched metal-work, in various shapes and sizes, designed to eliminate all drilling. A wide variety of chassis shapes can be built up, all that is required for fabrication being 4 BA screws and nuts. There is a range of constructional designs available from Sorad — such as mains and battery receivers, a power pack and test unit — founded on "Radstrip" chassis. These items are fully described in constructional envelopes, which list in detail all the parts required to build the design. "Radstrip" can be supplied in separate quantities as required, and is specially useful for test and experimental work in the laboratory or radio workshop. It is made from 16-gauge aluminium alloy, punched in a repetitive pattern and slotted for valve-holders in the usual sizes, and the hole spacing is so arranged that standard tag strips and group boards can be mounted. Some sample shapes and sizes are shown at left in the photograph. The maximum dimension goes up to 18 ins.

VHF BANDS

A. J. DEVON

G3HBW/OH1NL Meteor Reflection Contact—

Certificate Award for G3HBW—

News, Views and Contest Comment—

Some New Beacon Stations—

SINCE last we were with you, there have been one or two occurrences of exceptional interest, a generally low level of activity, very poor winter weather, and a barograph trace that has varied from a deep trough (on December 4) to quite a high reading (on December 15). Before and after, and in between, it exhibited considerable variations — rather like the weather generally over the U.K.

This sort of thing was not conducive to the development of anything like a good GDX opening for any sustained period, though, in fact, the morning of Sunday, December 11, produced a spell of reasonable conditions in the N-S direction across England.

The outstanding result during the period was the success of G3HBW in working OH1NL by meteor scatter. The Germinids shower was expected over December 10-14, for which Arnold arranged test schedules with HG5KBP and OH1NL; on the 14th, G3HBW/OH1NL achieved a complete two-way contact, which took from 0300 until 0630 to work, with OH1NL's signals coming in on occasions at S9-plus in long bursts. In all, the essential information was received at G3HBW about five times; according to Arnold, "though it took such a long time to make, the contact was a relatively easy one, as the meteors were very good at times." This very fine QSO, obtained after a lot of painstaking (and pioneering) work, puts G3HBW up to 19 countries worked on two metres, and thereby into the hot seat in Countries Worked. It is, of course, also the G/OH "First," and on that, too, we congratulate G3HBW.

Special Award

In recognition of his outstanding achievements in the field of EDX working on two metres, we have thought it proper to award Arnold Mynett, G3HBW, of Bushey Heath, Herts., a special Certificate of Merit. We are sure that regular followers of "VHF Bands," who will know of G3HBW's work over the years both on two metres and 70 centimetres, will approve of this. Ever since being licensed, G3HBW has developed his station for VHF operation — in fact, he started as one of our most efficient SWL's on two metres some time before he became G3HBW.

Reverting to Geminids tests, OH1NL also worked HB9RG (by meteor scatter) between 1700 and 1931 GMT on December 13, the path being about 1,080 miles, making it a new European distance record for two metres; this is only a few miles more than the distance G3HBW-OH1NL (1,075 miles), but well up on the previous record of 1,014 miles, held by G5NF/I1KDB for their sporadic-E contact in June, 1959.

So once again we are able to record progress in the world of VHF in Europe.

Incidentally, at the moment of writing, G3HBW had not heard from HG5KBP — the Budapest VHF Club station on Mt. Gerecse, at a height of about 2,000 ft. a.s.l., and 30 miles from Budapest. It could well be that HG5KBP heard some of these meteor scatter signals, if their frequency setting was good enough.

News and Views

Coming back to the more familiar beats, it was interesting to find two metres quite well open during daylight on December 11, when a number of northerly G's were working stations in the Home Counties area, and there was a very fair level of activity.

Among the stations heard were G3EGK (Altrincham, Ches.), G3LRP (Wakefield, Yorks.), G5ML, G5YV and, in the other direction, for a station new to many people, G2WO (Ascot, Berks.). G6NB was on, with his transistorised transmitter, with which he has now worked about 30 counties; a test with G3EGK on December 11 was successful — and, by the way, if you hear a not-so-strong signal signing G6NB on 144·610 mc, it will be the transistor transmitter; Bill can now modulate it, transistor-wise, and has worked G5TZ on phone.

We are asked particularly to mention that GW8MQ (Carmarthen, *QTHR*), who gets very few

TWO METRES

COUNTIES WORKED SINCE SEPTEMBER 1, 1960

Starting Figure, 14

From Home QTH Only

Worked	Station
50	G3HBW
42	G3JWQ
40	G2CIW, G6GN, G6XA
35	G3KPT
28	G3MPS, GW3MFY
27	GW3ATM
26	G3KQF
25	G3HS
23	G2CVV, G3NAE, G3OBD
22	G5QA
21	G3HWR
20	G3GSO, G3OBB
15	G3NNK

This Annual Counties Worked Table opened on September 1st, 1960, and will close on August 31st, 1961. All operators who work 14 or more Counties on Two Metres are eligible for entry in the Table. QSL cards or other proofs are not required when making claims. The first claim should be a list of counties with the stations worked for them. Thereafter, counties may be claimed as they accrue.

two-metre QSO's, is anxious for tests and schedules with stations in the Midlands and Home Counties areas; when visiting there recently, G2KI found that London stations could be worked by arrangement — so for anybody wanting Carmarthen (and that must mean nearly everybody) it is only a matter of getting in touch with GW8MQ about fixing schedules.

G3MHD (Stanford, Essex) now has an 8/8 slot-fed (J-Beam) on a tower at a height of 45 ft., and as he runs 100w. to a QQV06-40A—to the design in the June 1956 issue of SHORT WAVE MAGAZINE, one of the best we have published on two-metre transmitters — he finds he is getting out pretty well; the PA is modulated by a pair of 6146's in Class-B zero bias. His receiver is an ECC84 cascode job into an HRO. G3MHD also remarks that he has plans for four metres.

Which brings us once again to emphasising the potential value of the 4-metre band for winter-time working round the U.K. The number of stations equipped for 70 mc working is still too low, but they are well distributed, and those who do use the band (70·2-70·4 mc) find it interesting and worth while. It is certainly the easiest VHF band on which to get started—even if it is the one on which least practical information has been published!—as the RF-27 tunes the band comfortably and, having an IF of around 7 mc, will work as a converter into almost any HF receiver. With a power limitation of 50 watts, the transmitter can be a simple Co-multiplier arrangement, say x9 with a 7800 kc FT-243 type crystal and using 6AM6-5763-5763 into an 832, or even a 6146, as PA; for an aerial, a three- or four-element Yagi would do admirably for a start; the (folded dipole) driven element can be 79 ins. long, and with 0·2 wavelength spacing, the distance between reflector and driven element, and driven element and director, should be 31 ins. The reflector length would be 83 ins. and the director 75 ins. These figures are for a simple 3-element array—reflector-driven element-director. Using a folded dipole with a 4:1 ratio between elements, *i.e.* 1-in. diameter tubing for the unbroken length, and $\frac{1}{4}$-in. rod for the parallel length, with a separation of 1-in. and broken at the centre for feed-line connection, 300-ohm ribbon feeder could be used to give a reasonable match into the array. It could be fabricated from a set of Band II (VHF/FM/BC) aerial parts.

For those wanting more elaborate set-ups for the 4-metre band, refer to the ARRL's *Antenna Book* and the *Radio Amateur's Handbook*—though it should be noted that as 70 mc is not a licensed amateur band in the States, details for this band will have to be worked out from the formulæ, as no physical designs are given. (The beam dimensions quoted in the foregoing paragraph are for a frequency of 70·3 mc, near enough.)

It is to be hoped that many more VHF workers will turn their attention to the 4-metre band—indeed, it should be the objective of all VHF operators to be equipped for 70, 144 and 430 mc.

Contest Comment

One of the keenest and most active supporters of the 430 mc band is G2XV (Cambridge). Gerry stands at the top of the Seventy-cem Counties Table with 33C worked, and is therefore more qualified than most to give an opinion upon the organisation of VHF contests — in particular, where 70-cm. events are concerned. Broadly, his view is that it is a mistake (under the present Region I I.A.R.U. procedure) to run 144/430 mc contests in parallel. Whichever band may be of most interest, the one blinds the other when it comes to competitive working.

Since the whole idea of contests on VHF is, or should be, to reveal the potentialities of a band for communication purposes, it would seem to follow that when a contest is arranged, maximum effort should be concentrated on a particular band. While the quick answer could be that this is not what is done in the case of HF-band contests, the answer to *that* is that the circumstances of HF-band working are totally different from anything that applies on the VHF bands under competitive conditions. It should not be necessary here to go into the whys-and-wherefores of this—but, briefly, one could point out that the two factors of differing propagation conditions and much sharper beam directivity on 70 centimetres can make 144 and 430 mc two entirely different bands to work on at a given time; there is also the fact that at many stations much of the two-metre transmitter is part of the Tx used on 70 cm.; hence, changing from band to band under contest conditions can be tedious and becomes an exercise to be avoided.

We had all this out years ago, and various methods were tried to bring in the 70-cm. side with two-

SEVENTY CENTIMETRES
ALL-TIME COUNTIES WORKED
Starting Figure, 4

Worked	Station
33	G2XV
28	G3HBW
27	G3JWQ, G3KEQ, G5YV
26	G6NF, GW2ADZ
23	G3BKQ, G6NB
21	G3IOO
20	G3HAZ
19	G2CIW
17	G3KPT
16	G2DDD, G3LHA, G3MED
15	G4RO
14	G2HDZ, G3FAN
13	G3MPS
12	*G5BD*
11	G3AYC, G3LTF
10	G2OI, G3IRW, G6XA
9	G5DS
7	G2HDY, G3JHM
6	G3JMA, G3KHA, G3WW
5	G3FUL, G3IRA, G3IUD, G5ML
4	G3JGY

On working four Counties or more on the 70-Centimetre band, a list showing stations and counties should be sent in for this Table, and thereafter new counties worked notified as they accrue

metre contest activity — such as separate scoring for cross-band working, and heavily-loaded points-value for 430 mc contacts made over the same distance as on two metres. At that time, the operating picture was somewhat confused by the fact that there were relatively few stations equipped for both VHF bands, and even fewer who—because they had separate sets of gear—could change bands quickly to take advantage of a 70-cm. opportunity immediately after a two-metre QSO.

It is for these reasons that we now go along with G2XV in thinking that two metres and 70 centimetres should be kept separate for contest purposes. In fact, as has been suggested from several quarters for some time now, it begins to look as if we ought to get back again into the VHF-contest organising business ourselves.

Getting back to the reports, the next is from G2CIW (Birmingham), who mentions that he found an *Ar* opening on December 15, with GM3GUI and GW2HIY heard. Otherwise, things have been pretty quiet for him during the period. Jack now has 255 stations worked on two metres, and 19 counties on 70 centimetres.

GI3KYP (Belfast) asks us to draw attention to the fact that GI3KYP/A will be active from 1900 on January 28 until the evening of January 29, frequency 145·596 mc, running 30 watts and using either CW or phone as conditions dictate. And for those who may hear him, or want a schedule, GI3KYP is *QTHR*.

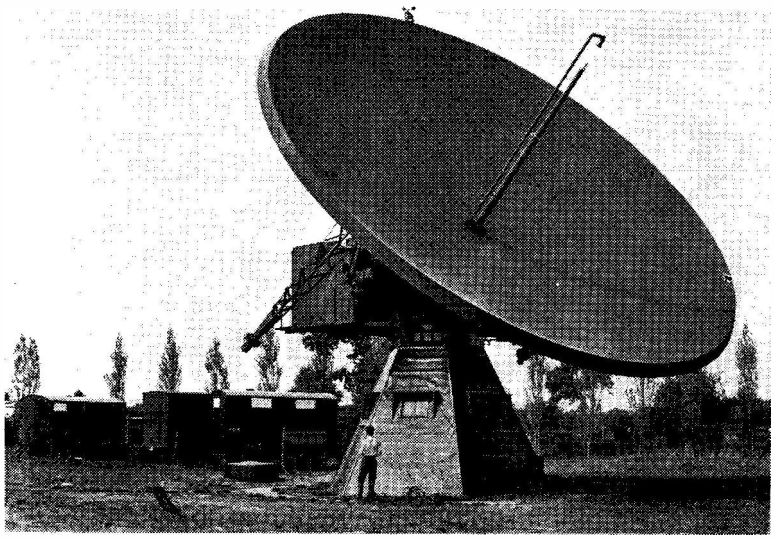
It now transpires that during the big Aurora opening over October 6/7—reported in "VHF Bands" in the November issue—GI3GXP worked HB9RG for the GI/HB "First." A fine contact, which we are glad to take into the list. Another GI regularly active on two metres is GI5AJ, who runs a nightly schedule, at 1900, with G2NY. For this schedule, the beam heading at Bangor should be right for the North Midlands and East Anglia.

Beacon Stations

In addition to GB3VHF on 144·50 mc, beacon stations either operating or projected include DLØVH on 145·98 mc and ON4UB on 145·00 mc. Also in hand is a beacon station to sign an SM4 call.

There is no doubt that these beacons will be of great value to all VHF operators as "condition markers" and, when their actual transmitting frequencies have been properly established, also as calibration signals. As most of the VHF fraternity will be aware, one of the best markers for two-metre conditions is Dresden TV on 145·25 mc—and, in this connection, G3HBW reports that during his Geminids meteor tests over December 11-14 "signals from Dresden TV were almost continuous for long periods and bursts of very high signal strength were recorded."

At ranges of about 100 miles-plus, any regular signal of known frequency in the two-metre band should obviously be of great value, not only for assessing conditions, but also for lining up converters and checking the aperture of beams; the latter operation can only be carried out satisfactorily if the receiver has a sensitive S-meter with the needle moving over a fairly wide scale (say, two inches at least). It does not matter what the actual calibration is, so long as the S-meter "feels" the change in signal level as the beam is swung through the correct heading; if the S-meter is sufficiently sensitive, it will be possible to observe the correct heading within a swing of about 10°. (What the heading should be can be taken off the map.) As a rough guide, the aperture of the beam will be the swing over which the S-meter reading does not reduce by more than one-third of the maximum value. Most amateur beams will be found to have an aperture of anything up to 60°; a good one will show about 30°. (As this is a debatable point, you had better not get too involved.—*Ed.*). *Tnx, A.J.D.*



At the Royal Radar Establishment, Malvern, they have a 45 ft. radio telescope available, which has been used for a number of research projects, including communication tests (by moon reflection) with the Bell Telephone Laboratory, New Jersey, and for investigations into the quality of the moon's surface as a reflector. For this latter investigation, a wavelength of 10 centimetres was used, the energising element being an English Electric long-anode Type M543 magnetron; this gives a mean power of 3.75 kW at 300 p.p.s., with a pulse length of 5 microseconds. Future investigations may possibly include Venus, Mars and Jupiter.

Statistical Evidence

Several readers have been good enough to take up the suggestion made on p.544 of our last, and have turned in very useful and

TWO METRES

COUNTRIES WORKED

Starting Figure, 8

19	G3HBW (DL, EI, F, G, GC, GD, GI, GM, GW, LA, LX, OE, OH, OK, ON, OZ, PA, SM, SP)
18	G5YV, G6NB (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, LX, OK, ON, OZ, PA, SM, SP)
18	G3CCH (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, LX, OE, ON, OZ, PA, SM, SP)
17	ON4BZ
16	G3GHO, G3KEQ, G5MA, G6XM, PAØFB
15	G2XV, G3FZL, G4MW, GM3EGW
14	G2FJR, G2HDZ, G3AYC, G3FAN, G3HAZ, G3IOO, G3JWQ, G3WS, *G5BD*, G6LI, G8OU
13	G3BLP, G3DMU, G3DVK, *G3GPT*, G3KPT, G5DS, G6XX
12	EI2W, F8MX, G2HIF, G3EHY, G3GFD, G3GHI, G3LTF, G3WW, G5CP, G5ML, G6RH, G6XA, G8VZ, OK2VCG
11	G2AJ, G2CIW, G2CZS, G3ABA, G3CO, G3JZN, *G3KUH*, G3LHA, G4RO, G4SA, G5UD, OK1VR
10	G2AHP, G2FQP, G2HOP, G3BDQ, G3BK, G3BNC, G3DLU, G3GSE, G3GSO, G3JAM, G3KQF, G3MED, G5MR, G8IC, GW5MQ
9	G2DVD, G2FCL, G3DKF, G3FIJ, G3FUR, G3IUD, G4LX, G8DR, G8GP, GC3EBK, GM3DIQ, GW3ATM
8	G2DDD, G2XC, G3AEP, G3AGS, G3BOC, G3EKX, G3GBO, G3HCU, G3HWJ, G3KHA, G3MPS, G3VM, G5BM, G5BY, G8SB, GC2FZC

interesting digests of their activities over the 12 months to end-August, 1960. As we said at the time, the real value of such a survey would depend upon it being made by a sufficient number of people distributed over the widest possible area — hence, we want a great many more followers of this piece to let us know *(a)* The total number of two-metre QSO's they had, *(b)* The number of different stations worked, and *(c)* The approximate number of hours put in on the two-metre band, in that twelve months.

As an example of the sort of report we have in mind, take that from GC2FZC, Guernsey: He had 220 contacts with 122 different stations, over the year to August 31, 1960; contacts were obtained on 63 days, while on 261 days he either heard nothing or got no replies to his CQ calls. This shows that during the year he was active on 324 days out of the 365 possible—which, if your A.J.D. may say so, is a pretty good effort.

This is precisely the sort of information required for the survey, and those who work the two-metre band regularly are asked to cull through their logs and extract the information, so that we may be provided with essential statistical data to prove the occupancy of the two-metre band under average conditions. (This is typically A.J.D.—*Ed.).*

Balloon Echo

The aluminised spheroid is still circling the earth, and considerable attempts, both commercial and amateur, are being made to use it as a reflector. While the G3BDQ/F9QE result last August need not be challenged—the correlation was too good, and the distance reasonable—the VK/ZL tests have proved abortive. It is true that the VK/ZL boys were trying both six metres (!) and two metres, and talk of "bouncing" when they mean *Echo I* as a passive reflector; but the fact is that for tests of this kind to have the remotest chance of being successful, three main considerations are involved (and here he is going to get into trouble with the VK/ZL boys.—*Ed.).* The first is reasonable gain in the beam—meaning about 12 dB with a PA input of the order of a kilowatt; the second is accurate beam heading—not just looking in the general direction and hoping for the best; and the third, most important of all, is accurate frequency setting.

How many VHF operators in the U.K.—or anywhere else, for that matter — can set up a frequency on their receivers to even the second place of decimals in the two-metre band? In other words, put the Rx dial on 144·73 mc to hear a signal at about that frequency? We would wager that not 10% of those reading this piece (here he is, sticking his neck out again.—*Ed.)* could get nearer than between 144·68 and 144·78 mc, and then they would have to scrape about to find the actual frequency.

And so, if you want to take advantage of *Echo I*, the reflection potential of which, on each successive orbit, can only last about ten minutes at the most, you must not only be on frequency and correct beam heading, but you must also be putting reasonable power into a high-gain beam. And if you have somebody on schedule with you who can likewise meet all these *desiderata*, then you have a reasonable chance of success.

It is a waste of time to use *Echo I* on a hit-or-miss chance-your-arm basis. Whatever else you do, you must be right on the nose with plenty of radiated power.

The VHF Century Club

There are no elections to record this time, so it gives us the opportunity to re-state the rules and conditions under which VHF Century Club Certificates are issued: We need to see not less than 100 QSL cards proving two-way contact on any VHF band, from 50 mc upwards, with 100 different stations; cards for /A, /P or /M QSO's under the same call are accepted; the claim must be accompanied by a check list, covering the cards enclosed, with essential details of the claimant's station, gear used, and so forth. Claims must be sent by registered post, with sufficient return postage, and addressed for the attention of A. J. Devon. As claims are normally dealt with in batches when a convenient opportunity presents itself to attend to them, it may be several weeks before there is any response from A.J.D.'s end — so don't worry!

Deadline ——

And that, friends, seems to be it for this month. It only remains for your A.J.D. to wish all readers of this piece a very happy and prosperous New Year, to thank all correspondents for their support, and to invite every VHF operator to write in regularly with the notes, news, views, claims, ideas, opinions and suggestions that go to make up this feature. Address it all to: A. J. Devon, "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1 —to arrive not later than **Wednesday, January 18,** for the next issue. CU then—*73 de A.J.D.*

FRED'S TEMPORARY MOVE

By G3COI

IT was the little things that brought home to Fred the fact that Winter had arrived—the layer of moisture on the 1155 dial, the frost on his bug, the ice on the half consumed cup of cocoa. Now he knew how the operators of the Trans-Antarctic Expedition must have felt, except that *he* hadn't a queue of rare DX waiting to work *him*—in fact, he reflected bitterly, as he pounded out his tenth consecutive CQ, he couldn't even raise a DL on an 80-metre band full of them.

He rose from his wicker chair with a shivering sigh and made for the trap-door which led to the rest of the house and warmth. As he entered the living room, he noted with approval that his XYL had gone out, leaving a roaring fire, so without further ado he flopped into his favourite armchair and let the heat soak through his frigid frame.

He became drowsy after a while and began to dream of operating a rig in warmer climes—DX in a topee and khaki shorts—the swish of grass skirts and the soft music of distant guitars. Suddenly he sat upright. Why shouldn't he have his rig downstairs by the fire ? The XYL was out and he could probably fix up a temporary affair before she came back—and when she saw everything set up, she wouldn't have the heart to order the stuff back to its normal place—in that freezing roof-space shack. He could camouflage the rig so that it blended with the furnishings and perhaps she wouldn't take it so badly. Yes ! It was a good idea and would enable him to operate in comfort at last.

After a dozen or so trips to the roof and back, Fred had amassed enough gear to set up station. He placed the 1155 on a handy shelf by the fireplace and put his exciter on the floor under a newspaper. After a few deft strokes with a bundle of flex and wire cutters he was ready to go and, in fact, was in full QSO with a local on Top Band when his XYL returned. She did not appear to notice anything unusual and the rest of the evening passed without comment.

A week went by and Fred revelled in the fireside QSO's—no longer did he have to wear his overcoat and fur-lined gloves when he wanted to natter on the band—no longer did he have to suffer the foul stench of his roof-shack oil stove—no longer did his CW carry too many dits from his shivering arm. There was no doubt in Fred's mind that his XYL had accepted the situation out of the kindness of her heart—she had not raised the slightest bleat of protest at the sight of the ugly black gear which had appeared like a blotch on the face of the homely living room.

Fred became bolder ; he moved even more gear downstairs. A receiver and small transmitter were all very well for temporary operation but one liked to have a few items of test gear around in order to keep a check on things. For instance, the field strength meter made from an old broadcast set coil pack (and built into the broadcast set)—and then there was the invaluable loop lamp resonator—both gadgets were vital to the maximum " tip of the nose " —or should we say " on the nose "—efficiency that Fred always strove to attain. Next was the Hi-Fi speaker unit. To the layman it looked like a suitcase with a hole in it and no lid, and in fact Fred had made it from a suitcase with a hole in it and no lid. The beautiful quality it imparted to 40-metre phones issuing from his 1155 immediately became apparent when Fred demonstrated by switching over from his ill-matched headphones.

Naturally, to keep his equipment in battle order required the occasional substitution of fresh components (you will notice that we use the word " fresh " and not " new ") so a small junk box was added to the downstairs collection. It was slightly larger than a tea chest and contained pretty well all an enthusiast could need. Condensers, mainly with very short leads, and resistors with even shorter or no leads at all ; small ex-Government units which had continued to defy all means of removing their knobs and dials. Overall was a layer of all types of wire ; coax, D8, D4, flex, bare copper, enamelled, 64 gauge, etc.

Only one fly remained in the ointment of Fred's pleasure—he still did not have his monster 813 PA

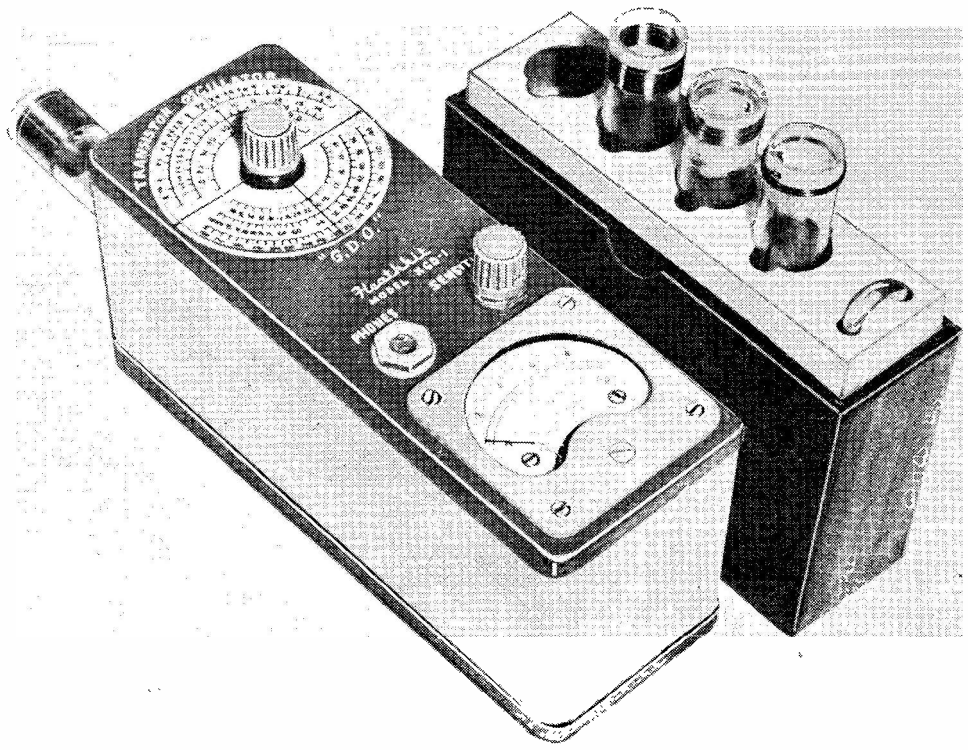
". . . . revelled in those fireside QSO's . . . ."

with him. A relatively uncompact item, you might think? I expect you can see it in your mind's eye right now. It was built into an 1131 rack which, as you know, is a not inconsiderable seven-foot-high job in its own right; modified by Fred, it comprised two giant power trays, a beefy modulator and speech amplifier. The whole weighed half a ton and took Fred a complete evening to move downstairs. He did this while his XYL was out at the pictures and when he had finished the job he lay down for a while to recover. He was so exhausted that within minutes he was asleep and was soon dreaming that he had been sent away by his firm during which time his wife had sold all his gear to various discerning amateurs for a not inconsiderable sum. With this money she had purchased on his behalf a brand new commercial outfit complete with rotary beam and all the trimmings. It really was a splendid dream and as he gradually awoke, he groped toward his armchair expecting to switch on the DX Super-Inhaler Rx and the Double TT21 Band Blaster Tx for a go on ten-metre Sideband. But instead he recovered full consciousness to find all his old stuff still there and his XYL glowering at it.

Of course, he had to shift the whole outfit back upstairs—right down to the last bit of 64 gauge. His XYL had borne the invasion remarkably well until she saw the 813 PA outfit—that had done it, and no wonder—the sight of *that* would have frightened a milkman's horse.

ROYAL NAVAL AMATEUR RADIO SOCIETY

With the formation of the R.N.A.R.S., all three Services are now represented by their own Amateur Radio groups. In its first three months, the Royal Naval Amateur Radio Society has gathered 66 members, and has its own Hq. station, G3BZU, regularly on the air on 40 metres. Membership is open to all ranks, past or serving, of the R.N., R.M., W.R.N.S., R.N.R., R.N.V.R. and the Navies of the Commonwealth. Associate membership is offered to civilians who have been connected in any way with the Naval Services. Full details from: The Hon. Secretary, Royal Naval Amateur Radio Society, H.M.S. *Mercury*, Leydene, Petersfield, Hants.



The new Heathkit model XGD-1 is a transistorised GDO covering 1.75 to 45 mc in five switched bands; as such, it is entirely self-contained, with no trailing leads, requiring only a small 9-volt dry battery for its power supply; this is fitted internally. The transistors used are an OC170 as oscillator, a GEX-34 for detector, and an XB104 as meter amplifier. Band change is by plug-in coils and the resonance indicator is an 0-500 μA meter actuated by the XB104 working as a DC amplifier. A headphone socket is fitted for listening on the beat note when aural checking is required, and the front-panel control gives variable sensitivity with on-off switching. The size overall is 7½ ins. by 2½ ins. by 3 ins.

A HOLE IN THE WALL

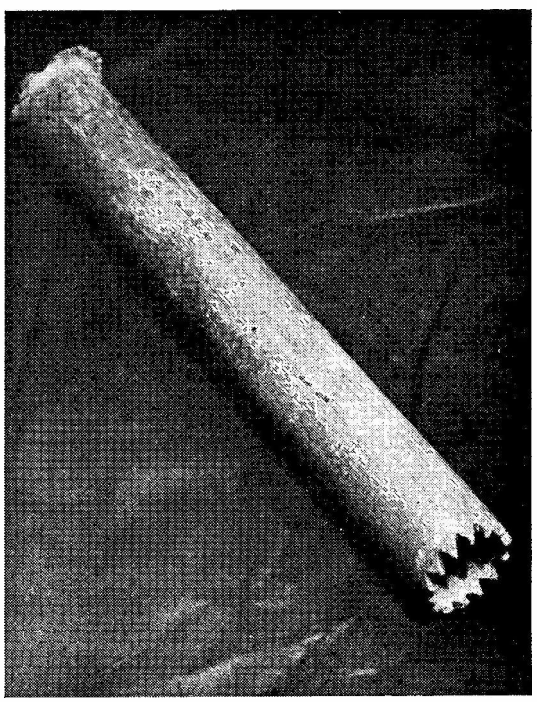
FOR THE AERIAL LEAD-THROUGH

H. G. Woodhouse, M.A. (G3MFW)

As a change from the excellent articles of an electronic nature which normally fill our *Magazine,* readers might like to read how to go about a simple masonry operation — involving, of course, aerial fitments.

The writer recently bought a house with a spacious loft area ideally suited for the shack, except that the architect had fiendishly contrived it so that there was no possible communication with the outside world *via* a piece of wood. Apart from wrecking the tiled roof (or taking the feeders through the bedroom), the only solution was to make holes in the cavity concrete-block wall. The preferred exit for the feeders was 35 feet above ground level, so it was desirable to do the minimum amount of work from outside!

Ex-Government glass feed-through insulators were available which fitted a $1\frac{7}{8}$in. hole, so a piece of $1\frac{7}{8}$in. outside diameter water pipe 15 inches long was obtained and a serrated edge cut at one end with a hacksaw, as shown in the photograph. With the aid of a 4-lb. hand hammer, the wall was attacked from the loft side, turning the pipe with the left hand between each blow of the hammer. When necessary, the teeth on the pipe were sharpened up with a file. Care was taken, when the first block was almost through, to prevent the last piece of masonry from falling into the cavity.



To make the hole through masonry, as described in the text by G3MFW, a length of $1\frac{7}{8}$ in. outside diameter water-pipe, about 15 in. long, had a serrated cutting edge made at one end; this was kept sharp as the work proceeded, which was by hammer-taps and half turns of the pipe.

The outer block was then tackled as before until an estimated three inches remained. At this juncture it is dangerous to proceed with the big-hammer technique in case an enormous area of plastering falls off the outside of the house.

A $\frac{3}{4}$in. hole was therefore drilled from the inside, using a "Masonmaster" tungsten carbide bit and an electric drill. If only light pressure is used, there is very little chance of an accident while breaking through to the outside.

The pipe-and-hammer method was then continued cautiously from the inside until only one inch of masonry remained. Then, with the aid of an extension ladder and a safety strap, the pipe-and-hammer technique was applied from the outside, when a few good blows completed the job.

The resulting hole was absolutely smooth and regular, and exactly the same diameter as the outside of the pipe used. The method is even easier with a brick wall, and possible (with much swearing) with a solid stone wall.

The glass feed-through insulator rod was extended to the required length, and the outer glass rim was well covered with "Bostik" before being put in place.

Result — RF goes out, and the Wx doesn't come in!

THE FARADAY LECTURES, 1961

Further to the note on p.435 of the October issue of SHORT WAVE MAGAZINE, following are the arrangements for the next series of these Lectures, which for this season are by L. J. Davies, C.B.E., M.A., B.Sc., A.M.I.E.E., on "Transistors and All That": *January 26,* Leeds Town Hall (apply for tickets to J. Woodhouse, c/o Brush Ltd., Scottish Union Building, 26 Park Row, Leeds, 1); *February 14,* Portsmouth Guildhall (apply H. W. Housley, 15 Southdown Road, East Cosham, Portsmouth); *February 16,* London, Central Hall, Westminster (apply Secretary, Institution of Electrical Engineers, Savoy Place, London, W.C.2); *February 28,* Birmingham Town Hall (apply J. C. Pyatt, Nechells "B" Power Station, Nechells, Birmingham); and *March 2,* Leicester, de Montfort Hall (apply W. L. Passant, Switchgear Division, Brush Ltd., Loughborough). Admission is free, and tickets are available on application. Details for Edinburgh and Newcastle, during March, will be given in a later issue.

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 U.K. section 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.

G3NHY, Kings Norton Grammar School Radio Society, Northfield Road, Kings Norton, Birmingham, 30.

G3OCA, K. Frankcom, 216 St. Helier Avenue, Morden, Surrey. *(Tel.: Mitcham 2592.)*

G3OCO, W. J. Butler, 95 Bishopgate Street, Liverpool 15, Lancs.

G3OFM, G. H. Manners, 24 Dryhill Road, Belvedere, Kent.

G3OGB, N. Jacobs, 41 Queenborough Gardens, Ilford, Essex.

G3OGR, G. Rayer, Reddings, Longdon Heath, Upton-on-Severn, Worcester.

G3OKA, J. A. Share, 38 Kernick Road, Penryn, Cornwall.

G3OKA/A, J. A. Share, Room 48, Y.M.C.A., Armada Way, Plymouth, Devon.

G3OKL, Amateur Radio Club, Manchester Grammar School, Old Hall Lane, Rusholme, Manchester, 13.

G3OKN, G. Tresadern, 44 Eccleston Crescent, Chadwell Heath, Romford, Essex.

G3OLA, G. Preston, 31d Hill Road, Arborfield, Reading, Berks.

G3OLL, E. Hind, 23b Hill Road, Arborfield, Reading, Berks.

G3OLV, A. S. Coombes, 120 Palace Road, Tulse Hill, London, S.W.2.

G3OMP, Dr. S. P. Spragg, Knossos, Campden Road, Clifford Chambers, Warks.

G3ONR, B. J. Reynolds, 49 Station Road, Crayford, Kent.

G3ONT, L. W. Harvey, 33 Eastcote Road, South Harrow, Middlesex. *(Tel.: BYR 8710.)*

G3OOF, E. E. Payne, 43 Hanworth Road, Earlswood, Redhill, Surrey.

GM3OOI, D. S. L. Yeo, c/o King, 3 Warrender Park Terrace, Edinburgh, 9. *(Tel.: FOU 6563.)*

G3OOO, H. G. MacGregor, Grad. Brit. I.R.E., 29 Walton Avenue, South Harrow, Middlesex.

G3OOQ, M. J. W. Webb, 14 Townsend Road, Tiddington, Stratford-on-Avon, Warks.

G3OOS, J. A. Robinson, 40 Wellington New Road, Taunton, Somerset. *(Tel.: Taunton 84660.)*

G3OOW, M. F. Docker, 116 Yarningale Road, Kings Heath, Birmingham, 14.

G3OOZ, C. Simpson, 2 Mead Street, High Wycombe, Bucks.

G3OPA, J. Atkinson, 6 Rochford Avenue, Loughton, Essex.

G3OPC, N. F. Ward, 5 Grange Road, Sanderstead, Surrey. *(Tel.: Uplands 1750.)*

G3OPE, C. Urwin, 10 South Road, Chopwell, Newcastle-on-Tyne. *(Tel.: Chopwell 234.)*

G3OPI, W. Bramham, 11 Falmouth Street, Walney Island, Barrow-in-Furness, Lancs.

GW3OPL, A. Milham, 21 Med. Regt., R.A., Kinmel Park Camp, Rhyl, Flintshire.

G3OPN, P. Nelson, 32b Biggs Lane, Arborfield, Reading, Berks.

G3OPO, B. M. Waghorn, Ayres Cottage, Ayres End Lane, Harpenden, Herts.

CHANGE OF ADDRESS

G2BJY, W. G. Johnson, 82 Highgate Road, Walsall, Staffs.

G2HCJ, R. C. Taylor, A.M.I.E.E., 822 Warrington Road, Rainhill, Liverpool. *(Tel.: Rainhill 378.)*

G3ACK, J. W. Hogarth, 60 Astley Gardens, St. Ronan's Lodge Estate, Seaton Sluice, Whitley Bay, Northumberland.

G3AJZ, N. McKechnie *(ex-GW3AJZ),* 24 Queens Road, Street, Somerset.

G3CCA, C. L. Wright, B.A., B.Sc. (Eng.), 14 Ridge Way, Oadby, Leics. *(Tel.: Oadby 3551.)*

G3CXJ, R. Davies, 13 Lovett Road, North End, Portsmouth, Hants.

G3EFI, P. J. Powell, 34 Temple Road, Bolton, Lancs.

G3EFP, J. C. Pennell, 30a Grange Gardens, Pinner, Middlesex.

GD3ESV, Rev. F. Ness, Rosslyn, Jurby Road, Ramsey, I.o.M.

GD3FXN, A. D. Radcliffe, Grassmere, Park Avenue, Douglas.

GM3HUN, W. F. Hunter, 111 Longstone Road, Parkhead, Edinburgh, 11.

G3IJU, E. Briggs *(ex-ZB1EB/VS1EB/9M2EB),* c/o Sgts' Mess, R.A.F. Station, Upavon, Pewsey, Wilts.

G3JCX, M. T. Jones, 40 Harvey Crescent, Wellington, Salop.

G3KLI, F. C. Beadle, 18 Hartley Road, Longfield, Dartford, Kent.

G3KOU, M. J. Hodges, 24 Hampden Road, Wantage, Berks.

G3LMG, J. Spray, 2 Rock Park, Mount Tavy Road, Tavistock, Devon.

GM3LQF, R. N. Bingham, Greystones, Dalry, Ayrshire.

G3MIK, R. Kerley, c/o Mme. J. Dyer, 26 Pembridge Villas, London, W.11. *(Tel.: BAYswater 5679.)*

G3NAI, R. E. Norman, 9 Howley Grange Road, Birmingham, 32.

GM3NQB, W. Hardie, 24 Brownhill Road, Thurso, Caithness.

G3OFS, C. J. Swain, All Saints' Lodge, Wellington Lines, Farnborough Road, Aldershot, Hants.

G3ZY, J. R. Tweedy *(EI9AG, 3A2CF),* 21 Birkin Lane, Grassmoor, nr. Chesterfield, Derbyshire.

G5TT, T. Caldicott, Chy-an-Mor, Mawgan North, Newquay, Cornwall.

G6GG, G. Golding, 28 Doggets Close, Rochford, Essex.

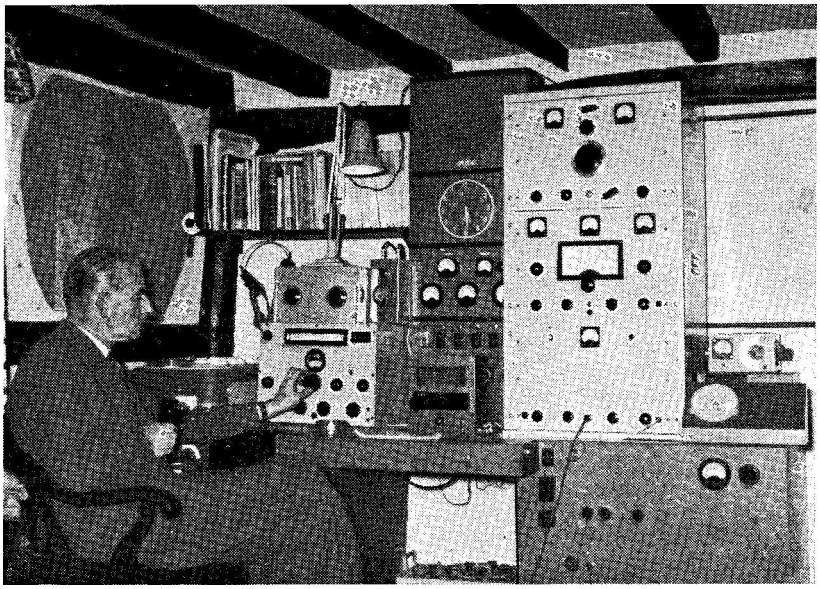
AMENDMENT

G3LDI, R. J. Cooke, A.L.C.M., 128 Drayton Road, Norwich, Norfolk. NOR.06.L.

G3OIZ, W. H. Ingle, 1 Queens Road, Littlestone, New Romney, Kent.

THE OTHER MAN'S STATION

G3LKB



FEATURED this month is G3LKB, the station owned and operated by Dr. L. C. Bousfield at Church Gate, Billingshurst, Sussex. Interest in Amateur Radio dates back more than 35 years, when early constructional efforts ranged from cat's whisker to 2-V-2 receivers, and the half-hour telephony transmissions from Writtle each Tuesday evening were impatiently awaited. Thereafter other youthful interests displaced " wireless," and it was not until 1955 that a visit to G3JEP reawakened enthusiasm. The fascination of listening to a solid VQ4 QSO proved sufficient stimulus to the obtaining of the callsign the following autumn.

Operating was started with an R.1155 and a 6w. Tx, both borrowed from G3JEP, friend and mentor. At the same time a transmitter, consisting of a Geloso VFO driving a pair of 807's, was put on the stocks. This was at first screen modulated, but later converted to high-level control, and still later a pair of 6146's was substituted in the PA to give full power. A CR-100 was an early purchase, and still remains the station main receiver.

Last year a Tiger TR300 was acquired with a view to clearing up TVI at this rather difficult QTH, and this Tx is seen in the photograph. The CR-100 is on the left, and a Minimitter converter is situated centrally, being used to boost reception on the higher frequencies. The Tx output goes *via* an LP filter, and a SWR meter to a Z-match ATU, the two latter being seen on top of the CR-100. The whole station is operated by a 12v. relay system controlled by a switch on the front of the console, or by a microphone pressel switch. TVI appears to have been overcome, apart from front-end break-through on one or two neighbouring receivers; in each case this is entirely overcome by a HP filter. It is now believed that the same results could have been achieved with the old rig!

Antennae are a G8KW, and a Minibeam 42 ft. above ground. The remote control beam indicator is seen on the right of the transmitter, but has since replaced the group of meters seen in the central panel, which were relics of the old outfit. A 19 Set, on the floor in the knee-hole, has since been converted to cover Top Band, and is mains powered.

Operational interest is general, a chat with friends on 80 or 40 being enjoyed as much as DX on 15 or 10 metres. If the XYL at times shows a little impatience, G3LKB puts the blame fairly and squarely on that VQ4 who cast the spell five years ago.

SMALL ADVERTISEMENTS — SERIOUS COMPLAINT

Since the appearance of the December issue of SHORT WAVE MAGAZINE, a reader has this to say: " . . . whenever I reply to a Small Ad. in the *Magazine* I am always the '4th or 5th person too late'; obviously, to reply by post is not quick enough. So, the moment the December issue arrived, I went through Readers' Small Advertisements and spotted the very thing I wanted. I sent a telegram saying my cheque was on the way; in my post the next morning was the usual 'sorry you were too late, OM, tnx for the telegram, am returning the cheque.' Where do I slip up? I am a direct subscriber of many years' standing and get my copy on the day of publication, and my cheques don't bounce . . . "

This is a situation in which we ourselves can, of course, do nothing. While sympathising with our reader and regretting his disappointment, it does go to show the value of *Magazine* advertising!

THE FIFTEENTH MCC

The Magazine Top-Band Club Contest
November 12-13 : 19-20, 1960

FOR the sixth consecutive year we are able to report a pleasing increase in the number of entries for MCC, which continues to attract more and more Clubs anxious to do battle with each other. The Fifteenth MCC produced 59 logs received on time, as compared with 54 last year, and seems to have been the most lively and, in some ways, the toughest event yet held in this long series.

Although a total of well over 70 Clubs were recorded as taking part (or, at any rate, making contacts) the scores were slightly lower than last year's. This was almost certainly due to conditions, which were very variable and, on occasions, quite poor.

Operating times and periods were identical with last year, but the going was undoubtedly harder, especially for those entrants situated in "fringe areas." For the centrally-located Clubs the pattern was virtually the same as in 1959, scores being very similar.

Stourbridge (G3BMY) registered yet another win; but whereas in 1959 they were no fewer than 54 points ahead of their challengers, this time they led by the very narrow margin of seven points only! And the challengers were the same Club—**Aldershot (G3KMO).** Behind them (and only two points behind) were **Gravesend (G3GRS)**—a newcomer to the honours in this contest.

1st: Stourbridge (G3BMY)	**653**
2nd: Aldershot (G3KMO)	**646**
3rd: Gravesend (G3GRS)	**644**

These three Clubs were the only entrants to top the 600 mark, just as in 1959 the first three were the only ones so to do. Very hard on their heels were **Greenford (G3JVL/A),** fourth with 599; **Bailleul (G3IHH),** fifth with 579; and **Harlow (G3ERN)** with 566. Even there the bunching did not stop, for **Surrey (Croydon)** were breathing down their necks with a score for **G8TB** of 564, and seventh place.

All the other scores are shown in Table I, and pretty evenly spread they are, too. Right down to the 24th position, a few extra points would have made the difference of a place.

Once again the non-Club contacts made little difference to the placing except right at the top end. The winner (G3BMY) and the third (G3GRS) both made 35 non-Club contacts, whereas the second (G3KMO) made only 22. Thus, among the leaders, the single-pointers did in fact decide the ultimate result—just as in previous years. This we find rather surprising, since so many participating Clubs were *not* worked even by the high-scorers—so it was not a matter of reaching saturation point.

The winner worked 57 Clubs in his best session and 46 in his worst; the runner-up 55 in his best and 48 in his worst. And the worst session, in all cases, was the first—Saturday, November 12, when conditions went quite flat for at least an hour. This session really did sort out the men from the boys!

For the rest of the period the going was very much the same as on previous occasions. It was hard for the more northerly Clubs, owing to the lack of nearby Club stations to work; and it was harder for those on the East Coast than those on the West. As always, *Chester, Wirral* and *Liverpool* made very reasonable scores, but there were obvious signs of scoring difficulty by such East Coast entrants as *Hartlepools, South Shields, Grimsby* and *Scarborough.*

And as for the two Scottish stations—it was very sporting of them to have kept on the air and to have sent their logs in. *Aberdeen (GM3BSQ)* managed to score 35, and *Leven (GM3LUM)* 26. *Leven* had no luck at all until the fourth and final session; *Aberdeen* remark that what they heard they worked. (Rather remarkable that soon after 1700 on the opening day they worked as far south as *Salisbury* and *Reigate* . . . thereafter they made no southern contacts at all.)

Operating

It was the general opinion that the standard of operating was not so high as in previous contests. The main faults were the indiscriminate use of "BK"—so that the stations calling the Club concerned were not told which of them was being copied; the use of long CQ's after a contact instead of a snappy "QRZ"; the unnecessary repetition of number groups up to *six* times; and, in a few cases, the use of just plain bad Morse!

There were a few very shaky notes, too. Fortunately for the Clubs concerned, the applicable rule mentions "Clubs receiving reports consistently worse than T9"—not "Clubs radiating notes worse than T9." The invigilators noted one Club in particular, with a more or less consistent T7 note; but he was being given T9 by nearly every station worked! This is a habit that comes under the heading of Bad Operating and must be cleared up in future. The lighter side of this was that when *one* Club did come out with a T7 report, several of those following would report likewise!

Stoke-on-Trent (G3GBU) had some transmitter

trouble and actually received a "T2" report from one Club, followed by a few T7's and 8's. They voluntarily refrained from claiming points for these QSO's; and this justified the judges in treating two or three other Clubs with poor notes in the same way. Contacts earning T7 or T8 reports have been disallowed in all cases, and this was responsible for reducing one Midland Club's score by as many as 42 points. A pity, but had everyone given honest reports there would have been no score at all for this one!

Bury (G3BRS/A) were unfortunately misled by their interpretation of one of the licence conditions, as a result of which they did not come on the air at all during the second week-end. We hope to clarify this point fully in the near future.

Promotions

There were a few spectacular improvements over last year's performances, in particular that of *Greenford (G3JVL/A)* who climbed from 21st position right up to 4th. Without this noble effort on their part the top five stations would have been the same as last year, though in a different order.

Mitcham came up from 14th to 8th place; *Salisbury* from 15th to 11th; *Crawley* from 30th to 14th; and *A.E.R.E., Harwell* from 38th to 16th; and perhaps most creditable of all, *Reigate (G3FM)* came literally out of nowhere to take 12th place—a very fine effort for their first entry.

Of the demotions there were many, but we will not mention them individually. In some cases these were due to change of location, but mostly, we should imagine, from a change of operators.

Comments

As always, the remark most frequently met with on the end of the log sheets was to the effect that all

TABLE I: **POSITIONS AND SCORES**

	CLUB	CALL	POINTS
1.	Stourbridge	G3BMY	653
2.	Aldershot	G3KMO	646
3.	Gravesend	G3GRS	644
4.	Greenford	G3JVL/A	599
5.	Bailleul	G3IHH	579
6.	Harlow	G3ERN	566
7.	Surrey (Croydon)	G8TB	564
8.	Mitcham	G3OCT	548
9.	Cheltenham	G3GPW	544
10.	Sutton and Cheam	G2BOF/A	532
11.	Salisbury	G3FKF/A	530
12.	Reigate	G3FM	509
13.	Clifton	G3GHN	500
14.	Crawley	G3FRV/A	483
15.	Nottingham	G3EKW	475
16.	A.E.R.E., Harwell	G3NNF	474
17.	Sheffield	G4JW	473
18.	S.T.C., Harlow	G3NIS/A	472
19.	Danbury	G3MWD	456
20.	Grafton	G3AFT/A	454
21.	Wolverton	G3LCS	453
22.	Chester	G3FNV	449
23.	Wirral	G3NWR	444
24.	Kingston	G3KIN/A	443
25.	R.A.F.A.R.S., Locking, Som.	G8FC	423
26.	Barnet	G3FFA/A	414
27.	Bradford Grammar School	G3MHB/A	400
28.	Acton, Brentford & Chiswick	G3IIU	395
29.	Norwich	G3JGI/A	388
30.	Edgware	G3ASR	386
31.	Liverpool	G3AHD/A	384
32.	Rugby	G3BXF	375
	RAF Little Rissington	G3NGZ	375
34.	Newbury	G3LLK	366
35.	Thanet	G3DOE	355
36.	Overstone	G3KQH	351
37.	Scarborough	G4BP/A	345
38.	Leeds University	G3LUU	340
39.	Blackpool	G3NJN	331
40.	RAF Watton	G3MSZ	327
	Stoke-on-Trent	G3GBU	327
42.	Grimsby	G3IYT	302
43.	South Shields	G3DDI	300
44.	North Kent	G3ENT/A	288
45.	East Kent	G3LTY	287
46.	Medway	G2FJA	274
47.	Purley	G3ODX	273
48.	Macclesfield	G3OFU	272
49.	Leicester	G3LRS	266
50.	Wellingborough	G3KSX/A	255
51.	Ainsdale, Lancs.	G2CUZ	251
52.	Ravensbourne, Kent	G3HEV/A	238
53.	Bury	G3BRS/A	213
54.	Derby	G3ERD/A	180
55.	Hartlepools	G3IDV/A	168
56.	Torbay	G3NJA	92
57.	Morecambe	G2FCL	74
58.	Aberdeen	GM3BSQ	35
59.	Leven	GM3LUM	26

members enjoyed the Contest and were now eager to do battle again and to make an even better score. Criticism was not lacking, however. We quote herewith a selection of "shorts" from competing Clubs.

"Too much bunching between 1820 and 1860 kc only plays into the hands of stations like ours which have more than adequate selectivity available" *(Stourbridge)* . . . "Band conditions pretty rough at times, and also some of the operating" *(Aldershot)* . . . "Although conditions on all four days appeared to be different, during the first hour we averaged 25 QSO's, during the second 17 and during the third 12. The main difference was the level of reports *(Greenford)* . . . "Chronic bunching, but not as bad as in the past, or are we getting used to it?" *(Bailleul)*.

Aldershot, G3KMO, were second in the Fifteenth MCC, the station set-up being very similar to last year, when they also had second place. In this view, G3IQE is nearest camera, with G3KMO on the right.

"Abundant key-clicks and an apparent inability to net . . . we could hear stations in the North at good strength but couldn't work them" *(Surrey)* . . . "Very few people know how to use the BK system; most stations asked to repeat a serial number would insist on repeating *call-signs several times" (Mitcham)* . . . "Had a cloudburst one evening, and water came through the roof. We claim to be the only contestant who used a water-cooled key!" *(Cheltenham)* . . . "Clubs north of Yorkshire seemed non-existent to us here in the South. A Midland Club should win" *(Sutton and Cheam)* . . . "Suggest an enhanced points value for OK and HB stations another time. Most stations did not answer their CQ's" *(Salisbury)* . . . "A very great improvement on last year, when we came last! After working the first 40 you really have to dig deep for them" *(Wolverton)*.

"We feel a change of time would relieve the monotony. An hour later may help the Northern Clubs and even bring in some GM's" *(Chester)* . . . "Constant use of BK sign when returning tended to confuse stations—but we'll be back again next year" *(RAFARS, Locking)* . . . "Too many stations calling CQ at once" *(Overstone)* . . . "Restoration of the prefix multiplier and possibly a county multiplier might be a good thing" *(Scarborough)* . . . "MCC, year after year, is an excuse for sausages and onions fried on the big stove-pot in our converted pig-sty out at Hulme!" *(Stoke-on-Trent)*.

"Lost the aerial the first day, and the power supply went up in smoke the second week-end!" *(East Kent)* . . . "On the second Saturday, owing to dense fog and ice on the road our operator was unable to make his way home—and had to stay with the rig all night!" *(Hartlepools)*.

Most Clubs commented on the spectacular fade-out on the first Saturday night. One or two of them even packed up and went home at 1900 or before, being unable to hear anything. This affected northern stations more than the others; in fact *Torbay* say that the first Saturday was good, but conditions poor on the other days!

Several Clubs make mention of the number of OK, DL and HB stations heard, and one or two suggest that bonus points should be awarded for working them. This will certainly be arranged next year, unless we decide to alter the whole layout once more—which is quite possible.

Blackpool make the interesting suggestion that the whole of the U.K. should be divided into areas, with the various inter-area contacts all carrying a different points value. This is certainly worth pondering over, but it seems that it would still give an advantage to Midland stations, who, though never scoring the highest possible points for one contact, would have more chance of working all areas, both to the North and South of them.

General

On the whole, Clubs who used individual members' stations made better scores than those who worked from their Clubrooms. This has always been a slightly unsatisfactory feature of MCC, meaning, as it does, that the true Club spirit is completely absent at some of the competing stations.

Few contestants bothered to say much about the gear used, but it appeared that a few of the high-scoring multi-operator types did use two receivers *(Aldershot* had two operators and two HRO's, with a 300-ft. wire).

Leeds (G3LUU) correctly used C.25 as their number, but another station, signing G3KNQ, was also using that number. This station was assumed by many to have been the Loughborough Club. However,

one of the competitors worked G3KNQ after the contest, and was told that he had not operated at all, so there seems to have been a pirate in the midst of things. (Points have not been docked for such contacts, since participants could not possibly have known what was going on.)

Deductions

Points *were* deducted, however, in quite a few cases. Not many, fortunately, except in the case of the one station mentioned who collected all the T7's and T8's. The main reasons for pruning points were *(a)* operation before or after the deadline; *(b)* more than one contact with a given Club during one session (bad logging system!); *(c)* contacts claimed with a Club but not confirmed by the other log; *(d)* non-correspondence of RST reports. In very few cases did the reduction of score make any difference to the final position.

Logs were received too late for inclusion in the table from Stevenage (G3JLA), South Birmingham (G3OHM), Wolverhampton (G8TA) and Brentwood (G3LST). Their claimed scores (unchecked) were 537, 433, 282 and 303 respectively.

Gravesend, G3GRS, distinguished themselves by coming up into third place in this season's MCC. The operating was done by G3JLB and G3MXJ (seen here), the gear being a CR-100 receiver with an EF50-6V6-807 PA; apart from the operating, the aerial system undoubtedly contributed to Gravesend's success — they had a 272 ft. system, centre-fed with three wires, which gave a choice of the full 272 ft., or either of two 136 ft. legs, all selected from the station end through an ATU.

Cheltenham, G3GPW, made 544 points and came 9th in the Fifteenth MCC, a good performance by one of the fringe-area entrants. Operators, left to right, were G3MOE, G3CGD and G3OLN; also assisting was G3CEG. Gear at G3GPW consisted of an HRO, the transmitter ran a 5763 in the PA, and their aerial was 320 ft. long. All HT at G3GPW is from vibrators, so the station is run exclusively from 6-volt accumulators.

Miscellany

We have already commended the two GM stations for their sporting entries; also heard and worked by many were GW3BQY, GW3KSQ, GW3NJW GW3OAY and GI6YM/A. Only the last-mentioned was a Club station, and unfortunately we have no entry from them. At least four other *bona fide* Clubs were active; two or three of them obviously made quite high scores. But their logs had not been received, more than a week after the date they were due in. So we are still wondering what happened to 3EFX/A, 3LCW and 3OOU. Notwithstanding these missing entries, however, MCC managed to break its own record once again.

The judges wish to thank G3KHT (Hucknall) and D. L. A. Low (Leicester) for very useful check logs, which were greatly appreciated.

One Club made an extraordinary complaint about the fact that some of the numbers were different from those allocated last year; but what last year's numbers have to do with this year's Contest we honestly cannot see—we might well have altered the whole lot, and probably shall, next time! This year's full list was printed in good time for everyone to use.

Once more, then, we should like to thank all competing Clubs for making this a particularly successful contest; we hope to see them all again next year, with many others swelling the total to yet another record. All points brought up by contestants will be borne in mind, and we have every confidence that next year's MCC will be bigger and better than ever.

Finally, a reminder to Club Secretaries that the deadline for next month's activity reports is **Friday,**

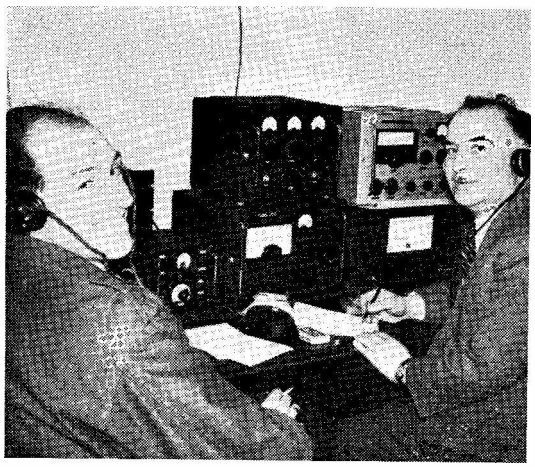
TABLE II

MCC — ROLL OF HONOUR : 1946-1960

Club	Points
COVENTRY	15
STOURBRIDGE	14
NEATH AND PORT TALBOT	11
Rhigos	9
Surrey (Croydon)	6
Aldershot, Chester, West Cornwall	5
Clifton, Crystal Palace...	3
Cheltenham, Harlow, Sheffield, Warrington, Bailleul	2
Grafton, Gravesend, Nottingham, Wirral	1

(The points for this table have been allotted on the basis of three for a win, two for second place, and one for third place. In the event of a tie, *both* stations have been awarded their full points. The position table for the years 1946-1959 inclusive can be found on p. 496 of the January 1960 issue).

January 13. They should be addressed, as always, to "Club Secretary," Short Wave Magazine, 55 Victoria Street, London, S.W.1. Meanwhile, to all secretaries, officers and members we wish a Happy New Year.



For this season's MCC, the Wirral boys signed G3NWR and (in this photograph) operators were G3CSG (left) and G3EGX; other operators were G3FOO, G3IGG and G3QX. Receivers used were HRO, AR88 and S.640, and their aerial was five quarter-waves long, end-fed; the Tx was three-stage, with an 807 in the PA.

R.Aux.A.F. SIGNALS RESERVE UNIT

Arising from the Editorial in the October issue of SHORT WAVE MAGAZINE, we are asked to draw attention to the Maritime Headquarters Units of the Royal Auxiliary Air Force, formed to assist NATO in the defence of the Eastern Atlantic. The Units recruit and train Signals staff to provide command communication facilities. Manned by voluntary recruitment on a part-time basis, with evening and week-end training schedules on Service communication equipment, and an "annual camp" of 15 days, men and women recruits are wanted. Members are supplied with uniform, and full pay, training allowances, travelling expenses and an annual tax-free bounty are paid.

Neat layout at G4BP/A, Scarborough, for the 15th MCC. Another of the fringe-area contestants, Scarborough did well to knock up 345 points. Operators were G2YS (seated) and G3FVW.

There are four Units at present formed or forming, based on London, Plymouth and Edinburgh, at the R.Aux.A.F. local Hq. in each case, and at R.A.F. Aldergrove, N.I., for the Ulster Maritime Support Unit. Application should be made to the Adjutant, No. 1 Maritime Hq. Unit, Royal Auxiliary Air Force, Valency House, Sandy Lane, Northwood, Middlesex. There are over 100 vacancies in No. 1 M.H.U., as it has only recently been formed, and its members are to be recruited from the London area.

TAYLOR VALVE MANUAL

Taylor Electrical Instruments, Ltd., who manufacture a comprehensive Valve Tester in addition to the wide range of their other instruments, now offer a completely revised and up-to-date Valve Manual for use with the Taylor Tester models 45A, 45B, 45C, 46A and 47A; more than 5,000 characteristics are included in the Manual, which costs 10s. post free from Taylor Electrical Instruments, Ltd., Montrose Avenue, Slough, Bucks.

Their new "Vista" range of panel meters is also interesting. Using the Taylor centre-pole movement, with DC sensitivities from as low as 5 microamps., they are in a smart "contemporary" styling, in four models embracing a wide choice of AC/DC scalings. A pamphlet on these new meters is available from the address already mentioned.

SWISS AMATEUR POPULATION

A recent issue of U.S.K.A.'s *Old Man*—which is the HB amateur periodical—lists a total of about 550 licensed HB9's, the callsign sequence being HB9B to HB9AAD; callsigns are mainly two-letter suffix, but the three-letter allocations have now been started. There are very few single-letter suffix calls extant, these being held by the real old timers of the early pre-war days.

SMALL ADVERTISEMENTS

(" SITUATIONS " AND " TRADE ")

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

TRADE

QSL's and Logs by Minerva. The best there are.—Samples from Minerva Press, 2 New Road, Brentwood, Essex.

WANTED FOR CASH: Good clean communication receivers and SSB equipment. Please state price. — Short Wave (Hull) Radio, 30/32 Princes Avenue, Hull. *(Tel. 18953.)*

QSL CARDS AND LOG BOOKS, G.P.O. APPROVED. CHEAPEST, BEST. PROMPT DELIVERY. SAMPLES. — ATKINSON BROS., PRINTERS, LOOE, CORNWALL.

"TELECOMM" 2-metre transmitters, receivers, converters and mobile Tx/Rx's ; also transistor DC power converters.—R.E.E. Telecommunications, Ltd., 15a Market Square, Crewkerne, Somerset.

AR88LF, £35 ; AR88D, excellent condition, £50 ; Eddystone 750, £58 ; 888A, £80 (as new) ; Geloso G209-R, £60 ; LG.300 with PSU and Mod, £75 ; DB20 Pre-selector, £7 ; Rx R.1392 (new), 100-156 mc, £6. New 2in. sq. S-meters, 0-1 m/a, £2 each. —K.W. Electronics, Ltd., Dartford, Kent.

TK35 TAPE RECORDER, brand-new, £60 ; Pam Slim-Line Portable Television receiver, 17-inch, new, £35 ; current Philips 17-inch Television receiver, £35. Large quantity (about 500) *ex*-rental Television sets (details on request). WANTED: Any Amateur equipment to buy or exchange for above.—Box No. 2392, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

OSCILLOSCOPE, Type 13A, urgently required. Highest price paid.—P.C.A. Radio, Beavor Lane, Hammersmith, W.6.

SPECIAL OFFERS for limited period only: "Telecomm" CR144D 14-valve 2-metre receivers, £45 (£65). "Communicator" 2-metre mobile Tx/Rx, £66 (£90). 12-volt 70-watt transistor power units, £13 (£18). H.P. terms (excluding t.p.u.) ; normal prices in brackets. — R.E.E., Ltd., Market Square, Crewkerne, Somerset.

READERS' ADVERTISEMENTS

3d. per word, min. charge 5/-, payable with order. Please write clearly, using full punctuation and recognised abbreviations. No responsibility accepted for transcription errors. Box Numbers 1/6 extra. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, S.W.1.

SELL: Working compact mains one-valve Rx, headphones, plug-in 80-metre coil, 35s. Xtals FT243: 7025, 7050, 7100, 7125 ; FT 171B: 3520, 3570 ; 5s. 6d. each. Exchange stamp collection for working Amateur receiver.—Details: Akehurst, Pee. Pendine, Carms.

SMALL ADVERTISEMENTS, READERS—*continued*

FOR SALE: E.M.I. Signal Generator, Type 30; slide wire attenuator with valve voltmeter, turret coil pack, ranges 1·6-2·4 mc, 8-16 mc, 16-32 mc, 32-60 mc, price £10.—Box No. 2385, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: B2 Tx/Rx; must be complete and perfect; no fancy prices. — Full details to: Box No. 2386, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Circuit Diagram for Collins TCS Tx and other TCS data. State price.—J. Frearson, 137 Williamthorpe Road, North Wingfield, Nr. Chesterfield, Derbyshire.

SALE, as new: DX-40U and VFO; 60w. peak phone, 75w. CW, £25. WANTED: K.W. DX-100. Letters answered. Fifty-mile delivery or collection.—Box No. 2387, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Communications Receiver, AR88, AR77, CR-100, etc.; must be in mint condition and reasonable. Cash waiting.—Box No. 2388, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: HRO Senior, excellent condition, six GC coils and 21 mc BS coil, with power pack, £18.—GAELJ, Claypole, Newark, Notts.

WANTED: Bug-Key, American make, good condition; state price, etc.—G2CIW, 1 Kingsdown Road, Northfield, Birmingham, 31.

EXCHANGE: Panda PR120v. (£55) together with unmodified BC-221 in TU5 cabinet with stabilised power pack, monitor speaker and amateur band calibration chart (£15), both in excellent condition, for LEICA 111.G camera with F2·8 Elmar lens and case. Other types considered.—Box No. 2389, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

EDDYSTONE 840 for sale, perfect condition.—Please phone: Rickmansworth (Herts) 5020.

DX-100U for sale; little used and in perfect order; going SSB; £50, inc. carr. Woden Choke DCS-13, 12H 250 mA, £1. TCS Tx and Rx, Multi-way plugs and sockets, 5s. each, plus postage.—Box No. 2390, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Two 40ft. Aerial Masts, two Command Receivers, many other items, valves, etc.; the lot, £5.—Turk, 25 Whetstone Road, Cove, Farnborough, Hants.

EDDYSTONE 358X, excellent condition, with p/pack, complete set boxed coils, plus photostat of handbook. Buyer collects. £12 o.n.o.? — P. Jackson, 60 Southwold Road, London, E.5.

BARGAIN SALE: Two Transmitters. 160-80m. and 80-10m, 2/254 M's in final, modulator and power supplies, £30 the lot (or items sold separately); no reasonable offer refused. Lots of other useful items, EHT Transformer, chokes, etc. All equipment looks professionally built and works well. Write for further details; inspection invited. Please drop me a line if intending to call.—G3MSL, 30 Blossom Waye, Heston, Middx.

FOR SALE: TR200/HF Transmitter, on portable stand, in mint condition, Z-match unit, spare valves including QY3-65 PA. £95.—*Phone: Ascot 1691.*

SMALL ADVERTISEMENTS, READERS—*continued*

AR88LF, FB condition but needs realignment, £35. SX-28 FB, re-crackled, manual, £35. TCS-12, new, unmod., manual extract and circuit, £10. TCS antenna loading box, 10s. 25w. VFO table-top Tx, PU separate case, 4 meters, screen mod., bands 80-40-20, £6. Q5'er, new, standard mod., less valves, £3. 6-9 mc Command Rx, extra audio stage, 6v. valves, £2. S44OB, resprayed, unmod., less RK34's and windings, with 70 mc crystal, £2. 19 Set, new (Canadian), £2 10s. W1191A Wavemeter (crystal checked, heterodyne), as new, in transit case with spares, £7. 18 Set Tx, new, unmod., key, special plug, spare AR8, £1 10s. Command Tx, 2·1-3·0 mc, less valves, unmod., £1. Command Rx, 234-258 mc (includes 3-6AK5), spotless, £1. Dynamotor, 24v. in, 600v. 425 mA, 240v. 200 mA, new, £1. New 813 (2), 30s.; 829B (25s.); 6146 (25s.); EF55 (4), equiv. 6AG7, 5s. Power units, all 230v. in, 250v. 120 mA, double smoothed 6·3v. 4A, fully enclosed, fused, £2. 510v. 275 mA, 375v. 85 mA, 12v. 2A (DC), 6·3v. 17A total, 4 fuses, centre-tap, switches, £6 10s. 510v. 100 mA, 275v. 50 mA, 6·3v. 7A, paper smoothing, £4. Potted xformer, 350v. 200 mA, 6·3v. 6A, 6·3v. 0·5A, 5U4 rect., fuses, unwired, perforated steel case, £3. Transformers 700/800v. 200 mA, 300v. 100 mA, 200v. 50 mA, 5v. 2A, 4v. 7A, 6·3v. 7A, 6·3v. 1A, with Pyranol 10 μF 2kV, in TU case, £3 10s. 350v. 130 mA, 6·3v. 5A, 4v. 3A, CT potted, 15s. Since 1949 *Short Wave Magazine*, 1950 *Bulletin*, 1957 *Brit. Comm. Electronics*, 1s. each, p.p. (carriage extra).—Perry, The Hall, West Wratting, Cambs. *(Tel. 240).*

TOP BAND Mob./fixed station; compact, small; Command Rx/Tx, 8 ins. x 6 ins. x 6 ins., Ph/CW, worked DL/OK. Vib. Pack, mains pack, speaker, mic, whip/coil, all accessories, cables, etc. Exchange for all-band converter or Rx.—G3MXO, 160 Yardley Fields Road, B'ham, 33. *(Ste. 2760.)*

SALE: HRO, plus coils (seen Northallerton), £7 10s. Super-Pro, £17 10s. Geloso Tx, nearly finished, £25. AR77 scrap, 15s. Prefer buyer collect. WANTED: 'Scope, with wobbulator, car radio, Euming projector with tape provision. — Martin, Cygnet Cottage, Kingswood, Great Missenden, Bucks.

WANTED: CR-100 Receiver; state price.—A. J. Fantham, 92 Grange Farm Drive, West Heath, Birmingham, 31.

840A, working order, no modifications, £25 (carriage paid). New 1960 *CQ*, 44s.—Box No. 2391, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Coils E and F for National HRO-60, urgently. SALE: BC-221, stabilised power pack, charts complete and extra 1000 kc crystal, £23. Minimitter Multi-Q, mint, £5. Surrey area.—Box No. 2384, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Jason V-Voltmeter; handbook and trimming tools for AR88D; crystals FT241, Channels 45, 46, 47; mechanical filter, 455 kc; NC-303.—Hodgkinson, 794 Bury Road, Breightmet, Bolton, Lancs. *(Phone 8046.)*

SMALL ADVERTISEMENTS, READERS—*continued*

NATIONAL NC-188, AC Mains SW Rx, 500 kc-40 mc, new, with box and handbook, £75 o.n.o.? (£100 list). AR77 AC Mains SW Rx, with spares and handbook, £20 o.n.o.? G73 Wavemeter, AC Mains, with charts, £4 o.n.o.? Buyer to collect.—Everley, Peel House, Fairfield Road. *(Phone Uxbridge 36989.)*

WANTED: Panda Cub Transmitter; must be in good condition.—Price and details to: Cook, 11 St. Edwards Road, Bounbrook, Birmingham.

AR88LF, good working order; no case. AVO meter, Model 8, c/w leather case, mint condition; two new 815's; Philips dual impedance mic. (50/25,000 ohms).—Offers, please to: K. R. Denman, 4 Princes Avenue, Droitwich, Worcs.

SALE: COMPLETE STATION.—888A, LG.300, Elizabethan, 30ft. galvanized lattice tower, two Class-B modulators 805's, UM3, TZ40's; mod. PX25's, p/pack; 2-metre Yagi, J. Beams 70 cm and 2 metres; G4ZU co-ax beam; telescopic mast; PSU's, 1300v., 1200v., 1000v., 600v., 350v.; Ind. unit, Type 7; 200 valves, including 813 (3), 805 (5), 832 (6), 9 CRT's. Offers £225. Shack (12ft. x 8ft.), £40.—G3GYW, 239 Westbourne Grove, Westcliff-on-Sea, Essex.

WANTED by GW, pair ·0001 μF HV-type variable condensers, suitable for ATU. Please state physical dimensions and price.—Box No. 2382, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: HRO Mx Receiver, in perfect order, complete with p/pack, L/S, nine coils and handbook.—G3LNK, 36 Oldfield Street, Fenton, Stoke-on-Trent, Staffs.

WANTED: 6-band converter, working to fixed IF of around 2 mc. Price according to condition. Cash waiting. — GW3OLX, 10 Park Wern Road, Sketty, Swansea.

TELEPRINTER, Creed Mk. 3, good working order, £15 o.n.o.?—G3NGK, 99 Masons Hill, Bromley, Kent. *(Tel. RAVensbourne 7774.)*

SALE: LG.300, mint, 221, HRO Rx mint, Type 62 Set. Valves, etc. Offers? Would deliver Tx/Rx 150 miles.—G3IQO, 20 Asbridge Street, Liverpool, 8.

150-WATT Rack Tx, 813 PA, pi-output, band-switched all bands, all power supplies, TVI-proof; buyer collects; £25.—Roshton, G2JZ, Whitehall, Kingswinford, Staffs.

AR88LF, with S-meter, excellent condition; ex-G3MLG, deceased. Buyer collects. £35.—Olver, The Spinney, Moor Hall Drive, Sutton Coldfield.

VIBROPLEX BUG, drives me dotty, £3 10s. Two each—472, 474 kc; FT241A, Channels 55, 56; 7s. 6d. each.—Faulkner, Grange Hostel, Farnborough, Hants.

SHORT WAVE MAGAZINE, September 1946 to November 1956 (except Jan. 1950, missing); clean copies, £2 (carriage free). — Reeves, 1a Norbury Crescent, London, S.W.16.

SMALL ADVERTISEMENTS, READERS—*continued*

FOR SALE: The following equipment, belonging to the late G3GTM: One Marconi Power Meter-type T.T.340, £2 10s.; two Standard Telephone M/c, Mic.-type, 401C, £5 each; one BC221 Frequency Meter, Power Pack and Calibration Book, £20; one-beat Frequency Oscillator, 30 c/s to 15 kc, £7 10s.; one Hichok Valve Voltmeter, ZO213, £10; one ex-Admiralty Wavemeter, G73, and Calibration Diagram, £3; one Hunt Capacity and Resistance Analyser, Type G.R.13, £4; one Weston Analyser, Model O.E.8, £4; one Home-made Transmitter, 829 Final, 3·5-28 mc, with modulater (pair 807's) and power supplies, £10; one Lab-gear LP Filter, £2; 1-10 mc Bi-square aerial and mast, £10 o.n.o.? Above can be seen by arrangement. —*Telephone Bridestow 318.* All inquiries to: G3BRJ, Trefaes, Westella Road, Yelverton, Devon.

FOR SALE: AR88LF, in mint condition; no mods.; with handbook; £35 o.n.o.?—G3KFQ, 31 Celtic Road, Deal, Kent.

WANTED URGENTLY: Ex-Police Car receiver, as advertised, p.161, May 1960 *Short Wave Magazine*; must be working and unmodified. Also Hallicrafters S27 handbook. — Prices, etc., to: D. Rees-Jones, 56 Higher Road, Hunts Cross, Woolton, Liverpool.

SALE: Brand-new, boxed RCA 813's, 30s. each. Send s.a.e. for list of other valves and surplus gear.—Box No. 2383, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SINGLE SIDEBAND: Complete "Kendon" Exciter, comprising SB.1, Mx.1, Mx.2, LA.1; all mounted on standard chassis with VFO, bandswitched all bands. Will drive 813. £27 10s.—Olver, Spinney, Moor Hall Drive, Sutton Coldfield. *(Phone Four Oaks 1188.)*

SWL URGENTLY REQUIRES any Rx 160-10m., any condition but working, to exchange with a complete printing outfit. Two machines, type, and paper, etc., etc. Cost £40. Also tape correspondence with another SWL. — A. P. Carpenter, 472, Long Riding, Basildon, Essex.

ELECTRIC DRILL: Black & Decker Utility ¼in., Model 1, 235/250v., as new; just returned from complete overhaul by makers (new armature, field coils, brushes, spindle and bearings). First offer of £4 secures (please include postage).—Watts, 62 Belmore Road, Thorpe, Norwich, Norfolk.

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