The SHORT WAVE Magazine

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FOR THE EXPERIMENTER AND THE RADIO ENGINEER

The SHORT-WAVE Magazine

EDITORIAL

CTV *The artificial agitation for commercial television has disclosed one disturbing fact—and that is the shortage of frequencies in the VHF area. This need not trouble us unduly at the moment, because Band II* (87.5-100 *mc*) *and Band III* (174-216 *mc*) *are far enough away from our* 144 *and* 430 *mc bands, in terms of frequency, not to bring them within the orbit of anybody's calculations.*

On the other hand, if the pressure on frequencies in the VHF area develops as it has done on the HF bands, it may conceivably lead to envious eyes being cast upon our comparatively generous VHF allocations when the next international reshuffle comes round.

Until the threat of CTV—and it is nothing less—everybody was fairly happy with what they had got at the VHF end of the spectrum. While we cannot expect to arrest the march of progress, it is more than questionable whether CTV in this country would represent progress. A fair prognosis would be that competitive television would weaken the BBC, technically and artistically ; and would lower the standards, because advertising appeal would at all times have to be aimed at the lowest common denominator (*what hay the manufacturers of detergents and patent medicines would make* !).

All this would be brought upon us in the name of " free competition " and " breaking the BBC monopoly "—which in this case means no more than the interests of the small but very influential group planning to control the CTV stations, market the receivers, and sell advertising time on the air.

On these grounds, and for the same reasons that we believe in the monopoly of the General Post Office, we also believe that the development of Television as a public service should be left entirely to the British Broadcasting Corporation, and that the BBC itself should be protected from the threat of these disrupting influences.

Austin Forsyth G6FO.

The Design of HF Receivers

EASILY-CONSTRUCTED 14 MC CONVERTER FOR THE BC-453

PART II

P. SHORT, M.Sc., A.M.I.E.E. (G3CWX)

Those who made their way through the first part of this article, in our February issue, may well be expecting that the promised receiver design will be something of an extraordinarily complicated nature which only the advanced expert can fathom with any hope of success. It is precisely this which the present offering is not. Having settled on a simple design, the author has taken care to build the specimen shown using only the tools and facilities mentioned. The photographs show a result which, though somewhat unrefined in appearance, is nevertheless of very satisfactory performance. The only assumptions he has made are that the potential constructor understands the superheterodyne principle and can follow a circuit diagram.—Editor.

THE receiver shown in the photographs demonstrates what is probably the simplest and cheapest method of getting satisfactory performance on the 14 mc band. Construction and adjustment have been greatly eased by designing the receiver especially for this purpose. It consists only of a three-valve front end — RF amplifier, frequency changer and oscillator—feeding a BC-453 tuned to about 465 kc. But its performance may come as a surprise, even to those familiar with VHF work where corresponding arrangements are, of course, commonly employed.

In order to minimise the constructional effort necessary there is only the one RF stage and a three-gang tuning condenser is used, though as the IF is in the range 450-470 kc, second channel suppression is little better than the average for this type of front end. It is not difficult to add another RF stage and fit a 4-gang tuning condenser, but it does mean a little more work. The use of a BC-453 as the IF and output system saves a lot of time, and as these units are even now available at less than the retail value of the valves they contain it is hardly worth while to build an equivalent. Those who wish to do so can, by the way, use ordinary IF transformers and beat oscillator coils in place of the BC-453 variable tuning system.

The parts used in the construction are nearly all obtained from surplus materials, mostly at a fraction of the retail price of the present-day article, so an estimate of the total cost is not easy to make. It all depends on what there is already available in the way of bits-and-pieces.

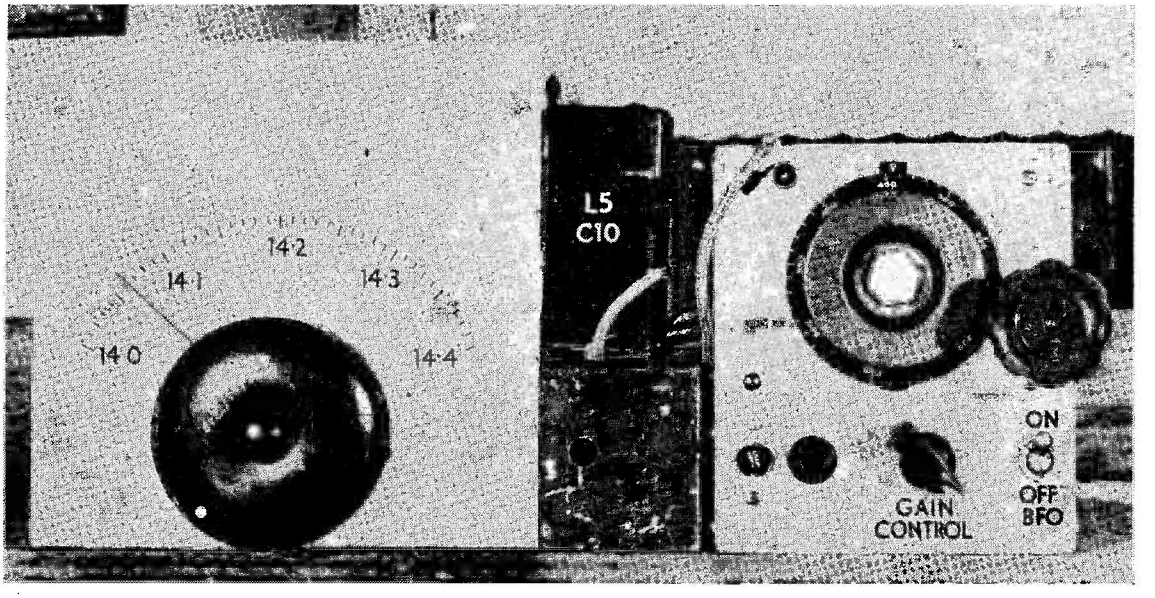
Theorists may turn up their noses at a receiver which has no crystal filter, but practical experience, reinforced by the figures given below, shows that the added complication of constructing and lining up a crystal filter is unnecessary at this stage. After this receiver is built and working, but only then, it would certainly be a good second step to add one. The job is not difficult and the chassis used has in fact room for crystal filter components, though they have been removed for the purposes of the present design.

BC-453 Bandwidths (Measured)

For	6 dB down	... 2.3 kc
	20 dB down	... 3.9 kc.
	40 dB down	... 6.0 kc
	60 dB down	... 8.4 kc

Note.—All coupling controls (found under screw-on 85 kc IF transformer knobs) pulled out as far as they would go. These figures are taken from the author's specimen, which is suspected to be a little inferior to the general run of these units.

The RF unit is built on a metal chassis measuring $8\frac{1}{2}$ ins. x 6 ins. x $2\frac{1}{2}$ ins. No metal work other than the drilling of holes in this chassis is involved and the tools required are only the usual wheelbrace, drills, screwdriver, pliers and soldering iron, with maybe a rat-tail file for the $\frac{5}{8}$ in. dia. valveholder apertures. For these last, and for some larger holes later found superfluous, the writer actually used a couple of chassis socket-punches. Although the components have of course been laid out and wired with discretion, the good stability of the final article is due as much as anything else to the use of low-impedance tuned circuits, made practicable by the selection of a low-noise pentode of high mutual conductance for the RF stage itself. Nearly all the components are small and suspended in the wiring. The RF stage bypass condensers are best wired across the valveholder to form an elementary sort of screen between control grid and anode pins, and the anode connection goes directly up through the chassis and above it to the RF



The two sections of the G3CWX receiver when married up—the BC-453 unit is on the right.

transformer. By these means it has been possible to avoid the necessity for additional screening, which is always a trouble to those without proper metal-working facilities.

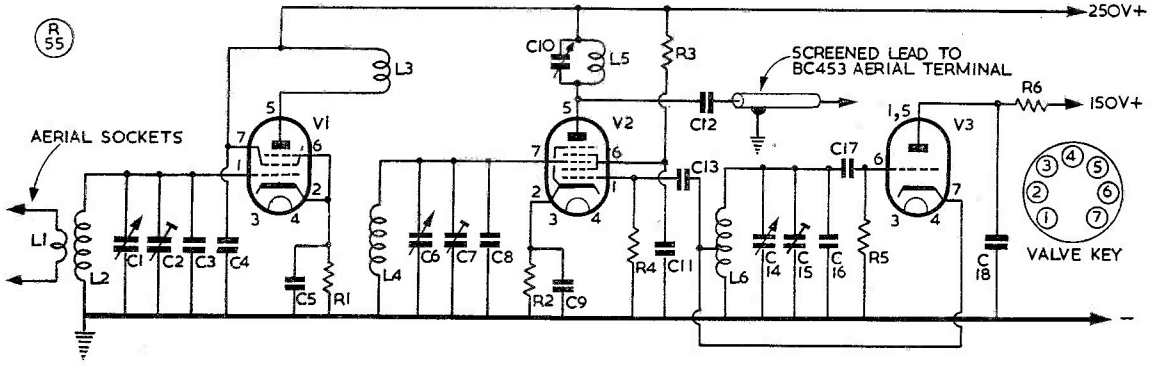
RF Circuits

The three-gang tuning condenser C1, C6, C14, of 25 $\mu\mu$F per section, is used with added shunt capacity to give a total tuning capacity of about 250 $\mu\mu$F at 14.0 mc. The 14 mc band is accordingly spread over roughly 140 degrees of the 180-degree range of the tuning dial. The RF input circuit needs a coil L2 of $5\frac{1}{2}$ turns of No. 14 enamelled wire close-wound on a $\frac{1}{2}$ in. dia. former, self-supporting but here fixed for convenience on a piece of polystyrene rod. Its measured Q is a little over 140, giving a resonant circuit impedance of only 6,500 ohms. This, incidentally, does not mean that the selectivity is poor, for at a given frequency the bandwidth of the tuned circuit is inversely proportional to the value of Q and to nothing more, whatever the value of the impedance at resonance may be. The RF amplifier valve is a Mullard EF91 (CV138). It is unprofitable to try a 6AK5 instead. The shunt trimmer capacity actually in use at present has a 100 $\mu\mu$F variable section, so that extraordinary aerial coupling arrangements are more readily coped with and readjustment for use on other bands is simplified. Those who intend to stick to one input circuit will need only a small variable trimmer capacity C2, as specified on the circuit diagram, and for 80-ohm input a 2-turn aerial coil L1.

The RF coil inductances may be adjusted by spreading the turns in the usual way. For those who prefer the ease of adjustment obtained with iron-cored slugs the design here actually used as interstage transformer L3, L4 is offered: its tuned secondary winding L4 is 4 turns of No. 22 enamelled wire wound on a moulded polystyrene former with slug (Neosid, Ltd., Part Nos. 400 and 550) and has a Q of 90. The RF amplifier valve is coupled to this by a 4-turn primary L3, closely interwound, and the resulting stage gain of 30 dB is acceptable.

Frequency Changer

The frequency changer valve type selected is a 6BE6, which does not generally appear on the surplus market. It was desired to have the convenient layout and ease of construction given by a single-ended miniature valve, while avoiding that more intimate connection between oscillator and signal-frequency circuits which the use of the surplus CV138, and suchlike pentodes, as frequency changers generally involves in practice. No doubt similar results could be got from the octal-base ECH35, for example. The interstage transformer L3, L4 is screened from other parts by being mounted above the chassis, everything else bar valves and IF circuit being below, so the use of a



Circuit of the 14 mc unit described by G3CWX.

frequency-changer valve with top-cap control grid is not difficult.

Multigrid frequency changers of the type preferred are, however, rather noisy. The stage gain of 30 dB is little more than sufficient to make input circuit noise appear above other internal noise sources and it is preferable to increase this figure by using the 14 gauge coils, without iron cores. The frequency-changer anode feeds an IF tuned circuit L5, C10, for coupling to the BC-453. The screened lead shown is connected to the BC-453 aerial terminal; remember to allow for its shunt capacity by readjusting the IF circuit capacity, if necessary. Half an IF transformer, mounted above the chassis, does very well for L5, C10.

Oscillator

Little need be said about the HF oscillator. It takes a 6C4/CV133 valve V3 and is standard except for the large fixed trimmer capacity C16 (mostly silvered mica) which together with a 25 $\mu\mu$F air-spaced variable trimmer C15 and the tuning condenser C14 makes up the total of the tuning capacities. It is of course desirable that some part of the trimmer capacity should be of negative temperature coefficient, to cut down frequency drift, but the best proportion is found by trial and error and varies with the components and wiring used. The comments of G3AKA on VFO compensation in the February, 1953, issue of *Short Wave Magazine*, are relevant here.

The coil used for L6 is actually 4 turns of No. 22 silvered wire wound in tension on a groove cut in a $1\frac{1}{8}$ in. dia. ceramic former, with the cathode tap one turn from the earthed end. Ceramic formers with threads cut to take the wire are not easy to come by, so whatever is specified will probably be rejected in favour of a little ribbed ceramic former, which leaves most of the wire unsupported, wound to the same specification as the aerial coil and tapped at one turn from the end. It will have to do. A common feature of all ceramic coil formers is that the holes never seem to be exactly where one would like them ! This can nowadays be circumvented by the use of a rather expensive tungsten carbide tipped "household" drill of $\frac{1}{8}$ in. diameter. (This is also No. 3 Rawlplug size and will justify its cost later on by drilling through bathroom tiles and suchlike difficult jobs !)

The oscillator injection grid current in the 6BE6 mixer valve V2 should be measured with the oscillator running, by a milliammeter inserted at the earthy end of the gridleak resistance R4. If the current is much above the makers' rating of 0.8 mA the position of the cathode tap on L6 should be readjusted, but, unless the frequency changer stage seems unduly noisy, lower values of current are nothing to worry about.

Table of Values

Fig. 1. Circuit of the 14 mc Front End.

C1, C6, C14 = 3 gang 25$\mu\mu$F. variable, ceramic insulation.
C2, C7, C15 = 25$\mu\mu$F. trimmers, air-spaced, ceramic insulation.
C3, C8 = 200$\mu\mu$F. silvered mica.
C16 = 200$\mu\mu$F. total, silvered mica and ceramic negative-temperature-coefficient, see text.
C4 = 0.0025$\mu\mu$F., 350v. working.
C5 = 0.0015μF., 350v. working.
C10 = Part of 1F coil assembly, tuning L5.
C11 = 0.01μF., 350v. working.
C12 = 0.0015μF., 350v. working.
C13 = 0.0025μF., 350v. working.
C17 = 25$\mu\mu$F., ceramic.
C18 = 0.0025μF., 350v. working.

NOTE.—*The bypass condenser values are those actually used. Small 0.01μF. units will be suitable also.*

R1 = 160 ohms.
R2 = 270 ohms.
R3 = 22,000 ohms.
R4 = 22,000 ohms, 1 w.
R5 = 47,000 ohms.
R6 = 1,000 ohms.
All but R4, ½watt dissipation.

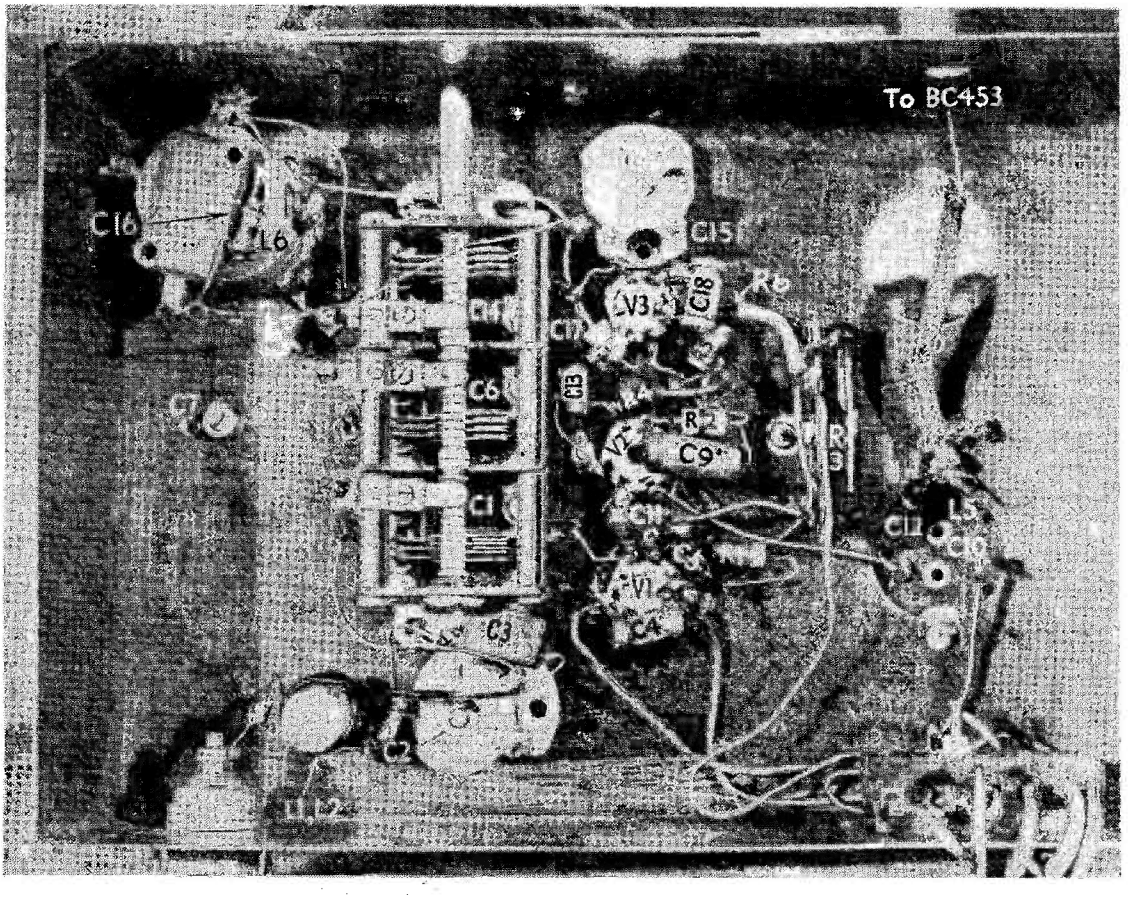
L1, L2, L3, L4, *(see text)*
L6 = *See text.*
L5 = One winding from an IF transformer — anything in the range 450-470kc. will do.
V1 = EF91—CV138.
V2 = 6BE6.
V3 = 6C4—CV133.

Phone Operation

The receiver as shown is of course intended for CW work. Those wishing to use telephony can fit AGC to the BC-453, but to the BC-453 *only*. If the bandwidth is found too narrow, which will generally be the case, the BC-453 IF transformer coupling controls may be re-adjusted. As has been described before under the BC-453 performance data, these controls are pulled right out for maximum selectivity. Having tuned up the receiver in this condition, the outer two of these coupling controls may now be pushed right in, which gives a suitable increase in bandwidth. A noise silencer should preferably be fitted to the BC-453 second detector circuit, and an audio gain control also provided.

If the peak output of the BC-453 is found to be excessive, either on CW or on phone, it is worth noting that this unit may be run satisfactorily with anode supply voltage reduced to 45 or 50, which makes the effect of ignition noise and the like much less disturbing.

It will be seen that what has been described above is not a specimen of an ideal receiver to end all receivers, but a simple and effective little unit which can be made by anyone who can get command of the kitchen table for a few evenings. The writer hopes that success with this will encourage people to go further in the business of receiver building, instead of merely sitting and looking at their present Rx with disgust and wishing that they had the money to buy a " really superior " commercial article. It has been assumed that a knowledge of the BC-453 and how to adapt it for amateur use has already been gleaned, especially from past articles on the subject in *Short Wave Magazine* (*see* September, 1948), but if not, a study of a circuit diagram and the information that the beat oscillator switch shorts to earth one of the sockets in the 7-way outlets, while



Construction under-chassis of the receiver unit built by G3CWX for operation on the 14 mc band. The values have been chosen to give optimum performance at this frequency.

the gain control is a variable resistor connected between the cathode line of two 12SK7's and earth, similarly accessible, will be helpful. For the present purpose it is not necessary to fit a variable tuning control, the frequency being set to any convenient value and left there. It is, however, necessary to adjust the beat oscillator until its frequency is about one kc away from the second IF, which can be done by listening to receiver noise with the beat oscillator on and adjusting with a small screwdriver the tuning control to be found towards the rear on the right hand side of the BC-453 chassis. Having got the pitch of the noise up to the desired frequency, it will be found that CW signals now are loudest at this frequency, but that on rotating the main tuning dial till the other side of zero beat is reached, signals are much weaker. Those who have already handled a receiver with an adjustable crystal filter will not need instruction on the above points, but the writer hopes that not only these but others will soon be encouraged to press on to a receiver with two RF stages, and perhaps a crystal filter to provide the highest usable selectivity.

More about Aerial Coupling

AND POINTS ON TRANSMITTER ADJUSTMENT FOR PHONE & CW WORKING

J. N. WALKER (G5JU)

While this article deals mainly with points arising from our contributor's earlier treatment of the subject of Aerial Coupling and Loading, he also covers in some detail the practical considerations involved in setting up a transmitter for CW and Phone operation under proper conditions. Hence, the discussion will be of considerable interest to those who may feel that they still have something to learn about these matters.—Editor.

ONE or two queries have followed the publication in the June and July (1952) *Short Wave Magazine* of articles by the writer dealing with the transference of RF power from transmitter to aerial. There, the subject was dealt with on a broad basis and mainly having regard to an unmodulated carrier. For actual communication, the carrier must of necessity be modulated, by key or voice, and the conditions can then at times be modified. Obviously, this is a subject of many ramifications, and it is not possible in a short article to cover all the possible variations likely to be met with in practice—but some clearing up of a few points may assist readers who are studying the earlier articles.

Broad Signals

It has been pointed out that where a single frequency is concerned, over- or under-loading by the aerial cannot affect the signal—it is neither broad nor narrow. But, in practice, it is difficult to ensure there is only a single frequency. Taking CW telegraphy first, providing *(a)* The characters are so shaped as to give completely clickless keying; *(b)* The transmitter is free from parasitic oscillations; and *(c)* No frequency shift effect occurs, which presumes absolute stability of the PA *and* earlier stages, whether neutralised or not, then truly the transmitter can be considered as emitting on a single frequency. But by no means always are all three provisions fulfilled, and the operator of the transmitter may not even be aware that some minor fault does exist. The ideal course would be for the transmitter to be modified until any tendency towards spurious emissions, no matter how slight, were completely eliminated. Failing this, any ill effects (on others) will be mitigated if the aerial coupling is on the loose side, as recommended in the previous articles.

Coming to telephony, a definite band of frequencies has to be dealt with, the width thereof being dependent on the design of the modulator, the response of the microphone and other minor factors. As with CW, the transmitter and the modulator should be designed so that non-linearity and over-modulation cannot occur, particularly at the troughs of modulation. Then the only frequencies emitted will be the carrier and its true sidebands with no "whiskers" to irritate neighbouring operators.

The explanations which follow relate to anode (including anode/screen) modulation and not to the various methods (*e.g.*, control grid, screen grid and cathode modulation, including Clamp and super modulation) which come under the general classification of "efficiency

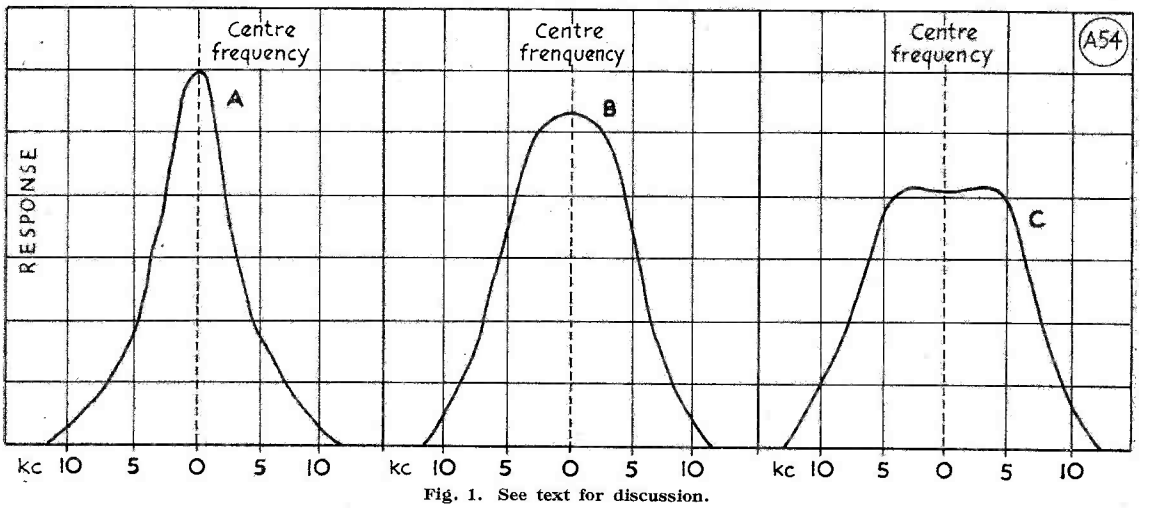


Fig. 1. See text for discussion.

modulation." Conditions may be quite different for these systems. The impedance of the valve and the optimum value of load coupled to it are liable to vary during actual operation and the only general advice it is possible to give here is to employ moderately tight coupling so that the PA stage is well loaded at all times. Frequency modulation is also a subject on its own, in that the transmitter operates under conditions similar to CW telegraphy, but the design of the RF circuits and the degree of aerial coupling call for special consideration in view of the much wider band of frequencies transmitted compared to amplitude modulation.

Selectivity

The problem is now one of selectivity, since not only has power to be transferred from the RF generator to the aerial, but the coupling must be such as to pass the whole band of frequencies, and the coupling which gives optimum transfer (which was the subject of the previous articles) may not be right in some cases. Actually it is hardly a problem at all where amateur communication is concerned, since quite a narrow bandwidth, as obtained with optimum coupling, serves for the transmission of reasonably good quality speech.

Although here the subject is concerned with transmitter coupling, the basic theory applies of course to any pair (sometimes more than a pair) of coupled circuits and as such is dealt with at length in the text books. A common example is an intermediate frequency transformer which can be designed either for high selectivity or for a wide bandwidth. The curves in Fig. 1 illustrate the point better than many words. "A" is the response, relative to the centre frequency, when the coupling between a pair of tuned circuits is adjusted to optimum or slightly below optimum. "B" is the resultant curve when the two circuits are slightly over-coupled, and "C" when they are heavily over-coupled. In "A" the bandwidth is narrow and the response falls off rapidly each side of resonance. With "B" the response is adequate for speech, but there would be some falling off at the higher musical frequencies. "C" is the right band-pass type of coupling for broadcast work. It should be noted that curves such as these apply as much to a transmitter as to a receiver—for broadcast transmission, the aim would be to achieve a response in the RF circuits similar to "C," but steeper curves, as in "B" and "A," are more suited to amateur operation.

The actual shape of any of the curves is inevitably bound up with factors other than the actual degree of coupling—the frequency, the "Q" of the circuits, the amount of loading imposed by valve, aerial or lumped resistance, all play their part. In particular, it is difficult to obtain a sharp peaked response at high frequencies, hence the use in a selective receiver of a low frequency (*e.g.*, 100 or 85 kc) in the IF stages. On most amateur bands it can safely be assumed that optimum coupling, giving maximum transference of power to the aerial, will also result in a bandwidth quite adequate for speech transmission, even when the latter is of the high fidelity kind.

Instability in the Transmitter

In an earlier paragraph, "whiskers" were mentioned. The most common cause of these is RF reaching the modulator and being amplified there, the output to the PA then containing

both RF and AF voltages. The effect is also produced when a transmitter, normally stable, becomes unstable at or towards the peaks of modulation. Whilst loose aerial coupling reduces the interference caused to others, such a state of affairs should not be allowed to exist and steps should be taken immediately to clear up the trouble, by the introduction of additional screening, stopper resistors and chokes, and perhaps re-routing of leads which pass through a strong RF field.

It should be borne in mind that a modulator may produce direct or harmonic frequencies at some strength over a small band (or bands) up to 10 kc or even higher, due to a resonance somewhere in the circuit (possibly in a transformer winding), and this may occur even when a filter is employed, intended to cut off at say 3,000 cycles. The effect on a receiver is similar to, but not so bad as, " whiskers "—one or two " bits " of modulation are found away from the normal transmission. A defaulter in this respect is the American SCR522 transmitter, often employed on two metres. In fifty per cent. of cases at least where this equipment is being used, two separate sidebands will be found, one on each side of and well spaced from the true carrier. In fact, the writer, when in contact with another station on two metres, is usually well aware an SCR522 is being used before being told so by the operator ! At the very high frequencies, the bandwidth is almost bound to be much wider than on normal high frequencies and it would not be possible to attenuate the offending sideband by reducing the aerial coupling without a serious falling off in power transference.

Transmitter Adjustment

Another point made concerns the adjustment of the transmitter when used for *(a)* Telegraphy, and *(b)* Telephony. It was assumed the transmitter had been adjusted for correct operation in whichever mode was being employed, but it is appreciated that, whilst in any case aerial coupling will be with the carrier unmodulated, there may be indications that all is not well when modulation is applied.

The main thing to remember is that, whereas with telegraphy, the PA in the transmitter accepts a certain DC power, delivering a percentage as RF power, when 100% modulated the PA at peaks has to accept *four* times the initial DC power and, for linear modulation, has to deliver four times the RF power to the aerial. The conditions of operation must be such that nothing prevents the power increasing in a linear manner when modulation is applied. To explain what can happen, the table herewith should be studied.

In the first place, the drive must be fully adequate for correct operation of the valve (or valves), not only at the initial input but at four times this input. If for example it is only enough for twice the initial power, the anode current will stop rising when the depth of modulation is only 40%, as the table shows. Any attempt to increase modulation further will result in distortion and " splatter," the more severe the greater the attempted depth of modulation. The peaks of modulation are then cut off square, a condition which results in unwanted frequencies being generated.

If the drive is sufficient for three times the initial power, the depth of modulation can rise to 75% before trouble starts. To repeat, for full 100% modulation, the drive must permit an increase of power to four times and then there should be something still in hand.

Bias Adjustment

Next, there is bias. For correct operation on telegraphy, the standing bias can easily be adjusted for proper operation, but there is no one correct value for telephony—unless the transmitter is being operated on MCW at a fixed level of modulation. Fortunately, most PA valves are not too critical about bias but, for telephony, the bias voltage must be increased in view of the higher peak anode voltage which occurs during modulation. The real point is that the drive must be increased in keeping with the higher bias.

The final arbiter is the input, relative to the rated dissipation and operating limits, at which the final stage is running on telegraphy, and it may help if some typical examples are considered. A fairly common case is a transmitter using an 807 type of valve with 400 volts on the anode and 225 volts on the screen. Following the makers' ratings, the bias would be 45 volts, the drive 65 volts peak (3.5 mA grid current) and the anode current 100 mA with the PA properly loaded by the aerial. These parameters could not—or should not—be maintained when changing over to telephony. The drive may possibly be sufficient for 80% modulation and the valve will in any case be over-run at peaks.

For correct phone working, the bias should be increased to about 80 volts, the drive voltage will require increasing to maintain 3.5 mA grid current and the anode current will drop to about 80 mA. The valve impedance has now increased, the reflected resistance from the aerial should be a little higher than pre-

viously and the aerial coupling should be slacked off a little, giving a resultant of about 70 mA anode current. Then conditions will be correct, both as regards transmitter adjustment and coupling to the aerial.

Other PA Settings

It may be that a similar transmitter is being used but with the input kept within the 25 watt limit—say 400 volts, 60 mA. Whether or not any adjustment is required when changing over to telephony depends on the means employed to reduce the anode current to 60 mA. If it is done by reducing the driving power, then of course the drive must be increased to an adequate level, the bias being increased to bring down the anode current which would otherwise increase. If the input is reduced by keeping aerial coupling loose, other things being equal there may be no necessity to change anything, but it will be well to ensure that the bias and drive are both near their proper values for telephony operation.

The same general conditions apply to a higher power transmitter. Taking an 813 running at 1,000 volts, 150 mA, there is plenty of reserve in hand for telephony operation, and, in many cases, no adjustment will be required when changing from CW to telephony.

It can be said that it is a bad thing to use more drive than is necessary when operating on CW, at least as far as production of harmonics is concerned and having in mind possible television interference. An adjustment for drive—for example, a potentiometer controlling the screen volts of the driver valve —is always a useful refinement. Again, it may be said that this talk of increasing drive is all very well, but the maximum drive available is already being used and there is doubt if it is sufficient. The only thing to do in such a case is to reduce the input by slackening off aerial coupling, to the point at which full modulation is still possible. It is far better to do this than to attempt to modulate the higher power under incorrect conditions of operation, whilst the available power is kept within a reasonably narrow band and used in the most effective way.

Telephony operation should not be attempted on a PA stage already running at full power on CW—that is, unless the cost of fairly requent replacement of valves is of no concern ! A pair of 807 valves will accept without distress 150 watts (750 volts, 200 mA), but this is an extreme rating for intermittent operation and it is foolhardy to expect them to run at the same rating continuously, and, on top of that,

Table

APPLIED ANODE VOLTS 100
INDICATED ANODE CURRENT ... 10 mA
MEASURED DC POWER ... ... 1 watt

Depth of Modulation (per cent.)	Peak Volts	Peak Current (mA)	Peak D.C. Power	Estimated Peak RF Power
0	100	10	1.0	0.6
40	140	14	1.96	1.18
50	150	15	2.25	1.35
75	175	17.5	3.06	1.8
100	200	20	4.0	2.4

accept a peak power input of 600 watts, as would be the case at 100% modulation. The drive alone required to reach this input would damage the valves very quickly.

Meter Readings on Telephony

The anode current meter reads the mean direct current and no change or flicker should be observed during modulation. The modulation power is at audio frequency and the negative and positive excursions of current cancel out as far as the meter is concerned—or should do.

If a change does occur, it is a sign that rectification of the audio waveform is taking place and both distortion and interference will then be evident. There are a number of factors which can bring about rectification and it simply boils down again to incorrect operating conditions. If the drive is inadequate, the anode current flattens out at a certain point, beyond which the modulation waveform is converted into direct current. Exactly the same effect will occur if the valve filament or cathode has insufficient emission. Here it must be remembered that in a stage operating under Class-C conditions the anode current is passing in pulses, the peak value of which will be much greater than the mean value of current recorded on the meter. When modulated, the valve is called upon to pass currents twice as great again and it is quite possible for the peak current in a fully modulated 807 valve to reach an instantaneous value of 800 mA ! Hence it is most essential there is ample emission in reserve—a valve in which the emission is beginning to fail may continue to give service under CW operation but is quite useless for telephony.

A further reason is bottom bend rectification —the anode current reaches zero and ceases for part of the audio waveform, so reducing the mean anode current. Over-modulation is indicated and interference to others will be severe, irrespective of the aerial coupling.

The anode current is liable to vary if there exists a serious mismatch between the PA

stage and the aerial or feeder and this is particularly evident in a VHF transmitter.

Finally, there is downward modulation, by which is meant an indication of *reduced* power in the aerial and not necessarily a change of anode current in a downward direction. If this occurs the other factors noted above being checked and found in order, there is only one answer—a mismatch between the modulation transformer and the PA stage. In general, it will be found the modulation transformer is too lightly loaded — that is, the impedance presented to it is higher than it should be. In this connection, it is well always to err on the side of loading the transformer a little too much, if anything.

Conclusion

The subjects discussed above have digressed somewhat from the original, but it will be seen that no one part of a transmitter, particularly when telephony operation is desired, can be divorced from the other parts, and many factors have to be taken into account before one can be sure the signal emitted from an amateur station (or any other, for that matter) is the best possible under the prevailing circumstances.

Variable Voltage Power Unit

APPLICATION OF THYRATRONS

R. E. B. HICKMAN

DURING development and experimental work the need frequently arises for a source of HT voltage. A description is given below of a wide range power supply unit which, without using expensive variable transformers or wasteful tapped bleeder resistors, will deliver currents of up to 200 mA at any voltage from about 50 volts to 400 volts. The unit to be described uses a pair of grid controlled rectifiers or thyratrons, such as RCA-2050 or RCA-2D21.

Theory of Operation

A thyratron is a rectifier tube containing gas within its envelope to decrease the voltage drop across the tube and increase the efficiency of rectification, and having one or more grids interposed between its plate and cathode to control the start of plate current flow. The control electrode controls only the starting of the current flow. Once started the discharge cannot ordinarily be modified or stopped by controlling the charge on the control electrode.

Fig. 1 shows the critical control characteristics of a thyratron tube. Curve A represents the AC voltage on the plate of one rectifier in a full-wave circuit. Curve B shows the critical instantaneous grid voltage which when applied to the control grid of the thyratron makes it just fail to ionize or "fire." In this condition no current passes through the tube and the rectifier output is zero.

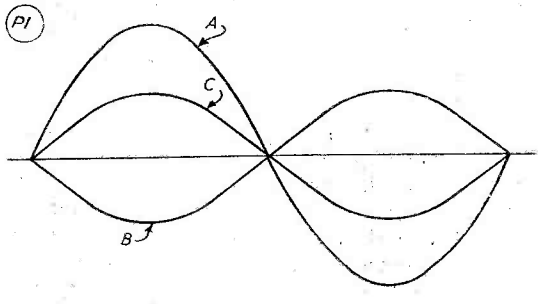


Fig. 1. Showing the control characteristics of the thyratron.

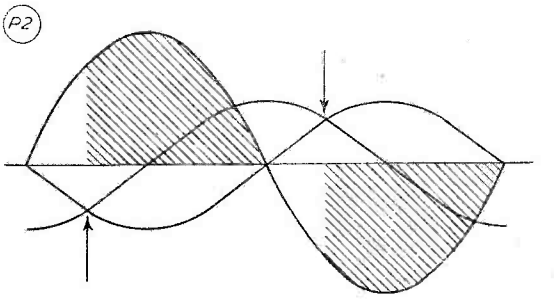


Fig. 2. These curves are discussed and explained in the article.

Curve C represents an in-phase voltage which, when applied to the control grid of the thyratron, causes it to fire at the start of a cycle and continue to conduct until the end of the cycle, when the plate voltage drops to zero and the tube de-ionizes, thereby restoring control to the grid. Under such conditions both thyratrons behave like conventional diode rectifiers and deliver maximum power to the load.

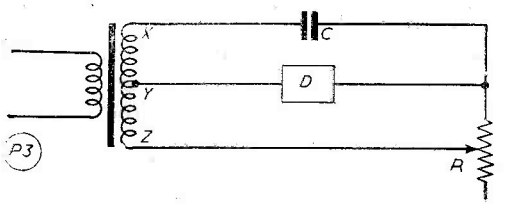


Fig. 3. Phase-controlling network, enabling voltage output to be varied with constant current.

Fig. 2 shows the relationship of plate voltage to critical grid voltage when the control voltage is 90° out of phase. The arrows indicate the points where the actual negative grid voltage becomes more positive than the critical control voltage for the applied plate voltage. Ionization occurs at these points and current flows during the remainder of the half cycle, as indicated by the shaded areas. Thus it can be seen that by varying the phase relationship between the applied anode voltage and the control grid voltage, variations of output will be produced by the rectifier. In the extreme cases, full output voltage would be produced when conduction occurs over the whole half-cycle, and no output voltage when no conduction occurs.

Phase Control

Fig. 3 shows the basic phase control network. The centre-tap of a transformer secondary winding is connected to a coupling device D. Considering the centre-tap Y as the zero-point, the voltage at X is 180° out of phase with respect to the voltage at Z. If now the resistance of R is high compared with the reactance of C, the coupling device may be considered to be connected across the winding XY and the voltage across it in phase. If, however, R is low compared with the reactance of C, the coupling device is effectively across YZ and the voltage across it is now out of phase. In this case the condenser C is connected across the whole secondary winding, but as its reactance will normally be high compared with that of the transformer winding, no adverse effect will result. It will be appreciated that by varying the value of R in circuit any phase relationship may be produced and the desired control achieved.

Circuit Arrangements

Fig. 4 shows the schematic arrangement of a practical power supply unit. A separate transformer is used to excite the filaments of the thyratrons and to supply the phasing voltage. 6.3v. and 5v. windings on the power transformer are available for energising additional equipment.

Resistor R3 is used in series with the input condenser of the filter to limit the peak current to the maximum rating. Its value should be approximately (0.9 x V) ohms, where V is the RMS voltage across half the power transformer secondary winding.

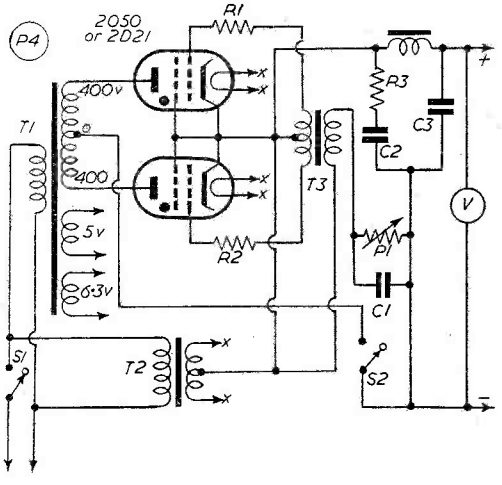


Fig. 4. Circuit for a power supply unit, using thyratrons, embodying the principles discussed in the text.

Grid resistors R1 and R2 prevent the flow of excessive grid current and consequent loading of the phasing transformer. It may be necessary to reverse the connections between these resistors and the transformer to obtain the correct phase relation so that firing is prevented when the potentiometer is in the maximum-resistance position.

The phasing transformer T3 may be any small interstage, single-plate to push-pull grids, audio transformer. P1 is the phasing control.

Switch S2, which delivers high voltage to the rectifiers, should not be closed until at least 30 seconds after the heaters have been energised. If desired a thermal delay switch may be fitted to bring about this degree of switching control.

THE G8UN SOLDER GUN

Further to the article appearing on pp. 281-282 of the July issue of *Short Wave Magazine*, describing the home-construction of a quick heating solder gun, G3BZM (High Wycombe) suggests the addition of a torch bulb mounted on the front laminations and fed from a second LT winding. G3BZM uses a screw-type bulb holder mounted on a strip of aluminium, which also forms a reflector and a light shield, connected across 20 turns of 26g. enamelled wire scramble-wound beside the copper strip winding feeding the bit. The result is the convenience of a solder gun with the additional advantage of light just where it is needed — on the job.

More IF Selectivity

NARROWED BAND WIDTHS ON CW AND PHONE

I. E. HILL (G6HL), *W/Cdr., R.A.F.*

In this article, our contributor shows what can be done to get greatly-improved selectivity in the IF chain. By obtaining the degrees of discrimination he shows to be possible in an IF amplifier designed on the lines that he suggests, it is possible to work very much nearer to strong signals than when using a receiver having the more usual selectivity characteristic. For this reason alone it is worth paying more attention to the problem of better receiver selectivity. But it also means that CW transmissions must be made cleaner and sharper and phone band-widths reduced to no more than the maximum necessary for intelligible speech.—Editor.

THE IF amplifier described in the April, 1952, issue of *Short Wave Magazine* was the result of quite a number of different approaches to IF selectivity, but it was far from final. The switched selectivity scheme gave a reasonably sharp response on CW and a narrow band-pass on Phone. Nevertheless, alignment with a wobbulator and 'scope showed that some compromise adjustment had to be made. With this adjustment made for optimum CW selectivity, the response in the Phone position was not true band-pass. The selectivity of the amplifier was exceptionally good, but it could obviously be bettered.

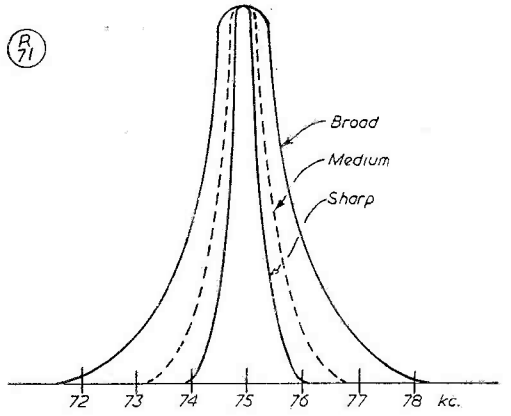


Fig. 1. Reproduction of selectivity curve obtained on oscilloscope when aligning 75 kc amplifier using a wobbulator.

The first modification was to drop the IF to 75 kc by the addition to the coils of small fixed condensers and to alter the first IF stage to include a crystal filter, a 75 kc crystal having been obtained on the surplus market. The objective was to increase the selectivity of the first IF stage used only in the "sharp" selectivity position. It should then be possible in the "medium" and "broad" selectivity positions to align for band-pass without losing maximum selectivity on CW. The scheme worked, but not too satisfactorily, and the crystal introduced some ringing. After several tries the crystal was discarded and the amplifier realigned on 75 kc in the same manner as the original 85 kc version. Selectivity obtained with the original amplifier realigned on 75 kc is shown at Fig. 1.

Further development was curtailed by decision to build a 50-watt transportable transmitter ready for the next change of QTH. Thought was, however, given to ways and means of modifying the IF amplifier further to improve selectivity on CW and give better band-pass on Phone. In *QST* for November, 1951, the design and construction of an interesting 20 kc amplifier was discussed, but this of course would not be readily adaptable to Phone usage.

After careful consideration it was decided that the design target would be an IF amplifier having three selectivity positions :

(1) "Sharp," with a relatively broad nose to the selectivity curve but minimum skirt response. Approximate effective width to be 1 kc.

(2) "Medium," with a wider nose than in Sharp but also minimum skirt response. This position is required only for the reception of chirpy signals or those few DX stations who effect bubble-and-squeak notes spreading over a kilocycle or so. This adjustment can be a compromise one. Approximate effective width to be 2 kc.

(3) "Broad," having a band-pass response 4 kc wide and minimum skirt, required only for the reception of speech.

Using a selective IF amplifier one becomes very snooty about key clicks. One cannot be otherwise because there would be so many silent patches in the band if only the guy one kc or so away had learnt and practised the simple rules of how to remove key clicks. Following a highly selective IF amplifier an audio limiter does not do very much about this form of interference. But one good way of

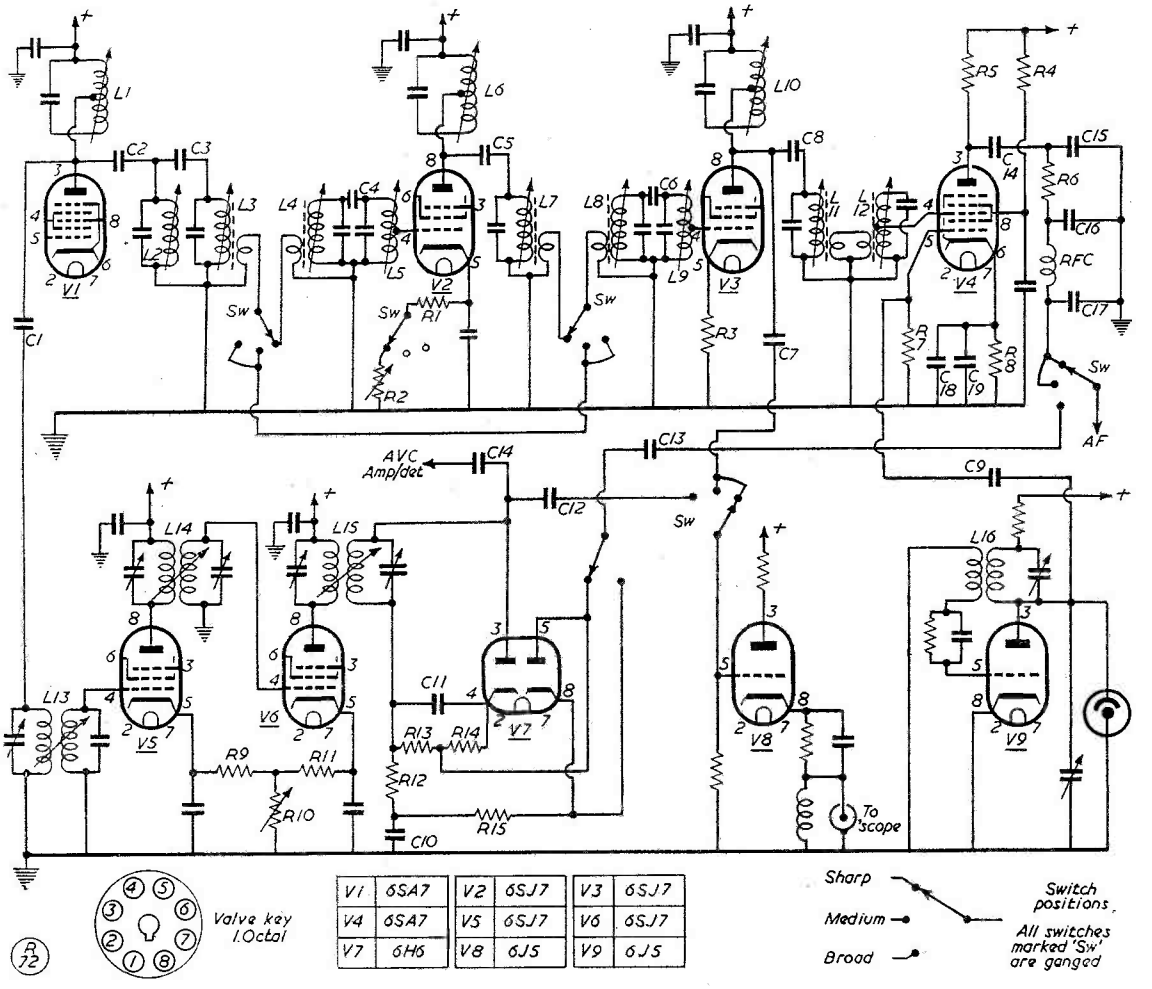


Fig. 2. Essentials of the two-channel IF amplifier suggested by G6HL. As explained in his article, a very high degree of selectivity, while maintaining adequate gain, can be obtained from an amplifier designed along these lines. The curves at Fig. 1 and Fig. 4 show the sort of results that can be expected.

Table of Values

Fig. 2. Essentials of the Two-Channel IF Amplifier.

L1, L2, L5, L6, L9, L10 = R.1155 D/F coils rewound 140 turns 7/44 Litz in each of four sections, with .001 μF in parallel.
L3, L4, L7, L8, L11, L12 = R.1155 Range 5 D/F coils, with .0006 μF in parallel.
L16 = BC-453 oscillator coil loaded to 51 kc.
C2, C3, C4, C5, C6, C7, C8, C12 = 10 μμF.
C6, C14 = 50 μμF.
C9, C12 = 25 μμF.
C10, C13, C17, C18 = .01 μF.
C11, C15, C16 = 500 μμF.
C19 = 10 μF.
R1, R3, R9, R11 = 270 ohms, 1-watt.
R2, R10 = 10,000 ohms variable.
R12, R15 = 1 megohm, ½-watt.
R13, R14 = 250,000 ohms, ½-watt.
R7 = 22,000 ohms, ½-watt.
R4, R5 = *As required.*
Valves = 6SJ7, 6SK7 or similar for IF amplifiers. 6SA7 for Converters. 6J5 for BFO and cathode follower.

Note: IF amplifier screen resistors to be 56,000 ohms in each case. Anode feed to be decoupled with 750-ohm resistors and 0.2 μF by-pass.

minimising the effect of key clicks and at the same time decreasing the loading on the last tuned circuit is to use a converter valve instead of the conventional diode detector. For CW reception it is far better to "convert" and filter out the resultant beat note than it is to "mix" at IF and then detect.

To cut further preliminaries and get down to the final decision for rebuild, refer Fig. 2. An IF of 50 kc was selected as about the lowest

with which one can hope to get a reasonable band-pass of 4 kc without too many complications. It will be seen that the input to the IF amplifier is split and feeds two separate IF strips. One strip provides the CW selectivity and is very similar to the amplifier described in the April, 1952, issue—and in fact uses the same components, except that additional condensers are used to bring the IF down to 50 kc. A 6SA7 converter with separate oscillator is used to obtain the audio beat. The output of the 6SA7 is filtered for RF and fed to a selectivity switch, the degree of selectivity in this IF strip being varied by switching in or out the first IF stage.

The second IF section is coupled by BC453 transformers padded to 50 kc. A conventional diode detector is used followed by a series diode noise limiter, the audio output going to the selectivity-change switch. AVC is obtained by use of a 6B8, the AVC being used to feed the S-meter valve and also to control the earlier (RF and IF) stages of the receiver. It should be noted that all the 50 kc stages are operated at fixed gain. A cathode follower is used to feed IF to the oscilloscope. The feed to this cathode follower is switched between the diode phone detector and the CW converter by an additional wafer on the selectivity-change switch.

Construction

Construction presents little difficulty, conventional IF amplifier practice being followed except that the size of decoupling condensers can profitably be stepped up to 0.2 or even 0.5 μF. Particularly on the CW strip, decoupling is most important if optimum selectivity is to be obtained. To aid constructors, a table of condenser sizes required to tune the IF transformers to various frequencies is shown at Fig. 3.

Coil A is the Range 5 D/F coil from an R1155 receiver. Coil B is a Range 3, 4 or 5 D/F coil rewound with 140 turns 7/44 Litz wire in each of four winding sections, the whole winding being centre-tapped. For these coils, condenser sizes and frequencies are shown for core plug screwed fully in and fully out. It should be noted that the exact condenser size required will depend on the amount of valve or other circuit loading, but with the larger sizes of additional condenser the adjustment of the plug gives adequate swing.

The Phone IF strip comprises two RF pentodes coupled by three BC-453 transformers. Condenser sizes necessary to resonate these coils are shown in Fig. 3. As additional capacity is added to these coils, the small variable condensers fitted are swamped and it becomes necessary to add midget variable condensers of about 100 $\mu\mu$F together with additional fixed capacities to resonate to the required frequency.

The two IF strips must be carefully isolated and screened in order to avoid instability. Otherwise, no particular constructional difficulties are likely to be encountered.

Alignment

By far the most satisfactory method of alignment is to use a wobbulator and oscilloscope. For CW alignment connect the 'scope to the plate of the 6SA7 converter. For phone alignment connect the 'scope to the diode detector anode. The cathode follower output could be used for phone alignment but not for CW as in the latter case it is not connected to the tail of the IF amplifier in use.

Alternately a signal generator and output meter can be utilised, but this is nothing like as satisfactory as the wobbulator method.

When the wobbulator and 'scope are used for alignment it will be possible to obtain better selectivity in "Sharp" than can be obtained adjusting only for maximum output. With the 'scope the response can be made almost vertical on one side but tuning for maximum output will give a symmetrical response. Note right hand side of sharp response in Fig. 4. The difference is only a few hundred cycles, but it helps.

By either method the CW IF strip can be dealt with first. With a 50 kc signal fed into the amplifier and the CW oscillator switched off, selectivity switch to "medium", L1, L2, L3, L8, L9, L10, L11, and L12 are peaked to maximum output. The selectivity switch is next set to "sharp" and L4, L5, L6, and L7 adjusted to maximum output. All coils in the strip are then realigned to give the most satisfactory response curve. Switching back to "medium" the response curve should be found to have broadened out a little but still be satisfactory for CW. Output should be noted on "medium" and then the amplifier switched to sharp; R2 should then be adjusted to give the same output as that obtained on "medium."

Attention is now turned to the Phone IF strip. Coupling in the BC-453 transformers is set to minimum by pulling out all the coil plungers. The variable padding condensers are then adjusted until maximum output is obtained. The transformer coupling is now increased by pushing in all three plungers until

Parallel Condenser μμF	Transformer A		Transformer B		Transformer C
	Core IN	Core OUT	Core IN	Core OUT	
50	125	160	150	181	72
100	101	130	120	144	67
150	84	104	104	123	62
200	75	95	90	105	60
300	65	81	78	94	55
500	50	64	61	73	45
1000	36	46	45	55	35
2000	26	33.5	35	42	27

Fig. 3. Approximate resonant frequency of transformers obtained by addition of parallel capacity.
(A) Transformer A—R1155, range 5 D/F coil.
(B) Transformer B—R1155 D/F coil rewound four sections, 140 turns, 7/44 Litz in each, centre tapped.
(C) Transformer C—BC-453, 85 kc IF transformer.

the response curve flattens at the top. This is where the wobbulator pays highest dividends. By a little careful adjustment of transformer coil coupling and tuning a satisfactory band-pass response of about 4 kc width can be obtained. Care should be taken to ensure that the CW strip is tuned to a frequency within the band-pass of the phone strip and preferably the central one.

An audio tone-modulated signal should next be fed into the amplifier. With BFO "on," tone modulation "off," the *audio beat* output from the CW IF strip should be noted. With tone modulation "on," the *audio* output from the phone strip should now be checked and R10 adjusted until output is the same as the audio beat output obtained on CW. This adjustment can only be an approximation, but it does serve to ensure that the effective gain of the amplifier is similar on both CW and Phone signals of the same mean carrier strength.

Performance

Well, what would you expect of twelve high-Q circuits on 50 kc ? One can tune right up to the big fellows and copy the little ones. But, as mentioned earlier, one does become very critical of key clicks and the other undesirable features of the not-so-good signals. The user of this type of IF amplifier will find that there are more indifferent signals than good ones in the amateur bands. It is small satisfaction that many of the commercial stations, professionally installed and operated, show up even worse ! Selectivity curves obtained during the wobbulator and oscilloscope are shown at Fig. 4.

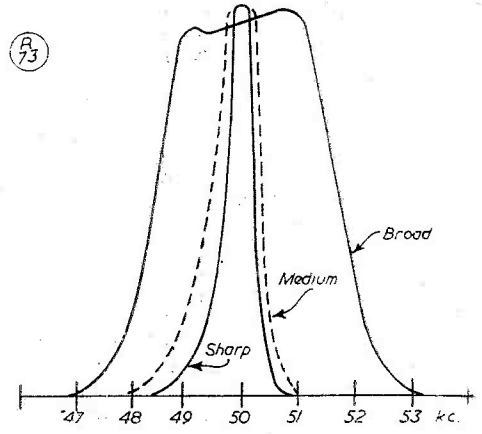


Fig. 4. Selectivity curve obtained on 50 kc amplifier unit, under the same conditions as for Fig. 1.

THANKS FROM G3JFP

Following the appearance of the article "Station G3JFP on the Air" in the June issue of *Short Wave Magazine*, John Proctor of G3JFP has received many gifts from readers, some of them anonymous. A recent parcel, forwarded *via* our offices, contained a crystal-controlled Top Band transmitter, with "John, Middlesex" as the only clue to the sender of this generous present. G3JFP would very much like to know the identity of the giver, in order to thank him personally.

OVERSEAS JOURNALS

Remember that you can obtain—or renew—subscriptions to all overseas technical journals, radio or otherwise, through the Publications Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1. You may be interested in such subjects as biology, mining engineering or surgery—lists of titles with subscription rates in sterling are available covering all scientific and technical periodicals published in America. Your subscription to *CQ, Radio & Television News, Radio Electronics, Proc. I.R.E.*, or *QST* can also be accepted in sterling and despatched through this office.

C. SMITH, G2UQ

It was with deep regret that we heard of the sudden death of Charles Smith, G2UQ, of Whittlesey, Cambs., who died on June 29 at the early age of 46, leaving a widow and one son. He had held a licence for over 20 years and was active on all bands. During the war, he saw service with the R.A.F.

DX COMMENTARY

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

IT has become almost traditional to open this feature with some remarks (usually far from cheerful) about conditions on the bands. For the last two years we have often had to chronicle the worst month on record, only to find its record broken again in the succeeding month. Depression follows depression, and the DX-starved enthusiast finds himself wondering whether he will ever hear those KG6's at S9 any more.

As a substitute for predictions, we are glad to have some *facts* to offer this month. They may not present a very rosy picture, but at least they put things in the right perspective and show us where we are likely to stand for a while.

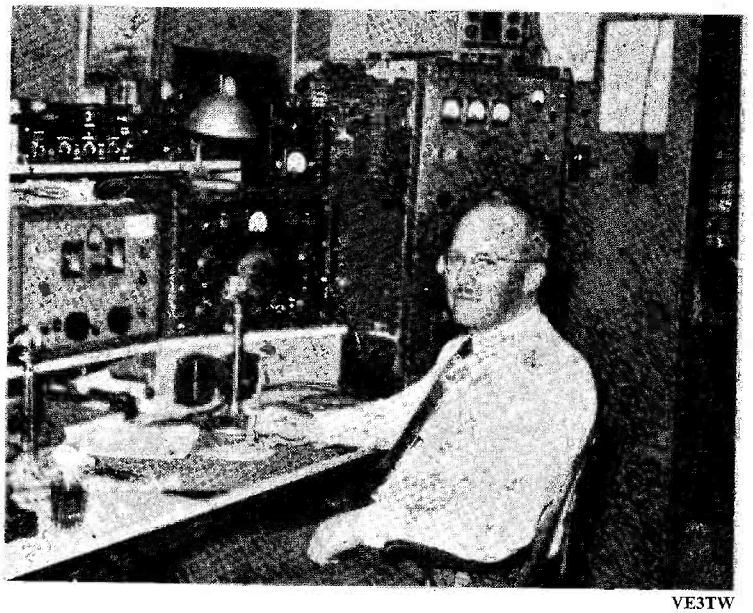
We were recently privileged to have a talk with an eminent authority on solar activity (with no particular interest or connection with radio), and he gave us the following facts concerning the so-called eleven-year cycle. They all refer to sunspot numbers and not, except by implication, to radio propagation conditions.

First, the most recent minima have been logged in the years designated as 1912½, 1923, 1933½ and 1944, giving a nicely-defined period of 10½ years rather than 11. *Second*, the maxima nearly always follow the minima at an interval of not more than three years, and the last two maxima having been sharply defined in 1937 and 1947. (In other words, there is a steep climb from minimum to maximum and a much slower falling-off after the maximum. This, in fact, has been observed for *more than a century* and has only failed to occur twice during that period).

Third, the 1947 maximum, coinciding with the best radio conditions that any of us have ever witnessed, was the *highest maximum* ever recorded. The relative sunspot number for the year 1947 was, in fact, twice that of the peak in 1927-8, and fifty per cent. higher than that of 1937-8. It was, as far as can be ascertained, considerably higher than any number recorded since the year of Queen Victoria's accession! And the latter number, as recorded in 1837, was just ten maxima away, in a period of exactly 110 years.

Translating all this into terms of what a continuance of this behaviour might mean to us, we can summarise as follows: (1) Our minimum year is likely to be 1954; (2) The following maximum might well arrive as early as 1957, with conditions even in 1956 being as good as those of 1946; and (3) It is highly unlikely that the maximum will be as high or as sharply defined as that of 1947, but we may expect the rise, after the minimum has been reached, to be very rapid.

It is only fair to add, after all this, that the whole thing is still a matter of prediction and conjecture. Past observations, however, have shown that there is a surprising regularity about the behaviour of the 11-year cycle, and that the theory that there is really a 99-year cycle of which our 11-year friend is the ninth harmonic has much to support it. It may even be that we have just passed the peak of this larger effort. (*Late Flash*: An article in the July issue of *CQ*, received after writing the above, confirms the general picture but points out that the 1947 maximum was the highest since 1779!)



VE3TW

CALLS HEARD, WORKED AND QSL'd

The Month's DX

On account of phenomena not unconnected with the previous

paragraphs, news of real DX has been extremely scarce again. There have been one or two good periods on the HF bands, mostly late at night, but nothing of any real interest seems to have cropped up. Listen round 80 metres and note the number of erstwhile DX-chasers to be found there, and you will realise how "off" this off-season really is! Some interesting Top-Band notes are to hand, and we will start off with them.

Magazine Daylight Test

The mystic letters MDT showed up with some frequency on the Top Band during the week-end of June 20-21, and the results are really quite interesting. Contacts of over 100 miles during these daylight hours were almost commonplace, and several much longer hops were recorded.

GM3IGW worked from Clackmannan on the Saturday, and only raised G4NS (Cumberland) outside GM, but he did hear GI5UR. On the Sunday he went portable from Kinross, put up a 550-ft. aerial, and made three 200-mile contacts with Cheshire (G2YS, 3IOX and 3ITY); one with Newcastle (G3SD, 599), one with Lancs. (G3IQO), and one with Yorks. (G3US). G5JU (Birmingham) was heard, and was the best DX of the day.

G3IQO (Liverpool) worked GM3IGW and GW3FYR (Cardigan) for his best hops, and heard GM3OM and 6FB as well. G2YS (Chester) managed hops of 220 miles (GM3IGW) and 200 miles (GM6FB) as well as 210 to GM3OM, 180 to G3IAS and 160 miles to G3IUL. Quite a few more QSO's were over the century mark.

GI5UR (Belfast) worked GW3FYR at 200 miles for his best, and also raised Cumberland, Paisley, Southport and Lurgan. GM3OM (Stirling) made 210 miles with G2YS, 170 with GM3JDR (going northwards!) and several over the 100 mark. He was hearing G5JU but couldn't make a QSO.

G4NS put Cumberland on the map and worked right round from Cardigan and Belfast to Scotland. G4IV, away down in Truro, didn't hear any of the Northern activity but made contact with GW3FYR (130) and two GC's (120).

G2NJ (Peterborough) raised G3SD, Newcastle (175), G3IOQ, Haslemere (110) and G3HA, Bradford (105) for his best. Several others were around the 75-90 mile mark.

From GC-land, 2CNC reports hearing G3SD, Newcastle, working G5JU; best QSO was with GW3CKB (Glamorgan). GC3EML also kept the GC flag flying for a short time and worked G2JF, 3IAS, 4IV and GW3CKB—all between 100 and 200 miles. Stations were heard from 200-300 miles, such as G3IBL, 3IUF and 8RL.

G5JU (Birmingham) had contacts ranging from G2ZP/A (Chatham) to G3CBW (Middlesbrough), G3SD (Newcastle) and GW3FYR (Cardigan). He was called by two GM stations but failed to hear them in the high noise level. Outside the official hours he worked GM3EFS at 2000 BST—sun shining, broad daylight and good strengths with no trouble at all.

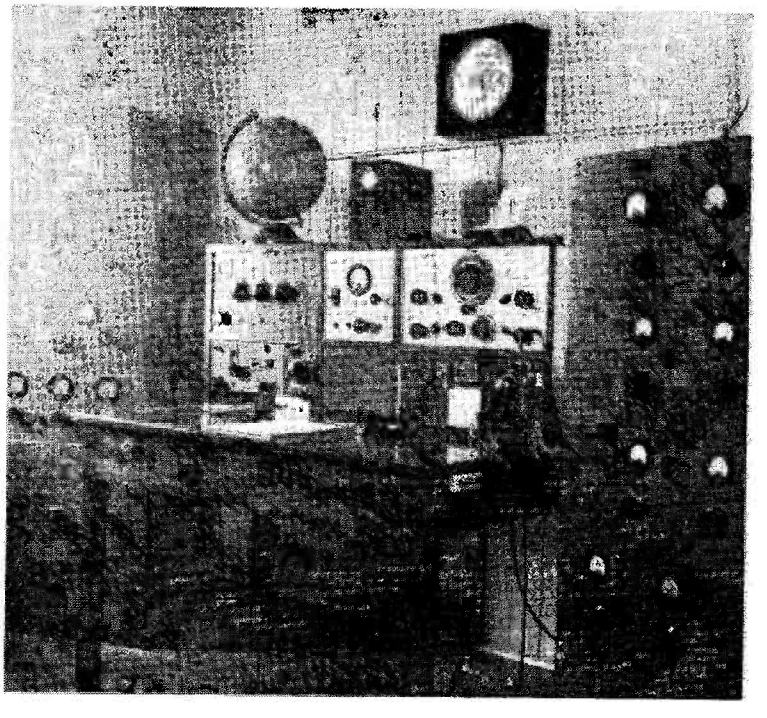
M. Dransfield sends a useful SWL report from Nottingham; the best DX heard there was GC3EML (270 miles), runner-up being GM6FB (225). About a dozen were logged from over the 100-mile mark. W. Iball (Worksop) heard stations from GM3IGW down to G3IAS and G8TS in Surrey, with some 30 counties logged altogether.

G3ITY (Chester) managed GM3IGW and GW3FYR for his best. DL1IX was laid up by illness, but managed to listen over the band from his horizontal position. Unfortunately, he heard nothing further than DL2PT at about 300 miles.

Generally speaking, the GDX results on this first *Magazine*

DAYLIGHT TEST No. 2

MDT No. 2 on the Top Band, Saturday-Sunday, August 22/23, 1500-1700 BST only, each day. Call "CQ MDT" and look for stations over 100 miles distant —And Please Report Your Results.



The console layout at VK4HR, Morningside, Brisbane, well known on all the DX bands and recently very active on 21 mc. His receiver is a home-built job.

Daylight Test were most impressive, and show that the 160-metre band is still potent for good U.K. coverage.

Other Top-Band News

Support has been forthcoming for the idea of a One-Watt WABC on the band this coming winter. One or two have quite rightly commented that, by the very nature of things, we are the QRM-ed and not the QRM-ers; yet *we* are the ones who decrease power still further. It does seem odd, but we must remember that we only have the band at all because we are very much "on sufferance"—and that all the people who are just QRM to us are, in fact, the legitimate users.

But, quite apart from all this, it was becoming evident that a WABC was a relatively easy business with 10 watts — it was getting the cards that was difficult! So a new start to the scheme, with a 1-watt limit, will add a spice of novelty and a little extra difficulty. We will have more to say about our One-Watt Winter in the next issue.

G6VC (Northfleet) has got his 77th card through — f r o m GM3IPU—but he finds a lack of activity around the band at present.

G2AOL (Otford) had made his WABC, having worked his sixtieth county last February after four months on the band—mainly with 2 watts. By the time his 60th card had arrived, he had worked 70 counties! G6KP (Morden) has also made it, and has had quite a bit of DX on the band as well. Between February and April he contacted the six G prefixes as well as HB, OH, OK, EI and ZC4, and he would like to see more Europeans showing up on One-Sixty during this coming winter.

G3ITY (C h e s t e r) worked GM3IGW, both in Clacks. and Kinross, and has both cards to hand; 'ITY's score creeps up accordingly. GI3CVH (Co. Armagh) hopes to be running 10 watts this season, and says there may be four other stations on from that county. He is also trying to stir up activity in Co. Tyrone.

G3GZJ (London, S.E.8) is most interested in a One-Watt WABC, never having been above three watts himself. He has 63 counties worked and confirmed, and the transmitter consists of 1T4 VFO, 1T4 buffer, 3V4 buffer and ATP4 PA. For one-watt tactics the 3V4 will be used as a PA. 'GZJ suggests that a phone award of some sort for Top Band work might be a good thing, especially as we seem to have lost a lot of the CW addicts to the other bands.

G3NA (Hereford) already has a one-watt outfit as a /P affair, and will be delighted to use it for any contest purposes on the band. G3ABG (Cannock) forwards the news that GM3AAU is now in Kirkcudbrightshire and should be on the air by this time.

G3FAU (London, E.15) points out, on behalf of the QRP Research Society, that many members have been achieving excellent results (and not only on the Top Band) with 2 watts or less, and that the One-Watt WABC should come quite naturally to some of them. Their own "200" contest aims at contacting 200 counties in Great Britain, using the 1.8, 3.5 and 7 mc bands, with a minimum of 50 counties on each, and a maximum power of 2 watts. He adds that G3IFN (Woolwich), who is bed-ridden, works the Top Band regularly with inputs down to 0.08 watts, and gets out in spite of a poor aerial system.

G3ETP (Lowestoft) would like to know where we stand on One-Sixty, and, in particular, wishes there might be some official indication of whether the "fixed" services will ever settle down. We have a feeling that things are becoming a little more stable already; it is up to us, with our VFO's, to remain flexible and to find spots (if possible) where we *can* work. There is still far too much congestion around the 1880-1920 kc area—why won't people spread out and use what little they still have?

G2YS tells us that the Chester Club plans a week-end expedition in September, when their call will be GW3GIZ/P, from Merionethshire. If the trip is a success, they might try a further sortie of interest to WABC-men. And G3IYW (Bristol) reports that he, G3EUK and G3GMN will be operating G3GMN/P from Brecknockshire on September 12 and 13.

G3BRL (London, W.5) is quivering on the brink of his WABC, with 60 worked and 59 confirmed. But he has been off

TOP-BAND COUNTIES LADDER

(Starting Jan. 1, 1952)

Station	Confirmed	Worked
G16YW	79	79
GM3OM	79	79
GM3EFS	78	80
GI3HFT	78	79
GM3IGW	78	78
G6VC	77	78
G8KP	77	77
GM3JDR	74	77
G2NJ	74	74
G3ELZ	73	76
OH3NY	73	75
G5LH	70	73
G4XC	69	72
G6ZN	68	72
G3HDQ	68	69
G3ESY	68	68
G3IAF	65	73
G3BJU	65	68
G4FN	64	68
GM3EHI	63	68
G3GZJ	63	63
G3IQO	61	67
G3HIW	61	66
G3AKU	61	63
G2AOL	60	70
G3FNK	60	69
G6KP	60	67
G3HTI	60	64
GI3CVH	60	64
G3IEF	60	61
G3AFL	60	60
G3IBL	60	60
G3BRL	57	60
G2YS	56	71
G2BJN	52	55
GW3CKB	48	61
G3ABG	41	55
G8JC	41	52
G3AKY	36	48
G3ITY	30	46
G3DO	30	39
G3DVQ	27	30
G3NA	24	31
G8VG	21	34
G3HWH	20	41
G5FA	20	38
G3FZS	20	33

the air owing to a spell in hospital, and has been spending his holiday with G2DVD at Slinfold.

GM3EFS writes from the Isle of Wight—apparently he got as far away from GM as he possibly could for *his* holiday! His Top Band score is now 78 confirmed, 80 worked, but he is striving hard to get away from it all for a while.

Trans-Atlantics Again

We have provisionally fixed the dates for the winter's Trans-Atlantic Tests as follows: 0500-0800 GMT on December 20 (Dummy Run), January 3, 17 and 31; February 14 and 28; March 14. These dates have been agreed upon by W1BB, who will, as usual, stir up all the activity that he can from the other side. The success of last season's event has already assured plenty of co-operation from the W's and VE's, and it is hoped that several more exotic spots will also be showing active call-signs this year.

The Ten-Metre Party

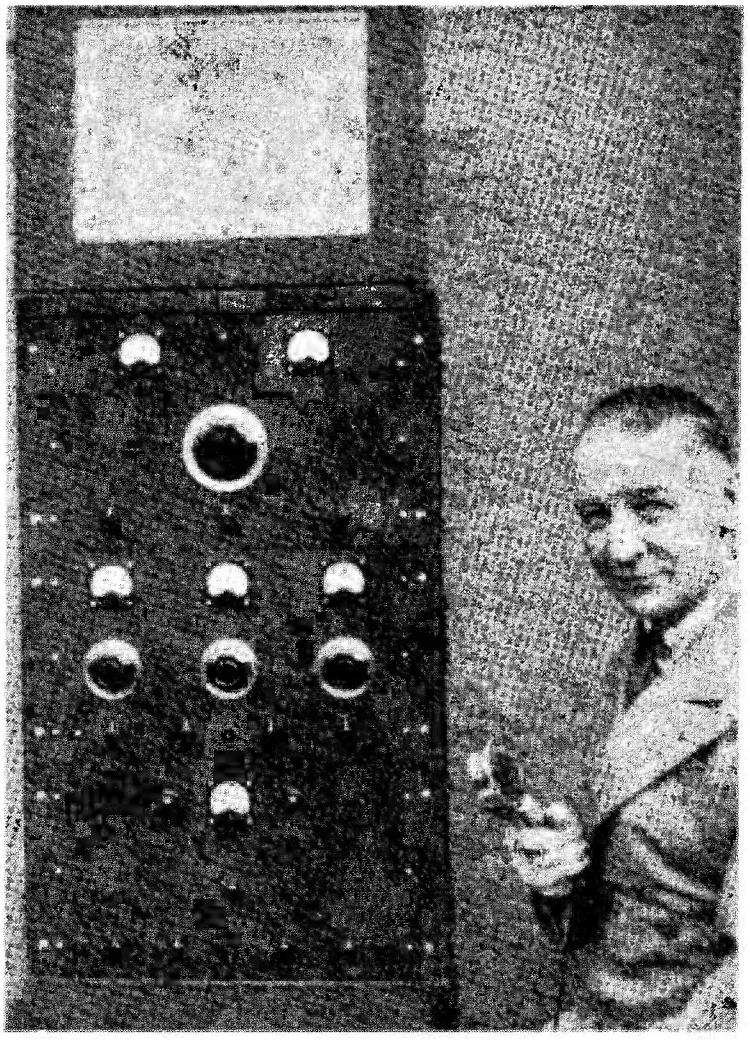
On June 28 the much-neglected 10-metre band came to life again for a while. Not, unfortunately, with lots of exciting DX—but at least it showed itself usable for communication of various kinds.

G3EJA (Reading) was on for a short time and worked OE1BU, OK1KTL and I1CEH, his 75 watts of phone getting S9 reports from all three. He also heard HB9BZ, but no G's.

GC2CNC (Jersey) used 250 volts to a 6V6 tri-tet CO and couldn't measure the exact power, but was obviously QRP! With this he worked seven DL's, an SM, an OE, an EA and I1BLF/Trieste, getting reports up to 589. All QSO's were off the back of a fixed 3-element beam facing west—and all were on CW.

G3HCU (Chiddingfold) put in four hours on the band and worked CN, two CT's, DL, two F's, HB, five I's, OE, two OK's and one DX station—LU8BS. Sundry G's were also heard and worked. G2BW (Walton) worked DL, OE, OK, I, F, YU, Trieste, ZB1 and ZE, but did not find much activity from G stations.

H. J. Hill, an SWL in Whitley Bay, logged many G's and I's, as well as F8SK working VQ2DT, LU3DBS working OE1BU, and, later (1930) CR6CT and CR6BX—all on phone. He thought conditions were grim and the skip a little too long for inter-G working. M. Dransfield, another SWL in Nottingham, logged thirteen G's and also heard DL, OK, SM, SP, I, F, EA, CN, OE and one DX station — VQ2DT.



G8VB, Greenford, Middlesex, the well-known 80-metre DX operator, with the transmitter which brought him the WAC Certificate (framed above) for the first phone-only 3.5 mc award for Europe.

It seems that conditions really *were* pretty bad, but even so a little activity made a whale of a difference to the normal "dead" feeling of the band during such spells.

Apart from this test, we have very few 10-metre reports. G3HCU found conditions well down, but there was usually something on the band, and he raised CR6BX, LU8BS and KT1BY, the latter being a new one on phone for him. Other countries worked were CT, DL, EA, F, HB, I, OE, OK and OZ.

G3CMH (Yeovil) notes the prevalence of short skip, but remarks that DX was coming in on June 28, in the shape of CN8MM, LU2DX, 3DBX and 5DZ, and VQ2DT. EI8J (Dublin)

worked OZ and DL with his 27 watts, and heard plenty of activity from I and SM.

The 21-mc Band

Even our newest band has been letting us down badly, with far fewer openings than ever before. It has, however, been interesting enough to keep the addicts busy, and perseverance has been rewarded. G6QX (Hornchurch) has found it open as late as 0100 BST, and round about midnight he worked such new ones as KZ5IL, PJ2AD and SU1GG.

G3CMH raised CE3CZ and ZB1AJ, both on phone, Gotaways being VQ3RJB, ZD1SW and ZD2S. Short skip brought in most of Europe. G2YS managed to collect SU1GG (1630). MP4BBD (1740) and ZS3K (1910), bringing his score up to 59.

G2CHL (Abbots Langley) puts in a good score for his 65/70 watts of phone, for which his 3-element beam must be partly responsible. He complains, though, about the excessive spread, even on this band, caused by stations obviously running super-QRO.

G2DPY (Shoreham) has put his score up to 32, not having used the band at all until quite recently. He feels that the band is going to "open up on us" one of these days and give us all a pleasant surprise. G3GUM (Formby) now heads the ladder, various new Europeans and a ZD1 having given him the necessary score.

G2BJY (West Bromwich) is not enthusiastic about things, and laments even last year's "good" conditions. During July 1-8 he found only YI, VQ4, ZE2 and 4X; during the same period last year he worked ZD9, OQ, KP4, JY, PY, ZC4—all with much better signal strengths. Other stuff raised during the month included ZP5DC (the only new one) and CE, VQ2, ZD2, OQ and VQ4, all on phone.

G3TR (Southampton) rolled in eight new ones on phone—ZD2, YV, CR6, ZE, SP, GI, HP and 9S. We have omttted to credit his score with the "Phone" label, and hasten to do so this month.

DX on Twenty

As usual, the 20-metre band has been wide awake at odd times, but mostly rather drowsy and full of short skippers. No really nice DX pieces have been obvious enough to attract a lot of attention, but individual reporters have one or two items of interesting news. G2DPY, for instance, worked ZK1AB four times, always between 0630 and 0830. W6 and 7 were also heard several mornings from 0430 onwards, being replaced as the morning wore on with KH6's. FO8AI was also worked one morning, and a good one heard in the early evenings was AC3IP.

G2HKU worked HZ1AB for his only effort on 20; G6VC heard ZC3AA one morning, and also found another G working FK8 late at night, which didn't sound quite right.

G3EHT (Wadebridge) stuck to phone and raised YV5AB, VU2FW, CE2CC, VS2DF, CP5EK, KP4IY and some LU's and PY's. G4QK, before embarking on his 3A2AY expedition with G6LX, worked VS9AR.

G8OJ (Manchester) kept plugging away on CW and managed to get TI2TG, MP4HBK, VP6PV, FF8, CO and ZD2. He also had a pleasant QSO with W9TYB/VO6, airborne over Newfoundland.

G3CMH worked FF8AG on CW and HZ1AB, OD5AJ and SU1MR on phone. Gotaways were M1B and 3A2AY (phone) and KG6ACY and JA1AC (CW). June 29 was quite a good evening, with HZ, OD, ZD2, KP4, CM, ZD4, YV, OQØ and VQ4 all coming in.

The Overseas Mail

ST2UU (Khartoum) writes to say that he will try to keep the Sudan on the map, and remarks that one has only to call "CQ G" from there and up pop G6ZO and G3ATU, whom he classes as a couple of "very astute operators."

VS1FR (Singapore) runs about 20 watts to a long wire, on Twenty CW only, and finds that G's seem to be out of reach, although the rest of Europe is not difficult. He is still trying, but now his note is T9 instead of the former T7 he doesn't seem to raise anyone! Look for him around 14050 to 14150 kc, using the lower frequency after 1700 GMT — but hurry up, because he will be a G by September.

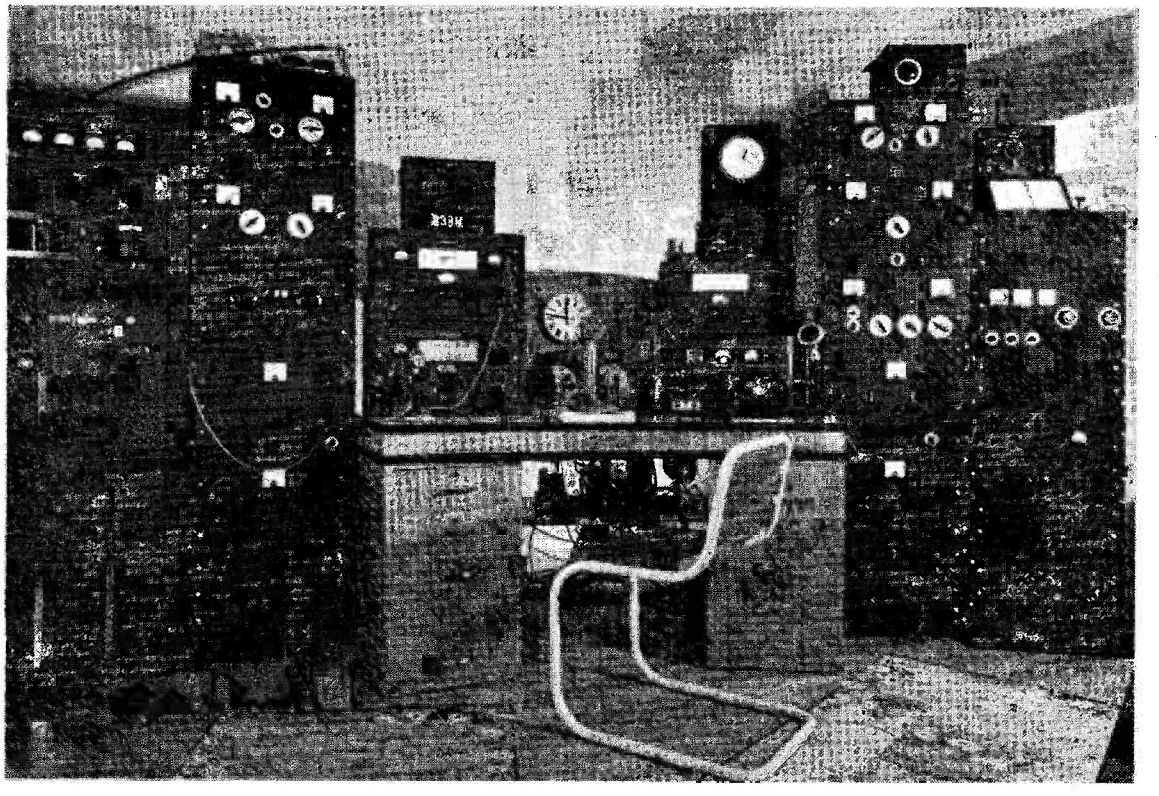
SU1FX tells us that since SU1AS and SU1MR were officially given the green light, a lot of the Canal Zone boys have adopted MD5 calls again, but there seems very little hope of official tickets with the political situation as it is. 'FX asks the chaps to bear with him, as his local QRM includes 10 kW, not many kilocycles out of the 14 mc band, as well as lots of high-powered FSK and SSB transmitters—all of them only a few hundred yards away. (At least he hasn't any TVI troubles!)

OH3NY (Lyly) is, of course, no longer on the Top Band, where he worked 75 British counties and 16 countries in three continents. In future his main band will be Two Metres, but his DXCC score is 133 worked and 119 confirmed.

21 MC MARATHON

(Starting July 1, 1952)

STATION	COUNTRIES
G3GUM	79
DL7AA	76
G5BZ	72
G6QB	68
G2BJY	65
G2WW	64
G2YS	59
G2BW	59
G3TR (Phone)	57
G3DO	56
G2CHL (Phone)	55
G4ZU (Phone)	55
G8KP	50
VK2AWU	47
G3CMH	44
G3FXB	40
G6QX	39
G8OJ	37
G2DPY	32
G3ABG	32
G5FA	26
G3WP	24
GW3CKB	19
G8VG	17
G2DHV	10



The magnificent layout at G3BM, Parkstone, Dorset. In spite of the commercial appearance, much of this station is home-built Aerials include a 3-element rotary beam for Twenty, mounted on a 55 ft. tower and remote controlled from the operating desk, and separate systems for the 3.5 and 7 mc. bands.

so he does know something about the DX bands! Matti enjoyed his Top-Band foray very much ; too bad that it had to be banned to the OH boys.

General News

Another buzz about that Easter Island Expedition: From CE3AG, *via* G3GQS, a message saying "CEØAA will be operating for certain from Easter Island for five days commencing August 3 or 4. Phone will be used on 14120 kc, and CW at the low edge." So by next dead-line we expect to have some reports on the working of CEØAA!

G3GUM hopes, during mid-August, to visit EA7CA and EA7CP, both 21-mc exponents, and thinks it should prove instructive. He had a recent visit from VP8AP, just about to start up as a GM, complete with 3-element rotary. Finally, 'GUM thinks there are at least three different stations signing ZC3AA, and doesn't believe that the genuine one has made himself heard yet.

G3ABG has been working some 20-metre phone, which makes a nice change. During one long contact with JA2EFA he discovered that the latter is coming to London soon, and will be looking up the boys. 'ABG also logs a contact with PI1MTD (Rotterdam Technical College) from his own school club station G3ABG/A. As a last item, he has received the VERON Code Proficiency Certificate, for 30 w.p.m.

G2BW suggests that we might run "ladders" for individual bands next year, for countries worked on each band during 1954. If this meets with general approval we are quite in favour—what do readers think of it? In any case, we should be dropping the Five-Band Table in favour of some sort of a 1954 Marathon—so which is it to be, one multi-band affair, or separate single-band do's?

Note, by the way, that we are not reproducing the Five-Band Table this month. This does not mean that it has been dropped—only that there have been so few changes that we thought you would prefer the extra space to be used for text.

The Rhodes Centenary Celebration station, VQ2RCC, at Kitwe, appears to have got out very well. G5VT and G6UT, both in Bishops Stortford, the birthplace of Cecil Rhodes, had contacts with him and passed the appropriate greetings. Both QSO's were on Twenty phone.

G5BZ (Croydon) exchanged greetings with 3A2AY (manned by Croydonians) on 3.5, 14 and 21 mc CW, and also on 21 mc phone. 'BZ tried to get some messages through for G4QK and G6LX, but his contact was broken up by sundry impatient G's. Other

QSO's were with EA9AP and ST2UU on 21 mc, the latter being ex-EQ3UU and YA3UU.

G8KP (Wakefield) raised HB1AG/HE for a new one on 3.5, and CE3AG, OY3IGO, PZ1WX and MI3KW on 7 mc. He has just received the "4X4" award. G3DO (Sutton Coldfield) has collected the A.A.A. Certificate for phone, and has increased his score on most of the bands.

G2HKU heard FP8AK on 3.5 mc and winkled out such DX as CM, TI, VE3, ZL, PY, LU and IT on 7 mc. On the latter band he also raised 3A2AY, and *heard* such nice stuff as ZK1AB, HR1AT, FM7WD and XE3K, all around 0500 GMT.

G3DXC (London, S.W.15), who was one of the ops. at YI2AM, is back home, and so, he tells us, is YI3FD, who has just acquired the call G3JDD.

G3FWU (Dartford), who has been busy getting married and moving around, remarks how difficult it is to find a house that the XYL likes, with a garden 132-ft. long which the OM likes! But they managed it, and with 28 ft. to spare. 'FWU has been licensed since 1949, but has spent most of the time in lodgings where radio was *out* . . . . so some frantic activity is forecast.

EI8J, on the subject of QSL's, says that he has QSL'd every first contact since he came on the air in 1936, but has only received 75 per cent. in return. So he has a long list of countries worked but not confirmed. As he says, there is much to be said for those who only QSL on receipt of cards—but if we *all* did that there wouldn't be any QSL's!

G6QX was pleased to get a card through from CR5AE, on a 7 mc contact.

AP2N, Karachi, has a neat layout and gets the DX.

Certificates and Awards

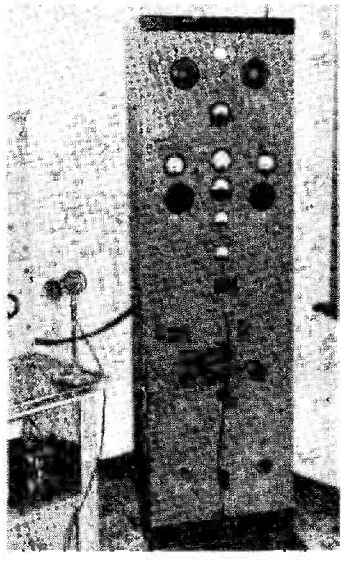
We are pleased to announce that the *Short Wave Magazine* Certificate of Merit has been awarded to G2PL (Wallington) and G8KP (Wakefield), in recognition of their being the only two stations in the world to qualify for the *Magazine DX Award*. This award, it will be remembered, is for work on five bands, *not* including 21 mc, and its tough spot is the working of 15 countries and three continents on Top Band.

Next month we propose to reprint the conditions concerning all the DX awards for which we are responsible, in answer to numerous requests from those who have "come in" since the details were last published. (General conditions for all *Magazine* DX Awards were given on p.673 of our issue for January 1953.)

One final note on the subject of awards is that GM3EST (Motherwell) has recently received his Certificate for being the highest-scoring GM in the CW section of the *CQ* Contest, 1951. GM3DHD received the phone award. What makes GM3EST's award interesting is that he was in the middle of a long illness at the time, and it was bedside operating that won the prize!

MDT No. 2

It was the unanimous wish of those who took part in the Top-Band Daylight Test that we should repeat the performance as soon as possible. So we announce Magazine Daylight Test No. 2, to be held on August 22 and 23, between the hours of 1500 and 1700 BST on each of the two days.



The transmitter at VK3XO, Fairfield, Melbourne; some details of this station were given on p.31 March.

Call "CQ MDT," announce your county with an easily recognisable abbreviation, and look for stations over 100 miles distant.

When sending in your results, as soon as possible after the test, please use a map of the British Isles and a ruler so that you can tabulate the distances within, say, ten miles.

Report your doings as early as you can after the event, and we will summarise and tabulate them in the October issue. Deadline for the September issue is **first post on August 12,** and the one after that will be first post on September 16. Address all your news, scores and everything else to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Until next time, then, 73 and BCNU.

DAYLIGHT TEST No. 2

MDT No. 2 on the Top Band, Saturday-Sunday, August 22/23, 1500-1700 BST only, each day. Call "CQ MDT" and look for stations over 100 miles distant —And Please Report Your Results.

Portable in Bute

EXPERIENCES AND RESULTS ON A /P HOLIDAY

C. P. CALLANAN (GM3HLQ)

MANY happy hours have been spent in the past by the writer, in company with GM2CAS, of Aberdeen, in working portable from the by-roads near his QTH. So much so that he became fired with enthusiasm for a portable licence of his own, and after much searching around, an Army 22 Set was found. At this stage a moment's silence can be observed whilst we recall experiences with aerials supported by the yellow box kites formerly used by the R.A.F. Memories of GM2CAS running across a field trying vainly to get "lift" for the kite from a wind which just wouldn't blow, memories of QSO's which faded because right in the middle of one, a look out of the car window revealed the kite lying in the grass, and one memorable occasion on which, with the car surrounded by inquisitive young bulls, the farmer arrived to say he could " hear us grand " on his telephone !

Early Experiences

The usual portable location is a patch of grass on the top of a very high hill to the south of Paisley, a site which enables the car to be driven straight to the spot, there being quite a good road all the way. Whilst the height above sea level is not accurately known, it would be fair to assume this at 800 feet, a fact which makes it a popular picnic spot. Many have been the amused and sometimes startled expressions which have been directed towards GM3HLQ/P. To see a car drive up and a fifteen-stoner get out and start to fly a kite, and with it safely aloft, to tie it to the front bumper and then climb back into the car is something which has inspired many ribald comments. On two occasions a police car has been observed, doing its usual 29.95, and suddenly the speed would drop to a crawl whilst one could almost feel the conjecture going on inside between the bluebottles whilst they surveyed the scene and wondered if they should investigate !

On one occasion recently, together with GM3HLK, an hour was spent trying to hoist a kite, but as the wind was somewhere in the region of forty knots at this fairly high location, it just couldn't be done.

Finally, in exasperation, the kite was packed away, one end of the wire attached to the post of a five-bar gate and the other to the front bumper of the car — result, a hundred and twenty foot aerial four feet off the grass. The pessimistic look on the face of GM3HLK, as attempts were made to tune the transmitter, suggested that it would be by far the better plan to go and play golf ! However, a very apologetic little CQ was put out and when GM3HXC in the Orkneys came back with a 5 and 8/9 report, " stroke P " working took on a distinctly different aspect. This was followed by GM3BEA calling us to say that he wondered why we bothered to fly kites at all when we could get out with such a haywire aerial.

/P in Bute

GM3HLQ is the fortunate possessor of a very tolerant XYL with a philosophic leaning towards Amateur Radio, and when a fortnight's holiday on the Island of Bute was mooted what more natural than that the OM should suggest that the " stroke P " go along too ? Particularly, as the day for arrival on the Island was the Saturday (June 13) of N.F.D. On arrival at the holiday QTH a hundred and twenty feet of 24g. cotton coveerd wire was run out, one end tied to the bedroom window with a piece of insulating tape and the other to a bush in the hedge at the side of the drive leading to the house. The first CQ raised GM4NK, who suggested that it was apparent we had come on the air before opening the suitcases—he wasn't far wrong !

Going QRT at midnight and coming on again at 07.00 on Sunday enabled quite a lot of stations to be worked, and for the remainder of the fortnight on the Island, one hundred and forty contacts were made, all on Eighty.

The whole of GM was covered, the northern half of G, several stations in GW, and GI and EI, all on phone. The Army 22 Set was used exclusively, mainly with the 120 ft. wire, but occasionally with kite-borne aerials, and quite consistent reports were received all the time. Two six-volt heavy duty accumulators were carried in the car boot and these were charged three times in the fortnight. It may be asked, why was not the car battery used ? The answer to that is very simple: GM3HLQ takes a poor view of swinging the car engine on a flat battery !

To the many stations worked he would say, as always, "here's to the next time," and before long GM3HLQ will come up again from a different location somewhere in Scotland and

if any future portable operations turn out as well as this, then it will indeed be very much enjoyed.

In conclusion, it can be said that there is only one cause for regret, that being that it was just not possible, by reason of receiver failure, to operate a Top Band rig and by so doing put Bute in the Counties Table. There has been no other amateur on the Island since the departure of GM3DOC two years ago.

18-Element Stack for Two Metres

DESIGN AND CONSTRUCTION

B. ARMSTRONG (G3EDD)

As the photographs show, this is a neat multi-element assembly which gives high gain and by its design is mechanically stable. There can be no question that "the more the elements, the better the results" — provided that the matching is accurate. Many multi-element VHF arrays are poor performers simply because the matching has not been properly done.—Editor.

THE array about to be described was developed from an idea of G4MW. The requirement was for a high gain beam of light weight and low windage, but with mechanical simplicity. For low weight duralumin and aluminium were used, for low windage $\frac{1}{4}$ in. diameter elements, and for mechanical simplicity the "plumber's delight" type of construction.

The basic unit of the array is a three-element Yagi with the spacing and element length chosen for a compromise between maximum back-to-front ratio and maximum gain in the forward direction.

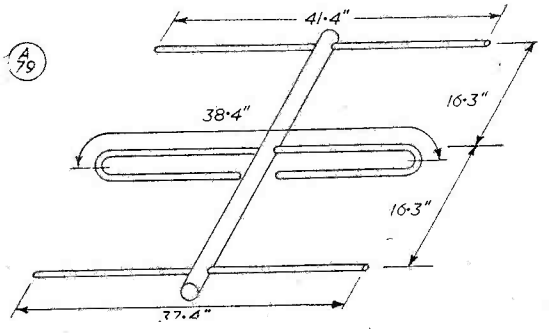


Fig. 1. Layout of one Yagi section for the 18-element beam.

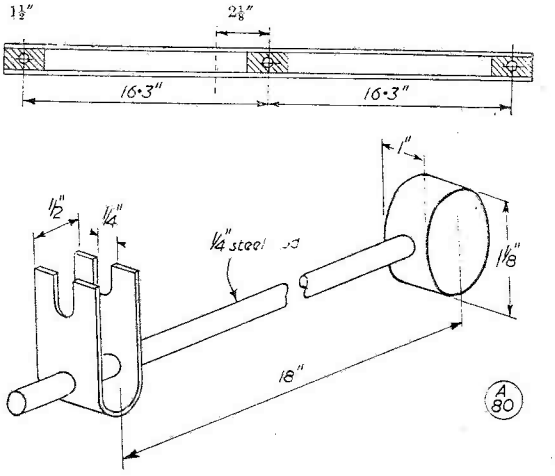


Fig. 2. Section of the boom. If the aluminium castings are available, the boom can be made in two separate lengths.

Fig. 1 shows the construction of each three-element Yagi section. The support boom is $\frac{1}{2}$ in. diameter dural tube with 20 SWG wall. At the points where it is drilled, an aluminium plug is placed for mechanical strength. In drilling, care must be taken to keep the holes dead parallel. Also the holes should be drilled slowly with a good sharp $\frac{1}{4}$ in. drill to avoid a hexagonal hole which is greater than $\frac{1}{4}$ in. diam. All the elements are hard dural rod $\frac{1}{4}$ in. diam. Although much harder to work, dural is preferable to aluminium. The reflectors and directors are cut to length and pushed through the appropriate hole in the boom. The centre of each parasitic element should be crimped in a vice or lightly hammered so that just as it comes central on the boom it becomes a force fit. This method of fixing, although crude, is extremely effective, and has passed the test of time in other arrays.

The driven element presents much more of a problem than the parasitic elements, since one fold must be made after the element is in place on the boom. If, however, a simple jig is

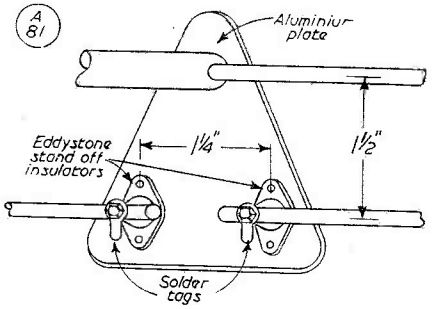


Fig. 3. Method of terminating the free ends of the driven element.

made, as in Fig. 2, it will make the bending much easier.

The bending of dural is a technique in itself, and rather depends on the grade. The method is to heat the rod in a flame until it has reached a temperature at which paper offered to it just chars. The rod can then be bent like aluminium, but hardens again after about 15 minutes. Another method is more or less the same, but bending pressure is applied during the heating process. This must be done gradually otherwise the bend will not be smooth.

The driven element is cut a couple of inches longer than required and one bend is made. The element is then passed through the boom and secured in the same manner as the parasitic elements. The second bend is then made and the extra length cut off. Holes for the Eddystone stand-off insulators are then drilled in the elements.

Fig. 3 shows the method of fixing the free ends of the folded dipole. The plate is made of 18 SWG aluminium.

The individual Yagis are fixed on to 1 in. dural tube with aluminium castings which were at one time available on the surplus market. If these castings are not to be had it is not difficult to devise an alternative method of fastening. Two U-bolts and a plate would work very well.

Fig. 4 shows the mechanical dimensions of the complete array. The main mast is a 22 ft. aluminium scaffold pole 2 ins. diam. with ¼ in. wall. A surplus casting was used at the top consisting of a sleeve which drops on to a 2 in. diam. pole and a casting which clamps on to 1 in. diam. tube or rod. Again, if this is not available, U-bolts will satisfy the requirement. Also, if U-bolts are used at the top it will not be necessary to make a special clamping arrangement for the lower support as this will have to be off-set to ¼ in. beyond the outside of the main mast with U-bolts and ¼ in. packing.

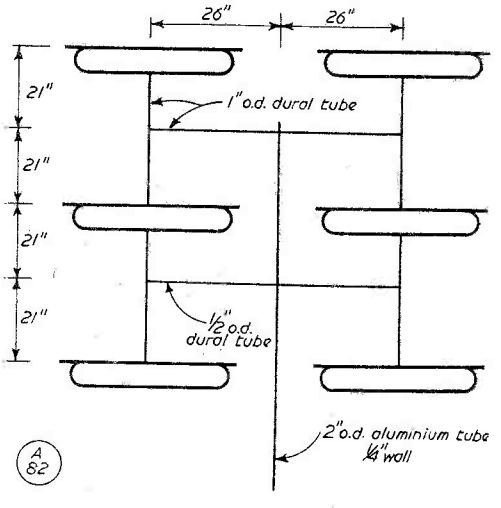
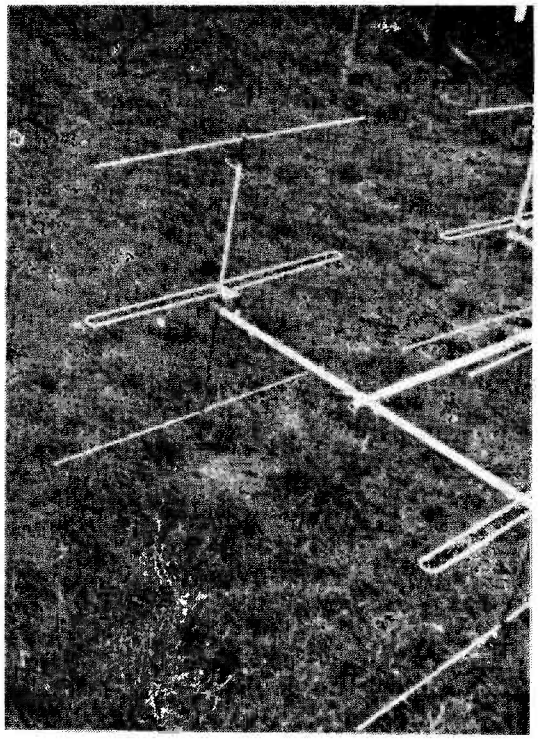


Fig. 4. Layout vertically of the 18-element array, showing the main dimensions.



Close-up of the element layout in the G3EDD two-metre beam design.

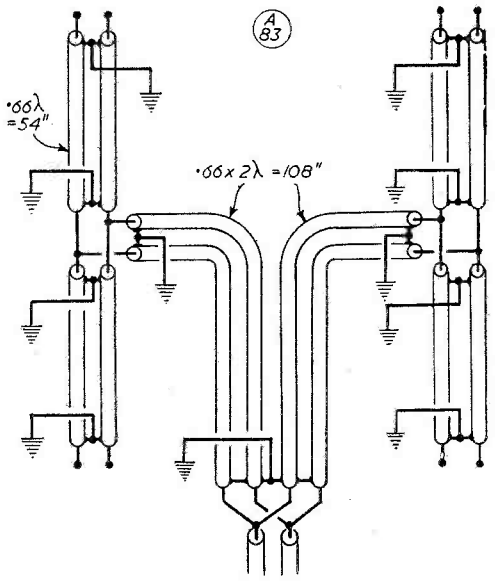


Fig. 5. Layout of the feed-line for the G3EDD beam.

Electrical Details

The basic 3-element Yagi has a feed impedance of 75 ohms and the six Yagis are fed in phase in parallel so that the actual feed impedance of the array is 12½ ohms. Consequently a matching section must be devised. 75-ohms coaxial cable is used to feed the array with a balance-to-unbalance transformer.

The feed to each Yagi consists of two 75-ohm coaxial cables, as shown in Fig. 5.

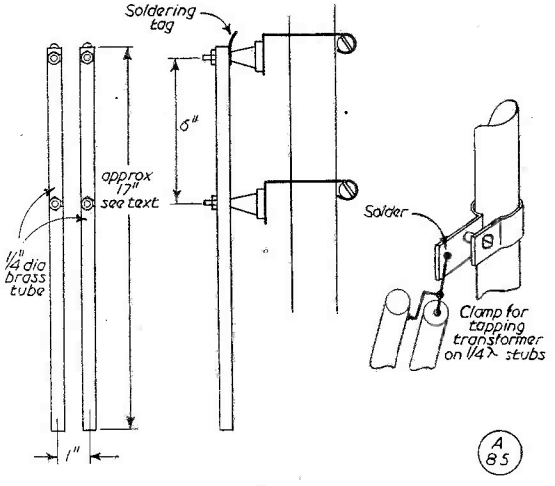


Fig. 6. Detail of the balance-to-unbalance transformer, discussed in the text.

Since these lengths are short, small diameter cable is used, such as Uniradio 32. The lengths of these phasing lines has been calculated, assuming a velocity factor of 0.66. They are in fact an electrical wave-length between each Yagi and two electrical wave-lengths between the centre of each stack and the top of the ¼-wave matching section. The advantage of using double coax feed is that the phasing section can be taped to the support tubes, or run anywhere, without unbalancing the system. In addition, the array is made more compact by virtue of the fact that the vertical spacing can be a convenient measurement, and any excess in the phasing section can be looped up. The braid of the coax at each end of the phasing sections must be securely soldered to the nearest convenient earth point.

The balance-to-unbalance transformer takes the form as shown in Fig. 6.

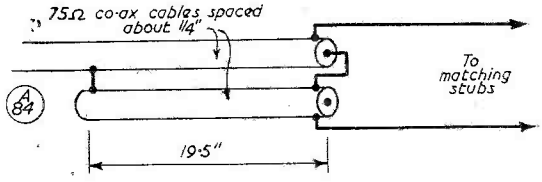


Fig. 7. Constructional details for the quarter-wave matching stub.

The ¼-wave matching section is shown in Fig. 7. No dimension is given for the length of the stub since it is affected by so many factors. (To give a definite length is akin to pre-setting a tuned circuit by guess and assuming it is on tune in practice.) The tapping point and length of the stub is derived by careful measurement of standing-wave ratio. No complex array can be said to be working properly unless a proper match to the feeder has been arrived it. Such anomalies as, for instance, a 4-element Yagi working better than a 4-over-4 can be attributed to the fact that the stack has not been properly matched. Yagi aerials are inherently more susceptible to violent mis-match than an array of full-wave dipoles.

The above array was matched with the aid of a "Micro-match" bridge type standing-wave indicator. The lengths of the stub can be adjusted by using very thin walled tube which slides over the actual stub. The tapping point and the stub length are adjusted alternately until the minimum standing wave ratio is obtained. This array was matched to better than 1.2:1.

When the optimum has been reached the tapping sleeve and stub tubes should be soldered in place or alternatively a new stub can be made up of correct length, and the adjustable stub discarded. If the SWR has altered after the soldering operation the spacing of the stubs can be adjusted very slightly to restore the matching.

Weather Protection

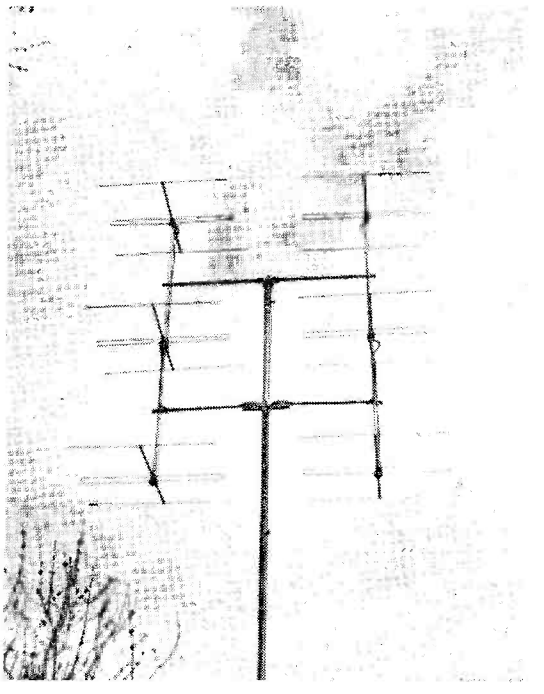
Waterproofing is of extreme importance; liberal use of good waterproofing compound is the only answer. "Aquatect" is an excellent preparation obtainable from most garages. Not only does it penetrate all cracks and crevices, but it never sets really solid and so wind flexing does not crack the seal. A small bottle is about 3s. 6d. and goes a long way.

The erection of the array presents a problem since it is somewhat unwieldy, although the complete array, without the main support, weighs less than 12 pounds.

The array was mounted on a 22 ft. x 2 in. diam. aluminium scaffold pole. This complete assembly had to be fixed on top of a tall tree. A jib was fixed up the tree so that the array could be hauled up clear of all obstacles, then the jib was removed and the array finally secured in position.

Results obtained have been as expected. The gain is of the order of 15 dB. An actual measurement was not taken for several reasons, but will be obtained as soon as the aerial is brought down.

In operation the array has shown a marked improvement over a well-matched six-element Yagi, at the same height, which was in use previously.



The 18-element two-metre beam assembly in its operating position. It consists of six sets of three-element Yagis, arranged as shown in the drawings accompanying this article.

CARDS IN THE BOX

We hold QSL cards for the operators listed below, for whom we have no forwarding address. They are asked to send a large s.a.e., with name and call-sign, to: BCM/QSL, London, W.C.1, which is the only address for our QSL Bureau. Cards will be forwarded on the next (fortnightly) G clearance. If publication of the call-sign/address in our "New QTH" feature and in the *Radio Amateur Call Book* is required, that should be mentioned at the same time. All new QTH's are automatically sent on to the *Call Book*, for which publication we are sole agents for Europe and the U.K. The *Radio Amateur Call Book* is the directory for the amateur stations of the whole world, and is now in its 31st year of publication.

G2CK, 2DHN, 2DMZ, 2DYF, 2HRY, 3BGV, 3DBM, 3DSP, 3FQM, 3FVB, 3GMS, 3GPG, 3HOY, 3HPE, 3HYH, 3HZK, 3IBB, 3IDZ, 3IIS, 3ILY, 3INA, 3INZ, 3IPQ, 3ISI, 3JUN, 3IUZ, 3IVF, 3IVR, 3IYH, 3JAN, 3JAY, 3JBS, 3JEA, 3JHN, 3JRB, 3JV, 3MTX, 4JY, 4PV, 5AA, 5XX, 6ZX, 8MW, 8PT, 8RW, GI3IWK, GM2BBW, 3FAH, 3IKD, GW2QZ, 3IMG, 5RH.

SHIELDING BOXES

It is again possible to buy, over the counter at the grocer's, biscuits in neat boxes with close-fitting lids, in the full- and half-tin sizes. In the well-known names, the cost is a few shillings for the biscuits, with "1s. 6d. back on the tin." Having disposed of the contents in the usual way, think twice before returning the tin, because for 1s. 6d. you have a useful box into which all manner of items of equipment can be built. By soaking off the paper labelling and giving the box (which is made of light gauge steel, tinplated) a coat of grey enamel, you can finish off a nice job. It is as well to tighten in the flanges of the lid, which serves as an inspection cover, before painting, and to provide a few ventilation holes if anything inside is going to run warm.

NAME AND ADDRESS

We are asked to state that Southern Radio Supply, Ltd., of 11 Little Newport Street, London, W.C.2, trade only at this address and have no connection with Southern Radio & Electrical Supplies of Sorad Works, Salisbury, Wilts.

VHF BANDS

A. J. DEVON

Another EDX Break, June 28-July 2—

LA Worked on Two Metres—

New Contacts on Seventycems—

EI2W Expedition Report—

VHF Band Plan Agreed—

Station News and The Tables—

THE great news this month is the spell of good EDX conditions from about June 24 to July 5, though they were by no means consistent nor did they obtain over the whole of the U.K. On the evening of June 29 the two-metre band was thrown into a ferment by the appearance of LA8RB (Sandfjord) for a new signal *and* a new country. Heard first by G6LI (Ludborough, Grimsby) at 2337 GMT, he was evidently receiving G6LI, who logged "CQ G6LI de LA8RB"—an exciting a call as anyone could wish for on VHF. G6LI answered—but no QSO ensued. Shortly afterwards, G6NB (Brill, Bucks.) succeeded in making the contact, which is also the G/LA "First" on the two-metre band. LA8RB went on to work several other G's, including G6LI, for the second G/LA QSO. (As an aside, it might be mentioned that this is the third time G6LI has been unfortunate enough to miss an EDX "First." In 1951, OZ2FR called G6LI but worked G3WW; then SM7BE went back to G5YV, having first called G6LI; and this time the same sort of thing happened with LA8RB. In each case, G6LI has made the *second* G QSO!).

For those many correspondents who have asked, the LA8RB QTH at Sandfjord is 59° 06′ N, 10° 13′ E, and the nearest pinpoint which would be marked on most maps is Larvik at 59° 05′ N, 10° 05′ E. Taking a convenient reference point in the Midlands, the distance Birmingham - Sandfjord is 640 miles. The path from Sandfjord to Grimsby is almost entirely over water, though some local high ground at the LA end looks as if it would screen off the GM's. On the other hand, the path to SM6QP of Gothenburg (worked by G6LI at 2315 on June 29, just before he heard LA8RB), though a little longer, seems to be clear of local screening.

Another interesting contact made by G6NB was LB9T, the prefix indicating an LA/P station, but we have no location for him. G6NB did extremely well during these openings, and a glance through Bill's calls-worked list—*see* "Activity Report"—discloses a total of 46 EDX and GDX stations in *twelve* countries; exceptionally good going by any standard.

LA8RB was still there on July 2, when he was worked by G4RO (St. Albans) at 0120 GMT. Others to raise him for a two-way contact were G2HDZ (Pinner, Middlesex), G3GHO (Roade, Northants.), G3GSE (Kingsbury, Middx.), G5BD (Mablethorpe, Lincs.) and G5UD (Kings Lynn, Norfolk), all on July 1/2.

A significant feature of the appearance of the Norwegian signals was that LA8RB and LA8RM were both "miserably weak" and unworkable at G5YV (Leeds), who could hear G's to the South and East of him giving S9 reports—this while the DL's, ON's, OZ's, PA's and SM's were pouring in at Leeds with high signal strengths (*see* the G5YV "Activity Report"). Local screening at the LA end might be the factor here. It will also be noted that G5YV reports reception of OE5EB, the first time an Austrian station has been heard on Two in this country.

From down in Gloucester, G8DA records DL1LB heard at 589 on July 1st, calling "CQ West G, GW, EI, GI," and apparently getting not much response—possibly because he was not tuning above 145 mc. During that same evening, PAØHAK was also coming over the 1000 ft. wall of the Cotswolds; it is most unusual for Continentals to be heard so strongly as far to the West. Unfortunately, we have no GW reports on the opening, so it is not known whether any of the EDX was getting into South Wales.

After about July 5, the band went quiet again, and it was not until July 16 that the EDX showed signs of reappearing—but that was right on the deadline, and we have no detailed reports.

During the EDX openings, and indeed for most of the period from June 24, conditions were good for GDX, with GI the only direction from which no signals are reported heard or worked. One can only assume inactivity, as the GI/GM path was certainly well open on occasions. And if Bill of G6NB could raise a GI, he would be out in front with 14 in the Countries Worked table.

EDX on 430 mc

Of course, when Two Metres is yielding EDX, we also expect things to be happening on 70 cm. The best seventy-centimetre contact reported during the period is that by G3IOO-PAØNL on July 2, which followed a GW2ADZ-PAØNL QSO on the same band. The distance G3IOO (Oswestry) to PAØNL (Amsterdam) is 335 miles, slightly more than GW2ADZ-PAØNL, but rather less than the GW2ADZ-ON4UV contact last March, which still stands as the world record for 430 mc. Reports on the G3IOO-PAØNL QSO were 579/549, and PAØNL also worked several other nearer G's during the same period.

These results tied up with some good inter-G contacts on 430 mc. G3IOO has now worked 6 counties and three countries, and

G4RO (St. Albans) 8 counties, with G3IOO as best DX.

But it is fair to say that the level of 70 cm activity appears to have been low when the band was open, and unless far more EDX and GDX QSO's were made on 430 mc than have been reported (and the volume of mail was heavy again this month) it seems that some good opportunities were missed. This may be because of the prevalent habit of 144/430 mc cross-banding and the current procedure of first making contact on Two before diving down to Seventycems—together with the fact that most 430 mc operators are keenly operational on Two Metres and could not chase DX on both bands at once. There are still but few G's (and even fewer Continentals) who are specialising on 70 cm; until we get a good many more who are prepared to forego the sweets of EDX on Two, the chances for breaking new ground on 430 mc when both bands are open will continue to be. well, missed! It is, in fact, very difficult to manage both bands when the going is lively, and we know of several good two-metre stations, also well equipped for 70 cm, which were not heard at all on 430 mc during the recent openings.

EI2W Trans-Atlantic Tests

In a modest, detailed and carefully restrained report, EI2W sets out the results of this important and interesting experiment. The results are the main thing, and at the moment of writing all that can be said is that "weak but unidentifiable" CW signals were heard at 0014 GMT on July 7 and at 1433 GMT on July 8. On July 11. the group "de W4" was heard at 0118 GMT, on 145.3 mc, and beam adjustment suggested that the source could have been W4; the only cross-check is that the timing coincided with the arranged schedule. An investigation is in hand with the ARRL, and it will be a milestone in VHF history (as well as a great triumph for EI2W and his band of helpers) if a W4 station can be positively identified.

Elsewhere in this issue appears our survey of the route, and it will be seen that July 7 did indeed give EI2W his best chance. On the face of it, an opening to W4 on July 11 does not seem very likely, as the anticyclone lying along the path died out on July 9. A further weather check and a more detailed survey in the W4 direction (which lies wholly across water) is being made to see what chances there were at that particular time on July 11.

An interesting sidelight on all this is that though the survey, discussed last month, for the EI/W2 path over the years 1951-'52 was so discouraging, in fact very much better conditions developed this year during the actual period of the EI2W Test than at any time during 1951-'52. If this proves anything at all, it is that weather is still the imponderable factor!

For the record, it should be stated that EI2W was in position at Kilkee, Co. Clare, from July 4-12 inclusive with two transmitters, on 144.18 mc and 144.19 mc, two receivers (Cascode and G2IQ), and that at no time did the input exceed 100 watts. The team of operators included: EI2G, EI2W, EI3B, EI3W, EI4R, EI5C, EI5J, EI6G, EI6X, EI8U and GI5HV as official log-keeper. A 24-hour schedule was maintained throughout the period, and it was found that even with 10 operators it was a very exhausting business to keep the routine going.

Our congratulations to them all on a gallant effort—particularly as they were nearer to success than they could have known at the time.

VHF Band Planning

After a meeting between the interested parties, and with no very great difficulty, it has been possible to obtain general agreement on a VHF Band Plan for the British Isles.

This amounts to accepting the *Short Wave Magazine* Two-Metre Zone Plan as it stands, and using it as the basis for settling the communication frequency area on the 70-centimetre band, simply by tripling the appropriate Zone frequencies.

What has been since October 1949 the *Magazine* Plan is now to be known as the "British Isles Two-Metre Zone Plan." It is hoped that *all* VHF operators will

TWO METRES

ALL-TIME COUNTIES WORKED LIST

Starting Figure, 14

From Fixed QTH Only

Worked	Station
61	G3BW
60	G3BLP (629), G5YV, G6NB
58	G3EHY
57	G2OI (349)
56	G8SB
55	GW5MQ
54	G2HIF (200)
53	G2AJ (519) G4CI
52	G2HDZ (398), G2NH, G3WW
51	G4SA
50	G3ABA, G5BM, G5DS (467)
49	EI2W (151), G3GHO
48	G5BD, G5MA
47	G3FAN, G5WP
46	G4HT (476), G5BY, G6YU (205)
45	G2XC, G6XM (356)
44	G3BK, G5ML (250), G3HAZ (194)
43	G3COJ, G5DF
41	G2FQP, G3BA, G3DMU, G4RO, G6CI (167)
40	G3CGQ, G5JU, G8KL, G8OU
39	G2FJR, G2IQ, G3GSE (405), G3VM, G8DA, G8IL (325)
38	G2AHP (375), G3APY, G3HBW
37	G2FNW, G2FZU (180), G3HBW
36	G3CXD, G6CB (312), G6TA (259), G8IP
35	G3FZL, G3HCU (224), G3HWJ
34	G2FCL (182), G3BKQ
33	G3BNC
32	G2FVD, G8IC, G8VR, G8QY
31	G3GBO (364), G3HXO, G5RP
30	G2HOP, G5NF
29	G3AGS, G3AKU, G3BJQ, G5MR (158)
28	G3FIJ (163), GM3BDA
27	G3DAH, G3FIH, G3WS (108), G6GR, GW8UH
26	G3AEP, G3CFR (125), G3DO, G4MR (189)
25	G5SK
24	G3FD, G3FXG, GM3EGW
23	G3CWW (260), G4LX, G5PY, G6PJ
22	G3ASG (150), G3BPM, G3FRY, G3GOP (122), G3HII, G3ISA
21	G3SM (180), G6XY
20	G3EYV
19	G2AOL, G3DLU, G3FEX (118), G3GCX, G3YH, G5LQ (176)
18	G2CZS, GM3DIQ
16	G3FRE, G3HSD, GC2CNC
15	G2DVD, G3IWA
14	G2DHV, G3GYY

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

conform and that in future we shall, each one of us, be strictly within our Zone frequency area, straying not to the LF end in order to be first in line for the EDX. (There is, of course, no objection to small "local" frequency changes *within the Zone*, and in fact it is probably just as well to have one or two other crystals available to avoid severe mutual QRM).

So as to give everyone a fair chance with the EDX, it was also agreed at the meeting to circularise all European societies and periodicals, asking them to give full and proper publicity to the British Isles Two-Metre Zone Plan, so that all Continental VHF operators will know that they should search over the whole band and not just poke about in the first few kc at the LF end. Readers affected may be assured that the importance of the DX being persuaded to tune above 145 mc is fully understood and appreciated; in this connection, every EDX-working VHF operator can help by asking the Continentals, in the course of their QSO's, to search the whole band, particularly above 145.2 mc.

If we all agree that this planning is a Good Thing and should be adhered to in the general interest, then it is the duty of every operator to do all he can to make it a success.

As regards the 420-460 mc band, a Table appears herewith which shows the frequency allocations finally agreed upon. It represents a fair division of the band and, while making proper use of the whole band, caters for all immediate requirements. It will be seen that automatic zoning in the 432-438 mc communication band is secured by tripling from the two-metre Zone frequencies.

In the working out of this VHF Band Plan as a whole, the emphasis was on co-operation. The conclusions arrived at, after the fullest discussion, were unanimous. It is hoped that all VHF operators will help to make the Plan work by giving it their full support.

Station Reports—North & East

Nice to hear again, after some long time, from G5BD (Mable-

TWO-METRE ACTIVITY REPORT

(Lists of stations heard and worked are particularly requested for this section, set out in the form shown below.)

GW4CG/P, Tondu, Glam.

WORKED: G2BAT/P, 2BMZ, 3DLU, 3FIH, 3FKO/P, 3HSD/P, 3MA/P, GW3BNQ, 5MA/P, 8UH.

HEARD: G2AHP, 2NH, 3CQC, 3HWF, 3ION/P, 4AP, 4CI, 4SA, 5BM. (*All on 21 June, 1145-2000 BST*).

G6RH, Bexley, Kent.

WORKED: G2ALN/A, 2ANT/A, 2BMZ, 2DCI, 2DSP, 2FCL, 2FJR, 2FQP, 2HCJ/P, 2HOP, 2UQ, 2XV, 3ABA/P, 3APY/P, 3BEX/P, 3BKQ, 3CCH, 3CFB/P, 3CNY, 3DVK, 3EHY, 3EPW, 3FMI, 3FRG/P, 3FUP, 3FYY, 3GAV, 3GBO, 3GOP/P, 3GWB/P, 3HAZ, 3HWF, 3MY/P, 3WW, 3XC/P, 4JJ/P, 5BD, 5MP/P, 5RP, 5TZ/A, 5YV, 6AG, 6NB, 6XM/P, 8MW, 8VN, 8VR, GM3IBV, GW2ADZ, 5MA/P, 8UH.

HEARD: EI2W, F8GH, G2PU, 3DLU, 3FD/P, 3GCX/A, 3GOP, 3HSD, 3NL/P, 4SA, 5MA/P, 5MR, 6LI, 8QY/P, ON4BZ, PE1PL. (*All June 6 to July 1 only*).

G3JMA, Nr. Harlow, Essex.

WORKED: G2AHP, 2DTO, 2FJR, 2FQP, 2MV, 2YB, 3AAN, 3ANB, 3DJX, 3FYY, 3HWF, 3SM, 3WS, 5MR, 5UM, 5YV, 6NB.

HEARD: G2FKZ, 2HG/P, 2PU, 3FUH, 3GDR, 4AC, 5MA, 5TZ/A, 6AG, 6LL, 6PG, 6TA, 8OU. (*June 11 to July 5*).

G6NB, Brill, Bucks.

WORKED: DJ1DC, DL3VJ/P, 6SV, EI2W, G2ALN/A, 2BAT, 2FO, 2HCJ/P, 2HQ/P, 3AOO, 3BJD, 3IOE. 4BP/P, 4JJ, 5UF, 6LC, 6QT, 6WF, 6XM/P, 8AO/MM, 8KL, 8SB, GC3EBK, GD3DA/P, GM3EGW/P, 3FGJ, GW2ACW, 3ENY, 5MA/P, 5MQ, 8UH, LA8RB, LB9T, ON4HN, OZ2FR, 2IZ, 2LX, PAØFB, ØFC, ØNL, ØPAX, ØRK, ØWI, PE1PL, SM6QP, 7BE. (*All June 11 to July 10*).

G3WS, Chelmsford, Essex.

WORKED: DL1LB, F8GH, G2BTY, 2CNT, 3BKQ, 3BRW, 3DLU, 3FUL, 3GHO, 3HXO, 3WP, 4HQ, 4OT, 5JO, 5UD, 5YK, 6LI, 6TA, 8AO/MM, 8SC, GW2ADZ, 8SU, PAØWI.

HEARD: G2BMZ, 2FJR, 2FKZ, 3CKX, 3FIJ, 3GHI, 3HAZ, 3HBW, 5BD, 5DH, 5HB, 5YV, GW8UH, LA8RB. (*All June 12 to July 9*).

G3GSE, Kingsbury, Middx.

WORKED: G2ANT/A, 2CZS, 2FTS, 2HDZ, 2UN, 2WA, 2XV, 2YC, 3BPM, 3DBM, 3DIV, 3FD, 3FIJ, 3FYY, 3GBO, 3GHO, 3HCU, 3HVO, 3IWA, 3MI, 5JO, 5MA/P, 5TP, 5TZ/A, 5UM, 5YH, 6PG, 8AO/MM, LA8RB, ON4BZ.

HEARD: G5ML, 5UF, 5YK, OZ2FR, 4LX.

G6LI, Ludborough, Lincs.

HEARD: DL1FF, 1LB, EI2W, G2BIY, 2BVW, 2HOP, 2YB, 3CXP, 3GHO, 3HBW, 3HWF, 3KS, 4AU, 5JU, 6AG, 6PG, 8AO/MM, 8OU, GM6WL, GW3ENY, 5MQ, OZ2FR, 2IZ, 3WK, PAØHAL, SM6BSW. (*All heard June 21 to July 2*).

G5YV, Leeds, Yorks.

WORKED: DJ1DC, DL1FF, 1LB, 3QA, 3TD, 3VJ/P, 6SV, 9LT, G2AHP, 2AOK/A, 2BMZ, 2DDD, 2DSP/P, 2FJR, 2NM, 2WJ, 2YB, 3ABH, 3BVU, 3CFB/P, 3CZY/A, 3FAN, 3FD, 3FUM, 3FZL, 3GVC, 3GYQ/P, 3GZM, 3HAN, 3HBW, 3HCU, 3HRW, 3HWF, 3IER, 3IOE, 3IRA, 3JMA, 3NL, 3XC, 4AU, 4OT, 4PV, 4SA, 5DS, 5HB, 5MA/P, 5MR, 5UD, 5YK, 6AG, 6RH, 6WU, 6XH, 8DA, 8DL, 8OU, ON4BZ, 4HC, 4HN, 4YB, OZ2FR, 2IZ, 2LX, PAØFB, ØOD, ØRK, ØWI, SM6ANR, 6QP.

HEARD: G2MV, 2FKZ, 3DLU, 3FIJ, 3HAZ, 3MA, 3WW, 4MW, 5BM, 6NF, 6PG, 8AO/MM, LA8RB, 8RM, OE5EB, OZ3WK, 5AA, PAØBAL, ØFC, ØHAK, ØNL, PE1PL. (*All over 100 miles, June 25 to July 7*).

G6MN/P, Nr. Leek, Staffs.

HEARD: G2ACV, 2ADZ/P, 2ANC, 2ASC, 2ATK, 2BVW, 2CYN, 2HCJ/P, 2HGR, 2JT, 2OI/P, 3ABA/P, 3AGS, 3BEX/P, 3BKQ, 3BW, 3DA, 3ENS, 3EPW, 3GCX, 3GMV, 3GWB/P, 3HID, 3IOO, 3IUK, 3IWJ, 3MY/P, 3NL, 4JJ, 5BM, 5JU, 5ML/P, 5YV, 6AS, 6NB, 6SN, 6LC, 6WF, 6WS, 6XM/P, 6XX/P, 8KL, 8MW, 8QF, 8QY. (*All heard-only on June 21*).

G3WP, Brightlingsea, Essex. NGR 62/086169.

WORKED: G2YB, 2WJ, 3ANB, 3BRW, 3FIJ, 4OT.

HEARD: G2BCB, 2CZS, 2HCG, 3VI, 3WS, 4AC, 4AU, 4RO, 4SA, 6NB, ON4BZ. (*June 13 to June 26*).

G3DLU, Weston-Super-Mare, Somerset.

WORKED: G2DTO, 2UJ, 3AGA, 3DJX, 3FKO, 3FKO/P, 3GBO, 3HBW, 3HSD/P, 3HVO, 3HWF, 3ION, 3IRA, 3MA, 3MA/P, 3WS, 4SA, 5BM, 5DS, 5MA, 5MA/P, 6AG, 8DA, 8DL, 8DV/A, GW3BNQ, 4CG/P, 8SU.

HEARD: G2BAT, 2BMZ, 2DO, 3ABH, 3AUS, 3FIH, 3FWW, 3YH, 4GR, 4RO, 5BD, 5HB, 5JU, 5LK, 5TZ, 5YV, 6NB, 6RH, 8DM, 8MW, 8OU, GW5MA/P, 8UH. (*June 17 to July 6*).

GW5MA/P, Near Blaenavon, Monmouthshire.

WORKED: G2AOK/A, 2BAT/P, 2BMZ, 2DDD, 2IT, 2NH, 2UJ, 2YB, 3ABA/P, 3ABH, 3APY/P, 3BEX/P, 3CFB/P, 3CVK, 3DKZ, 3FD/P, 3FIH, 3FKO/P, 3FSL, 3FUM, 3FZL, 3GVF, 3GWB/P, 3HSD/P, 3HWF, 3IER, 3ION/P, 3MA/P, 3NL/P, 3WW/P, 3XC/P, 4AP, 4CI, 4SA, 5BM, 5HB, 5JU, 5ML/P, 5NF, 5RP, 6AG, 6CI, 6NB, 6RH, 6SN, 6TA, 6YU, 8DM, 8ML, 8OU, 8QY/P, GW3BNQ, 4CG/P, 8UH. (*All June 21 only*).

G2HDZ, Pinner, Middlesex.

WORKED: EI2W, G2ANT/A, 2BAT, 2BMZ, 2BTY, 2DDD, 2DUV, 2DVD, 3CFB/P, 3CFK, 3DJX, 3FD, 3FYY, 3GBO, 3GJZ, 3GNJ, 3GWB/P, 3MI, 4OT, 5BC, 5DS, 5MA/P, 5TP, 5TZ/A, 8KZ, 8OU, LA8RB.

HEARD: F3JN, 8GH, G2FO, 3FMI, 3GEN, 5UD, 6XX, 8IC, GC3EBK, GW5MQ, 8SU, PAØWI. (*May 3 to July 11*).

G3IOE, Newcastle-on-Tyne, 3, Northumberland.

WORKED: G2FCL, 2FO, 3CCH, 3CYY, 3DIJ, 3GCX/P, 5UD, 5YV, 6LI, 6NB, 6XX, 8AO/MM, GM3EGW/P.

HEARD: G2FJR, 2HCG, 3BKQ, 3GHO, 3WW, 4LX, 5BD, 5ML, GM3FGJ, 5VG, OZ2IZ. (*June 18 to July 13*).

G5MA/P, Walbury Hill, Berkshire.

WORKED: F3JN, G2ATK, 2BMZ, 2BTY, 2DDD, 2WA, 2YB, 3AGR, 3BKQ, 3BVU, 3CGQ, 3DLU, 3FAN, 3GHO, 3GOP, 3HAZ, 3HWF, 3IER, 3IOO, 3ISA, 3ITF, 3WW, 4RO, 4SA, 5HB, 5MR, 5NF, 5SZ, 5YK, 5YV, 6JK, 6OU, 6WF, 8DA, 8DL, 8OU, GW2ADZ. (*June 27 and 28*).

G2CZS, Chelmsford, Essex.

WORKED: G2AVR, 2FQP, 2HCG, 2UQ, 2XV, 3BKQ, 3BRW, 3CFK, 3CGQ, 3FUW, 3GHO, 3GJZ, 3GSE, 4PV, 5BD, 5TZ/A, 5UM, 6AG, 6NB, 6RH, 8AO/MM, 8VR.

HEARD: DL1LB, G2BMZ, 3GDR, 8OU, 8WV, OZ2FR. (*May 13 to July 9*).

70-Centimetre Band Only

G2HDZ, Pinner, Middlesex.

WORKED: G2DD, 2MV, 2RD, 3FP, 3GDR, 5DT, 6NF, 8KZ.

HEARD: G2FKZ, 3HAZ, 3MI. (*May 25 to July 11*).

thorpe, Lincs.), one of the OT's of the VHF bands. With a new 16-ele stack at 45 ft., he was in amongst the EDX and makes good progress in the Tables. This beam, fed with 75-ohm coax through a simple half-wave phase inverter of the type described by GM3DIQ in the February 1952 issue of *Short Wave Magazine*, is giving what G5BD calls "spectacular results." GM3EGW (Dunfermline. 241 miles) has become almost a local, with 26 contacts between them in 33 days over the month to June 30. When the EDX opening came, the LA, OZ and SM stations were all big signals.

G6LI (Ludborough, Grimsby), a consistent VHF operator who watches the weather and interprets the signs, sends a detailed report on his results and experiences over the period June 22 to July 3. He shows how conditions built up to produce steady EDX for the four days June 29-July 2, during which LA, OZ and SM were consistently workable. On June 29, EI2W was heard, as a good phone signal, for the very first time, but could not be raised on CW. By 2230 that evening the Danes were beginning to come through, working phone amongst themselves; then followed SM and LA. On the following day, June 30, the band was again wide open but activity was low; at 2210 that evening OZ2FR was calling GW5MQ, and some DL's in the Hamburg area were also coming across. On July 2, with the barometer at 30.15, humidity at ground level 80% and a cold, thick fog at Grimsby, OZ2IZ was a splendid S8 as early as 1900, with SM6ANR worked from G6LI at 1915, followed by GM3IBV (Larkhall, Lanarks.) for a new contact. And G6LI also puts in an interesting calls heard-only report covering stations which do not normally penetrate to his QTH.

From further North, G3IOE (Newcastle) says that with him the best dates were June 26 to July 2, with eight new stations worked and five heard yet to be worked, including GM's and OZ2IZ. And as usual G3WW was getting up there but could not be raised by either G3IOE or G4LX. Another puzzling phenomenon is that though G3IOE gets out well when the band is open, he does not receive the many GDX stations calling him with anything like the same ease or certainty. This is not at all a matter of "converter trouble" (as we know, G3IOE had long experience as an SWL on VHF before he came on the air) and the proof of his reception efficiency lies in what he can hear and work. Rather, it seems to be a matter of location, as the G3IOE QTH is at the bottom of a narrow valley, screened in all directions; his own theory is that when the reflecting layers are suitably placed, enough of his signal gets out to find DX, but he misses much of what is coming the other way, due simply to what might be called "vertical screening." We have had it from those who have seen G3IOE's location that it is astonishing he is able to do anything at all on VHF. So it seems to be a matter of perseverance by all hands—and G3IOE tells us nobody could be trying harder than he is to hear the stations the locals say are calling him. To this end, yet another converter—the 12AT7 job described in our last—is in hand.

East Anglia has produced a nice batch of reports this month. G3WW (Wimblington, Cambs.) goes up another one in Annual Counties. G5UD (Kings Lynn) is now at 11C in the Countries table, and remarks that though he receives the GW's well when conditions are reasonable, he seldom hears Midland stations — is it because they aim mainly NE/SE? G5UD is there most evenings, 1900-1930 and 2230-2300 BST, beaming from West round to South-West.

Both G2CZS and G3WS report from Chelmsford, Essex, with calls heard-worked lists—*see* "Activity Report." G2CZS would like an activity list by counties; we agree that this would certainly be useful to the newcomers and perhaps interesting to all VHF operators, but the truth is we have never had time to get round to it. Since this piece is written right against the dead-line (because we want everything in) time is a serious factor—and, as it is, it takes many hours to prepare all the tabular matter we try and present (without errors) each month. An Activity-by-Counties list involves tracing the QTH of every single station mentioned, and then getting them all into the right order—and then being asked the next month why so-and-so and somebody - else have been "omitted." However, come the winter, we will try and do this. In the meantime, the monthly "Activity Report" gives a very fair picture of what is about; it is also one of the reasons why we print calls-worked lists.

G3WS lays claims for both Counties tables, and has now achieved 108 stations worked. G3JMA (Harlow, Essex) reports himself in "as a newcomer to the two-metre air"; his gear consists of a modified S.440B driving an 832 coiled-line PA to 25 watts, a 12AT7-6J6 converter, and a 3-element Yagi. On the band since January last, G3JMA has achieved 16C worked.

G3WP, of Brightlingsea, Essex, is an even newer hand as far as VHF is concerned—he only came on the band for the first time on

LATE FLASH

THE G3BNC/II XV QSO

Contact reported July 22, 2330-2340 BST, RS-57, 145.1 mc. Subject to confirmation.

BRITISH ISLES

TWO-METRE ZONE PLAN

(This is reproduced here for the benefit of newcomers to the band).

***Zone A & B:* 144.0 to 144.2 mc.**	All Scotland.
***Zone C:* 144.2 to 144.4 mc.**	All England from Lancs. Yorks. northward.
***Zone D:* 145.8 to 146 mc.**	All Ireland.
***Zone E:* 144.4 to 144.65 mc.**	Cheshire, Derby, Notts., Lincs., Rutland, Leics., Warwick and Staffs.
***Zone F:* 145.65 to 145.8 mc.**	Flint, Denbigh, Shrops., Worcs., Hereford, Monmouth and West.
***Zone G:* 144.65 to 144.85 mc.**	Northants, Bucks., Herts., Beds., Hunts., Cambs., Norfolk, Suffolk.
***Zone H:* 145.25 to 145.5 mc.**	Dorset, Wilts., Glos., Oxon.,Berks., and Hants
***Zone I:* 145.5 to 145.65 mc.**	Cornwall, Devon, Somerset.
***Zone J:* 144.85 to 145.25 mc.**	London, Essex, Middlesex, Surrey, Kent, Sussex.

TWO METRES

COUNTIES WORKED SINCE SEPTEMBER 1, 1952

Starting Figure, 14

Worked	Station
54	G5YV
49	G3GHO*
45	G3BLP,* G3WW*
44	G2HDZ
42	G3IOO
41	G5DS
40	G2XV
39	G4SA, G5BM, G5ML
37	G2AHP, G2FJR
35	G3HWJ
34	G3FAN
32	G4RO, G6TA, G8IL
29	G8DA
28	G2HOP, G3HBW
27	G6YU
26	G3GVL, GC3EBK
25	G3DO, G3HCU, G3HXO
24	G5MR, G6CI
23	G2DCI, G2FCL
22	G3WS
21	G3FIJ, G3GJZ, G8VR
20	G3ISA
18	G2CZS, G3EOH, G3IRA
17	G3YH
16	G3IWJ, G3JMA
14	G2BRR, G3DMK

Note: This Annual Counties Worked Table opened on September 1st, 1952, and will be closed on August 31st; all operators are requested to send in their final claims (for 14 or more Counties Worked) for this year as soon as possible after August 31st. These will appear in the Final Table for The Year in the October issue. The Table will re-open w.e.f. September 1st, 1953, for the year to August 31st, 1954.

* Cards held for Annual 40 Counties Worked Certificate.

June 13, with QRP equipment consisting of 24 mc EF91-½ 6J6 72 mc-½ 6J6 144 mc-6J6 PA running 7 watts, on 145.65 mc; the converter is a 5-stage CC job with 9-11 mc IF (and some trouble with break-through), and the aerial for the time being is a rotary dipole, with a beam in hand. Though some useful contacts have been made (and SWL reports from over 50 miles are requested) a good deal of reconstruction is already planned.

Around the Home Counties

G2HDZ (Pinner, Middx.) is now in action on 435.17 mc, but is dissatisfied with his SEO receiver, and on the transmitter side will be putting in a QQVO3-20 as a straight PA. During the recent openings, good progress was made on Two, in spite of the fact that just as he started to call LA8RB his "Tx broke down for the first time in its life," due to an internal flash-over in the 3E29; a quick replacement enabled the LA to be caught, but SM still eludes G2HDZ.

G3GSE (Kingsbury, Middx.) was also happy with the EDX on July 1/2, and made new contacts for the Counties table with G5MA/P and GW5MA/P. G3GSE is among those getting a very strong signal from G5TZ/A, who has reappeared on Two with 5 watts from a good location near St. Catherine's Point, Isle of Wight; two other consistent signals from about the same direction are G2BMZ (Torquay) and G3HVO (Parkstone, Dorset).

G6RH (Bexley, Kent) apparently missed the EDX opening, though up to July 1st he made some good GDX contacts, including GM3IBV (Larkhall), who is getting out well. G2AHP (Perivale, Middx.) has rebuilt on the transmitter side, and on the first tests raised G3IOO and GW2ADZ; G3APY/P was hooked for a new county, and the G2AHP total of stations worked is now 375. Locals he gives active are G3CAT and G3HZK.

Another Portable Saga

As so many VHF operators will know, Bob of G5MA was out again during the month, at Blaenavon for Monmouthshire on June 21, from which location he worked 54 different stations; the following week-end he was on Walbury Hill, Berks., with 37 stations worked.

On this occasion, Bob had some unusual experiences; he was first visited by the police with a complaint about TVI; then G6JK, worked on the Sunday morning from High Wycombe, arrived; and then who should turn up but Old Timer G2GG of Newbury, whose call will be familiar to most G's who were active in the early 1920's. He had been listening to G5MA/P on Two, and having last worked Bob on 440 metres in 1923, came along to see how he was getting on! Well, 30 years is a long time, but this little encounter shows that whatever band an Old Timer is on, the urge is always the same.

From the home QTH, G5MA says he spent 14 hours trying to raise GD3DA/P during the latter's visit to Snaefell, Isle of Man, over June 9-14. Regarding these tests, we now have a report from G3DA himself. He found conditions poor generally on Two, except for a short spell around 2300 on June 9, when some South Coast signals appeared; the lack of activity during TV hours was very noticeable. On this occasion, the GD3DA/P coverage on Two was the area Devon, Lincs., Cambs., Ayrshire, Dublin and Belfast. The transmitter was 6J6-6F12-QVO4/7-832 giving about 3 watts RF out into a 3-element Yagi, the receiver being a CC cascode into a BC-733.

On the 70-centimetre band, results were much more satisfying, and several contacts over the 100-mile mark were made, including the GD/GI "First" on 430 mc with GI3GQB; the latter, when first raised on two metres early in the proceedings, protested that he had packed it in on 70 cm and couldn't try a QSO. With lots of urging from the GD3DA/P end and some conferences over the air, GI3GQB got his 430 mc tripler going and a lash-up Rx, and was able to work GD3DA/P for a straight QSO on 70 centimetres. Which all goes to show what can be done. Other stations worked from Snaefell on that band were G2JT, G2OI, G3AOO, G3AYT, G3IWJ and GW5MQ.

QUICK CONTEST No. 2

Week-end August 22-23. Rules on p. 239, June issue. Make it a Party!

BRITISH ISLES SEVENTY-CENTIMETRE ZONE PLAN

FULL BAND, 420-460 MC

Area (mc)	*Service*
420-425	SEO Transmission (MCW and Phone).
425-432	Amateur Television.
432-438	CC Communication Band, Station Frequencies tripled from Two-Metre Zone.
438-445	Amateur Television.
445-455	Future Amateur Development.
455-460	SEO Transmission (MCW and Phone).

South Again

G4MR, who used to be at Slough, Bucks., has not, he informs us, lost interest; it is just that having got married and moved to Letchworth, Herts., he finds he is on DC mains! So for the time being, he says, he will have to be content with reading about VHF.

Some of the results obtained by G6NB, from his hill-top site at Brill, Bucks., have already been mentioned. In terms of DX worked, his is probably the outstanding signal on the band now. Bill can certainly find them and work them—besides which, he is on consistently and gives a nice, snappy QSO on either CW or phone.

G4RO (St. Albans) discusses results on Two during the period June 24 to July 5, some particular points being his reception of G4GR (Marshfield, Mon.) at 589 on July 4 at 2300 BST, and F8GH and GC3EBK, both 579 at about the same time on July 5. As regards 430 mc, G4RO has a good deal to say, in particular that 432-438 mc is rather a wide band to have to search; our feeling is that we should see how the allocations already agreed work out, as the zoning seems to us to give the answer as regards band-widths to search. G4RO is another who stresses the difficulty of getting straight QSO's on 430 mc, without cross-banding or making previous schedules on two metres; an "ordinary CQ" on 70 centimetres seems to get one nowhere at all. As to the SEO business, which seems to be receiving some support in unexpected quarters, G4RO says "One dreads to think what would happen if people were really encouraged to use SEO and super-regen receivers"—and so do we. On the equipment side, G4RO had been using until quite recently a G3EJL-type 70 cm converter, from the original design in the June 1950 issue of *Short Wave Magazine*; he is now trying R89A/APN5A glide-path receiver cavities, on the lines of G3MY's design in our November 1949 issue, but with CCO instead of SEO injection, which is a marked improvement on the G3EJL mixer.

G5MR (Hythe, Kent) reports briefly, apparently not having encountered any EDX, and remarks that G5TZ/A is frequently a good signal. A useful article by Vernon appears in this issue. His calculations were tried on your A.J.D., and you can be assured that they are much easier and quicker than they look.

Midlands Area

It is not often we hear from G6MN (Worksop, Notts.), who is another of the OT's—but Eric was out /P with a two-metre receiver on June 21, and sends a calls-heard list. Brian G6CI keeps going in Kenilworth, with a few more new stations worked, and G3HVP (Glossop, Derbys.) reports himself on 145.65 mc, active at week-ends.

G2DCI (Sutton Coldfield) has a new transmitter with plug-in tank ends for 144 and 430 mc, with a G2DD converter in hand for 70 cm. Following the note in this space in May last about G2DCI, he and G3BA are now in regular personal contact. With 23C in four months for Annual Counties, G2DCI is doing much better from Sutton Coldfield than ever he did from Liverpool, where the total never even reached 14 for the bottom rung.

G3GHO (Roade, Northants.) was, of course, hard at it when the EDX was coming through; on June 28 he worked EI2W, ON4HN and PAØRK, and on July 1st LA8RB and OZ2LX. With G2BAT for Cornwall and G2HCJ/P for Westmorland, it all adds up to a good month's work for G3GHO. He is now trying a new aerial system consisting of three stacked slots with reflectors, but the general deterioration in conditions since July 5 has prevented any useful comparisons being made. G3GHO is the third VHF operator to gain an asterisk on his call in Annual Counties, for cards held for 40 counties worked since September 1st, 1952.

West & North-West

G5BM (Cheltenham, Glos.) is doing very well with his new 12-element stack; he goes up in both Tables and by the time this appears in print may have been heard over the two-metre air from ON4BZ. G8DA (Gloucester) says there should be two more VHF stations active soon in that area, and mentions the number of /P stations worked on July 5, though G3MY/P down in Cornwall was called in vain.

G3DLU is moving to Compton Bassett and thinks the new QTH will give him a lot more scope. G4CG operates as GW4CG/A from Port Talbot, Glam. and was GW4CG/P from Tondu on June 21—results as in "Activity List." At the Port Talbot QTH he is in the clear from South round to West, but heavily blanketed in the easterly direction, from which the only stations heard have been G2AJ, G4SA and G3BLP. His "locals" are stations like G2BAT, G3AGA and G3CQC down in Devon and Cornwall with, of course, GW3FSP and GW8SU. GW4CG/A is on 145.68 mc.

Up in Leeds, G5YV found that the EDX opening held from June 28 to July 4, with no lack of

TWO METRES

COUNTRIES WORKED

Starting Figure, 8

13	G3BLP (DL, EI, F, G, GC, GD, GI, GM, GW, ON, OZ, PA, SM). G5YV (DL, EI, F, G, GC, GD, GI, GM, GW, ON, OZ, PA, SM). G6NB (DL, EI, F, G, GC, GD, GM, GW, ON, OZ, PA, SM, LA).
12	G2HIF, G3GHO, G3WW, G5BD.
11	G2AJ, G3ABA, G5UD, G6LI.
10	G2FQP, G2HDZ, G3BK, G3EHY, G3GHI, G5DS, GW5MQ, ON4BZ. (DL, EI, F, G, GC, GW, ON, OZ, PA, SM).
9	EI2W, G4RO, G4SA, G5MA, G6RH, G6XM, G8IC.
8	G2AHP, G2XC, G3BNC, G3FAN, G3GSE, G3HCU, G3VM, G5BM, G5BY, G5ML, G8SB.

stations to work during the whole period. But after July 6, the bottom dropped out, and it was hard to find workable signals more than 100 miles away. The end of June also saw good propagation paths developing for GM from Northern England, and one evening G5YV was able to add four new GM counties in a row—putting him up to 60C in the All-Time and nicely in the lead with 54C in Annual Counties; as time is getting short for the latter, he won't be burning his pants in the hot seat for very long! G5YV was hoping to start work with a 24-element stack, which is to be tested against the 4-over-4.

CN2, EI and ZB1

CN2AP (Tangier, ex-G2CIW) writes that he and CN2AO have had what they believe to be the first local QSO on two metres, and adds that four other CN2's are now building for VHF. Contacts with FA, southern F and ZB1 are regarded as possible, and starting next Spring, CN2AP hopes to open schedules with this country. We may be able to get some of these paths surveyed on the weather probabilities, which would give a useful lead as to the chances of VHF contact over these distances.

The work of EI2W at Kilkee has already been discussed—from the home location near Dublin, two more G counties were raised on June 28/29, in G5UD for Norfolk (a nice QSO, that) and G2HCJ/P for Westmorland.

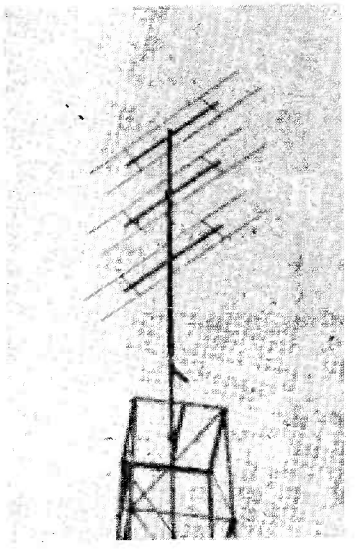
ZB1BZ and ZB1KQ keep going down in Malta, G.C., without very much in the way of results, though they do hear the occasional under-modulated phone carrier and sometimes CW with deep and rapid QSB. It is noticeable now that the band is noisiest and sounds liveliest when their beams are headed North, whereas for the first three weeks of June the noise was coming from the West. On a recent scheduled test on 130 mc, aircraft were followed all the way from Malta to the vicinity of Paris, so that both ZB1BZ and ZB1KQ feel pretty confident about scooping in the first readable signal that may penetrate to Malta on the 144 mc band. All G's should give at least one long, steady call (with plenty of call-sign and not too much CQ) on a beam heading of 150° every time they are on, and particularly in the early evening. The ZB1's are trying hard—let us make sure the signals are on for them. And what about some schedules? G6LI would like to discuss the matter with any interested ZB1 who cares to call him on 14 mc at 1800 GMT.

What Some People Say

"OZ2FR and DL3FM are the only Europeans I have ever heard with reasonably well modulated carriers. The rest involve the utmost ear strain to detect even a trace of audio on carriers which may be anything up to S7" (G3IOE). . . . "After my few weeks' experience on the 70 cm band, I am convinced that greater activity and more contacts would result if operators would call and listen on 430 mc more often, instead of prearranging their QSO's on two metres" (G2HDZ). . . . "I probably owe some QSL cards for two-metre QSO's and hope to attend to these during August" (G4MR). . . . "G6NB really has got a good receiver; I for one could kick myself when I hear the stuff he works on an apparently dead band" (G4RO). . . . "I find the VHF Weather Reports very interesting, and much enjoy reading them" (G5MR). . . . "OK on the VHF Weather Report, but how about the CT1 and EA paths, or are the Pyrenees too high a barrier?" (G8DA). . . . "Noting the remarks of the South Wales boys in the last issue of the *Magazine*, I sat and called 'CQ SW' every evening for a week at 1930 hours—but no joy!" (G3IOO). . . . "Clearly there is a great shortage of activity and few efficient stations in Norway and Sweden; of Denmark it may be said that the shortage of CW operators is acute—we hear the same old calls, always on phone" (G6LI). . . . "ZB1BZ now spends all his time between Two and listening to TV sound" (ZB1BZ).

VHFCC Elections

The following have shown cards qualifying them for election to the VHF Century Club:



The 12-element two-metre stack at G5BM, Cheltenham, mentioned in "VHF Bands" in June. Reflectors are spaced 0.15 w/1, and all elements are of ½-in. diam. aluminium tubing, with each pair of elements welded at the centre to an aluminium boom. These booms are supported by wooden horizontals 1-in. sq., mounted on a 2-in. diam. wooden pole. Feed is by 300-ohm ribbon. The result is a highly efficient beam, light and of low windage, without insulators at high voltage points. G5BM reports that performance is much superior to a 5-ele Yagi.

G3ENI, Richmond, Surrey (Certificate No. 147); G3BKQ, Blaby, Leics. (Certificate No. 148); and G2DDD, Littlehampton, Sussex (Certificate No. 149).

All G3ENI's cards were in respect of G contacts, with G3 + 3's predominating. G2DDD came on the band in September 1952, so has gained his VHFCC Certificate in exactly 10 months. As most readers are aware, VHF Century Club certificates are issued only on production of QSL cards proving two-way contact with not less than 100 different stations, on the VHF bands from 50 mc up. Cards should be sent by registered post addressed to A.J.D., with a check list; the Certificate is issued and the cards returned within a few days.

Movements and The Tables

Naturally, the month's activity has produced many new claims for the Tables, and we hope that everyone has been placed where he expects to find himself. By the time you see this, Annual Counties will have a bare three

weeks to run, and we shall show the final placings in the October issue. Simultaneously, the Table reopens for the year commencing September 1st, 1953, with all the same rules applying and all counties there to be worked all over again! Even G6FO says he is going to have a jolly good try for 14C this year.

Because of pressure on space, the Seventy-Centimetre Station List is being held over until next month; several new entries have been reported, but, as usual, our details are not complete, and *all* 430 mc operators who have not yet done so are asked to let us have the necessary information.

Quick Contest No. 1

This goes to press before the first of our series of Quick Contests, so all we can do is to remind you to send in your entry as soon as possible, for checking in good time for the report in the next issue.

One final point — NGR is not being quoted as often as it might; to us, it is an extremely valuable reference for pin-pointing stations and checking distances. Please quote your NGR on all reports to "VHF Bands"; if you do not know what it is, get the Ordnance Survey sheet for your district, and from the notes given in the margin of the map you will be able to work it out.

In Conclusion—

And that, *mes amis,* just about runs us dry for this month. The grateful thanks of your A.J.D. for a large and most interesting mail, to which he hopes he has done proper justice. It is your reports that make the story — we can never have too many reports. For the next issue, the dead-line is again tight, within a few days of your seeing this: **August 14 latest,** addressed A. J. Devon, "VHF Bands," *Short Wave Magazine,* 55 Victoria Street, London, S.W.1. With you again on September 4.

VHF WEATHER REPORT

PERIOD JUNE 11 TO JULY 15

A. H. HOOPER (G3EGB)

This month's report again shows a good correlation between results expected and results actually achieved, particularly for the period June 28 - July 4 — see "VHF Bands" in this issue. For the EI2W Trans-Atlantic Tests, the survey suggests that the best chance was on July 7, and on this date weak but unidentifiable CW signals were, in fact, heard at EI2W. On the other hand, what may prove to have been a genuine W4 signal was possibly received on July 11, for which date there is no correlation on the EI/W2 path. However, a survey of the EI/W4 route is in hand for this date, to see what the tropospheric conditions actually were over this more southerly path. Readers will agree that these surveys are already beginning to yield extremely interesting results, and with a sufficient number of active stations, reporting regularly, it should be possible to obtain valuable statistical data over almost any DX path from the U.K.—EDITOR.

ANOTHER varied selection. A series of depressions affected us from June 14 until the evening of June 23, when slack conditions between one anticyclone over Norway and another to the South-west set in. This high pressure belt lay from the Azores over Eire and North-west Scotland to Norway, rather too far west for the Home Counties to benefit fully. The pressure system remained largely in this position for a week and then, on July 1, started shifting South-eastwards to include most districts, finally clearing the country late in the evening of July 5. Then followed a depression with a series of fronts which passed over the British Isles in two stages. The shallow ridge between them had a brief beneficial influence on the evening of July 6. The vigorous cyclonic air circulation then resumed, giving way during July 10 to a ridge of high pressure which passed over us during the evening and night. Yet another depression followed, until late on July 14, when another shallow ridge approached from the west and passed over the southern counties on the evening of July 15. Only one semi-persistent spell during the whole period!

Interpretation

In Fig 1 is shown the presence of modified refractive index (MRI) discontinuities over East Anglia, as deduced from the results of radio-soundings reported in *The Daily Aerological Record* of the Meteorological Office, London. The period June 24 - July 6 can be seen to have produced several. Their presence suggests the likelihood of reflection of low-angle radiation to locations well beyond normal range. A study of radio-soundings over other areas of the British Isles reveals the probable direction and extent of such propagation, and it was found that over Southern and South-eastern England discontinuities existed on the evenings of June 24, 25, for the period June 28 - July 4, and on July 10. They extended over the remainder of the British Isles on June 24, 29 and on July 3, and also, with the sole exception of the South-western peninsular, on June 28, 30 and July 2. The GM/GI path appeared open additionally on June 25 and July 1. The ridge on the evening of July 15 produced short-lived discontinuities over isolated areas, the South-west and North only.

Unlike the conditions of early March, marked fluctuations in height and strength of these discontinuities occurred, and reflect the fact that they developed not in a large stationary anticyclone but rather in the fluctuating area (col) between atmospheric circulations, and within transitory ridges of

high pressure. On several occasions the values of MRI decreased with height over a shallow layer, thereby indicating a duct for the shorter wavelengths; on two occasions the layer was of the right order for ducting at two metres. Their lower limit is shown in the figure by a double ring. Unfortunately, they appeared only on isolated soundings.

At the foot of Fig. 1 is shown a graph of the mean sea level (MSL) barometric pressure at Cranfield, Bedfordshire. It covers the period of this survey and has been included for those who wish to assess the relationship of this quantity with VHF propagation.

Table 1 is partly derived from the charts in *The Daily Weather Report* of the Meteorological Office. The entries are for the evenings of the date quoted. On the first line is shown the type of pressure system over the Home Counties. The classification is into anticyclones (A), depressions (D) and cols (C). The last are areas of slack pressure gradient occurring between the main types of pressure distribution. They occur with light winds, as do anticyclones, and often result in radiation cooling. The atmospheric circulation is vague and poorly established and conditions fluctuate in an erratic manner.

Enhanced propagation over inland paths can arise by means of radiation cooling in the surface layers of the atmosphere at night-time. Super-refraction over the affected areas results until such time as the air becomes saturated or cooling ceases. The second line of Table 1 shows, as far as can be ascertained, the time of onset of saturation on the evenings when significant radiation cooling occurred. Where the time is after midnight the figures are still placed under the pre-midnight date. Each entry indicates, therefore, a suitable evening for extended propagation over inland paths, while the figures give an indication of when the effect faded away. Poorly defined and *Nil* cases have been excluded. An isolated evening on June 18 is shown, for example, and then a spell of five successive evenings starting with June 22.

For previous periods the incidence of anticyclonic or ridge conditions over certain paths from the UK has been shown. These are only indirectly related to anomalous propagation, and this month the remaining lines of Table 1 show the occasions when MRI discontinuities are known to have extended out from East Anglia along the stated directions to the countries whose prefixes are given. Open paths to intervening countries are, of course, implied. We see, for example, that good conditions existed to Denmark on the evening of June 27, and to both Denmark and Germany on June 28. On July 1 there were restricted conditions on the Continent, although East Anglia was still experiencing MRI discontinuities aloft.

Certain entries are in heavy type and underlined. Dates so indicated correspond, for easy reference, with the occasions of significant MRI discontinuities

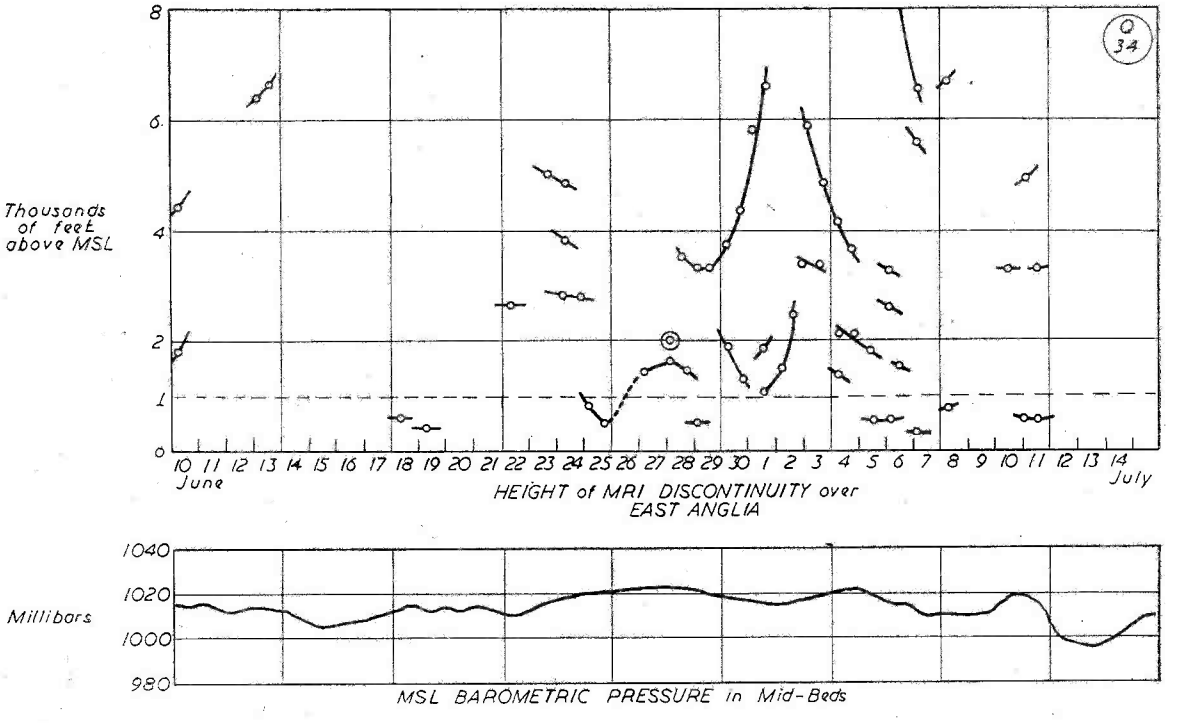


Fig. 1. Showing the reflecting layers which formed over East Anglia during the period June 10 to July 14. On occasions they continued out along several paths from the UK, giving the opportunity for EDX working; the dates when this was possible are given in bold in Table 1.

Date		JUNE																		JULY												
		11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Pressure System over Southern England		D	C	D	D	D	D	D	D	D	D	D	C	C	D	D	C	A	C	C	C	C	A	A	A	D	A	D	D	D	A	D	D	D	D	A
Radiation over Bedfordshire, GMT		—	—	—	—	—	—	—	01	—	—	—	21	21	23	01	23	—	—	21	20	01	—	—	02	23	—	23	—	24	02	—	—	—	—	01
Discontinuities aloft, from East Anglia to the countries indicated	*NE*	—	—	—	—	—	—	—	—	—	—	—	—	OZ LA	OZ	OZ	OZ	OZ	OZ LA	LA	LA	LA	—	SM LA	— LA	OZ LA	—	—	—	—	—	—	—	—	—	—
	E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DL	DL	PA	—	DL	DL	DL	PA	—	—	—	PA	—	—	—	—	—	—
	SE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DL	—	—	DL	—	—	—	DL	—	—	—	—	—	—
	S	—	—	—	—	—	—	—	—	—	—	—	—	—	—	45°	45°	—	—	—	—	—	—	49°	—	45°	43°	—	—	45	—	—	—	—	—	—

TABLE 1

Showing the broad possibilities for EDX working on VHF during the period June 10—July 14. The good dates are shown in bold type, underlined, with the approximate directions and distances to which the transmission paths are thought to have extended from Southern England. Careful checking with actual results reported should show an interesting correlation.

Notes—(1) *Conditions listed are for the evenings of the dates shown.*

(2) *D = Depression. A = Anticyclone, C = Col, slack pressure gradient.*

(3) *Times in the second line mark the fading of inland super-refraction.*

(4) *Country prefixes indicate the approximate limit of conditions.*

(5) *For the southern path, which is wholly over France, it has been necessary to indicate limits in two-degree steps of latitude. The latitude of Paris is about 49°N, and that of Marseille 43°N.*

in Fig. 1. Country prefixes were to have been stressed in the same way so as to show when the reflecting layer aloft was particularly effective. Unhappily, none rated this treatment during the period.

In Retrospect

A number of last month's reports have been of interest in relation to the weather analysis. First, G5MA/P in Rutland, who heard GC3EBK on the morning of May 24. This was within the ridge conditions indicated in the report as extending over the southern route from England, and it appears that the same path was open on previous evenings. The others are for May 25, when the Table showed unsuitable conditions for EDX, despite good conditions on adjacent evenings. The interruption was associated with the slow drift eastwards across the country of a very shallow depression and associated front. In that its extent was limited. timing of its movement is very critical. Thus the G3GHO/ON4BZ QSO took place at 0940 GMT when the front was still over the Irish Sea ; the G4RO/heard PAØ at 1900 was with the disrupting front still to the west—it passed over London at about 2100 GMT ; while for the G3DLU/heard GC3EBK report the front was already to the East of their path. It is a question of direction and timing, and in this connection it is worth noting that the Table refers to the *evening* of each day and is assessed from the observations for midnight and for 0200 GMT.

The Atlantic Path

In view of the tests being carried out on the West Coast of Ireland, a watch was kept on the Trans-Atlantic path for the period July 3-14. In addition to the surface weather charts for noon each day, it was possible to ascertain the presence of MRI discontinuities near the starting point and over the positions 52½°N 20°W, and 52½°N 35½°W, where our weather ships are stationed.

[Over

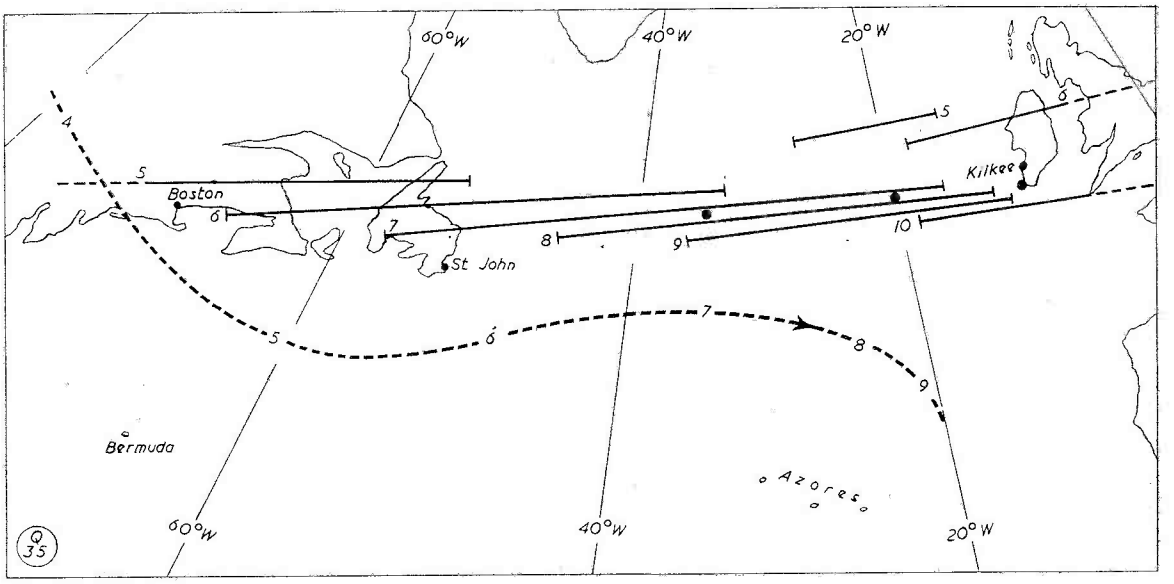


Fig. 2. This sketch bears upon the EI2W Trans-Atlantic VHF Tests, which took place early in July. The curve shows the general track of an anticyclone which travelled Eastwards from the vicinity of the Great Lakes to the neighbourhood of the Azores; the position at noon each day is indicated by the date. Associated with this system was an area of conditions suitable for DX working, and the extent of this is shown (for noon each day) over the EI/W2 route. On July 7, the best chance was given, though the gap was not quite closed. The blacked points indicate the positions of the weather ships, and on July 7 the New England States would have been easily workable from the ship placed at 20° West, only about 450 miles out from Kilkee, where EI2W was located.

The surface charts show a depression across the path for each of the first four days. On July 7 an anticyclone drifted over the path and, later, cleared it during July 9. A family of depressions then travelled over the route until July 12, when a strong North-westerly airstream spread over the whole of the North Atlantic for the last two days of the period. In Fig. 2 the successive positions at noon each day of the anticyclone centre are shown, moving across from near the Great Lakes on July 4 until the last position on July 9 before it finally collapsed. As with most others, it never extended fully over the path.

With subsiding air, it developed an effective discontinuity of MRI, and thus created suitable conditions for anomalous propagation over extensive areas. From the observations at the three points designated above (and represented by blobs in Fig. 2) an attempt was made to assess the limit of these enhanced conditions as affecting the path Kilkee-St. John-Boston. In the absence of information further to the west, the limits west of 40°W that have been assigned are necessarily less reliable than those to the east. In Fig 2 is drawn for noon each day a line representing the probable limits, along the stated route, of enhanced propagation. They have been offset to the sides of the route for clarity. They are dated at their western ends. Two lines are shown, dated at their eastern ends. These indicate the extent of similar conditions associated with a separate and much smaller system.

We can see that on July 5 propagation from Boston to St. John was quite likely. By the following day the drift eastwards had continued for both limits, and this particular path was no longer open. On July 7 the "open" path attained its greatest length, extending from the western coast of Newfoundland to about Long. 17°W. Communication from the weather ship at 20°W to St. John, about 1,500 miles away, appears a strong possibility. From this time onwards the anticyclone turned South-eastwards, and while the western limit progressed across the Atlantic, little movement eastwards of the eastern limit took place. By July 9 the near limit had still not reached the Irish coastline, and one wonders just how far off the coast it then was. If sufficiently near one could, perhaps, have beamed beneath the discontinuity to about 35°W. The two lines drawn to the North-east for July 5/6 were associated with another system. The gap between the areas affected by the two systems on July 6 was about 600 miles. It is disappointing that they did not unite on July 7.

The writer is indebted to the Director, Meteorological Office, London, for permission to quote information derived from the official publications mentioned.

PREPARATION FOR THE R.A.E.

A course of preparation for the Radio Amateurs' Examination of the City and Guilds of London Institute, starting from first principles, will be held at the Brentford Evening Institute on Wednesday evenings, commencing on September 23. Enrolment takes place at the Institute during the week September 14-18 (evenings) and the lecturer will be J. R. Hamilton, Assoc.Brit.I.R.E. (G2HKR).

Moon as VHF Reflector

CALCULATING THE ALTITUDE AND AZIMUTH FOR ACCURATE BEAM AIMING

V. G. MELLOR (G5MR)
Lieut-Comdr., R.N.V.R.

Merely to read through this useful practical article suggests that to fix the position of the Moon for beam aiming is a tedious and complicated mathematical problem. But take a Nautical Almanac and the Nautical Tables (obtainable through any good bookseller) follow our contributor's workings, and you find that it is only a matter of simple arithmetic. Moreover, making a few practice calculations will show that the whole process can be carried out easily and quickly.—Editor.

THE purpose of this article is to describe, as concisely as possible, a method of finding the Altitude (angular height) and Azimuth (true bearing) of the moon at any time and from any place. It is not proposed to discuss theory, and although Logarithmic Functions of angles appear, they are obtained from tables, and the only arithmetic involved is simple addition and subtraction.

The reference books required are *(a)* A nautical almanac and *(b)* A book of nautical tables. Those used by the writer are The Admiralty *Abridged Nautical Almanac, 1953,* and Burton's *Nautical Tables.*

First, write at the head of your paper the date and *GMT* for which the calculations are required, also the latitude and longitude of your QTH or other location from which you wish to work.

Then turn up the appropriate date in the nautical almanac and extract the Greenwich Hour Angle (G.H.A.) of the moon for the required time. The G.H.A. is tabulated for each hour, and for intermediate times increments and "v" corrections taken from the interpolation tables must be added to the G.H.A. for the preceding hour.

For example: Required, Altitude and Azimuth of the moon at 2017 GMT on June 19, 1953. Lat. 51° 04′ N. Long 01° 05′ E.

G.H.A. (20h.)	= 27° 48.6′	(v = 16.7)
Interp. Table (17m. 0s.)	= 4° 03.4′	
v corr. (17m.)	= 4.9′	
G.H.A. at 2017	= 31° 56.9′	

Next, also from the nautical almanac, take out the moon's declination for the same time; this is tabulated in a similar manner to the G.H.A.

First write down the declination for the preceding hour, noting whether it is N. or S. and whether it is increasing or decreasing. Also note value of "d" and obtain its correction for the appropriate number of minutes from the interpolation tables. This correction must be added to the hourly value of the declination if the latter is increasing, and subtracted if it is decreasing.

In the example:

Declination (20h.)	= 4° 47.0′ S.	(d = 13.2)
d corr. (17m.)	= 3.9′	
Moon's dec. at 2017	= 4° 50.9′ S.	

That is all that will be required from the nautical almanac.

Local Hour Angle

Now obtain the Local Hour Angle (L.H.A.) by applying your longitude to the G.H.A. already found as above. *Add* the longitude if East, and subtract it if West. (Remember "Long east, Greenwich least; Long. west, Greenwich best"!) Thus, continuing the above example, we have:

G.H.A.	= 31° 56.9′	
Long.	= 1° 05′ E.	(add)
L.H.A.	= 33° 01.9′	

In cases where the long. has to be subtracted (being west) and it happens to be greater than the G.H.A., 360° must be added to the G.H.A. before the subtraction takes place. Similarly, if the G.H.A. and east long. when added together are greater than 360°, this figure must be subtracted from their sum to obtain the L.H.A.

If the L.H.A. is not named it is always understood to be west; but if the L.H.A. is greater than 180° it will be found more convenient to subtract it from 360° and call the result L.H.A. (East).

Having obtained the L.H.A. write it down on the left hand side of your paper, and immediately underneath it write latitude. Underneath this write the declination, which has already been obtained as above. Then combine the latitude and declination as follows: If both

are of the same name, *i.e.*, both N or both S, subtract the lesser from the greater; if they are of different names, *i.e.*, one N and the other S, add them. For convenience, call the resulting quantity "x."

Now take your book of nautical tables, and turn up the Haversine Table. Extract the Log. Hav. of the L.H.A. (or L.H.A. East as the case may be) and write it down on the right-hand side of the paper opposite the L.H.A. Then turn to the table of Logarithmic Functions and extract the Log. Cos. of the latitude and of the declination; write these two quantities underneath the Log. Hav. L.H.A. Add all these three quantities together, proceeding only as far as the figure immediately on the left of the decimal point, *i.e.*, in the example write the answer as 8.70419, not 28.70419, and call the answer "y."

Continuing the example, these stages of the problem should look like this:

L.H.A.	33° 01.9′	(Log Hav)	8.90750
Lat.	51° 04′ N.	(Log Cos)	9.79825
Dec.	4° 50.9′ S.	(Log Cos)	9.99844
"x" =	55° 54.9′	"y" =	8.70419

Now turn back to the Haversine Table, look up quantity "y" in the Log. column, note the figures opposite it in the "Nat" column and write them down.

(*NOTE*: Haversine Tables. Readers who use nautical tables of a different brand from those used by the writer may find that the quantities obtained from the "Nat" columns of the Haversine Table are approximately half those shown in the examples given here. This is because many books of tables show natural haversines instead of natural versines, and will in no way affect the method or the final result. The figures should be written down exactly as they are given by whichever kind of table you are using.)

Now, from the same table obtain the natural versine (or haversine) of "x" and write it down under that of "y." Add these two quantities, and look up their sum in the "nat" column. The angle corresponding to this is the Zenith Distance of the moon, which must be subtracted from 90° to obtain the Altitude of the moon, and the first part of the problem is done. These final stages should appear thus:

"x" =	55° 54.9′	"y" =	8.70419
Nat =	43958	Nat =	10121
			43958
		Nat =	54079
		Zenith Dist =	62° 39.8′
			90° 00′
TRUE ALTITUDE of the MOON =			27° 20.2′

The Azimuth

This problem is much shorter, and involves the use of the "A, B. and C" tables which are to be found in most books of Nautical Tables. The only requirements are the L.H.A. (West or East as the case may be), the declination, and the latitude, all of which have already been obtained during the solution of the altitude problem.

The procedure is as follows: Enter Table A with L.H.A. and latitude and write down figure obtained, noting whether it is plus or minus. Then enter Table B with L.H.A. and declination, again noting whether the figure obtained is plus or minus. Combine the figures obtained from A and B according to their signs, calling the result "C" and also noting its sign. Enter table C with "C" and latitude; this will give you the required azimuth.

Continuing the example:

L.H.A. 33° 01.9′ and lat. 51° 04′ N.	"A" = + 1.90
L.H.A. 33° 01.9′ and dec. 4° 50.9′ S.	"B" = + .155
	"C" = + 2.055

Lat. 51° 04′ N. and "C" + 2.055. Az. = 38° (to nearest degree). Since "C" is plus and the lat. is north, the azimuth is south; and since the L.H.A. is west, the azimuth is west. The True Azimuth is therefore S38°W (true), that is 218°.

Caution: Since the rules concerning signs and the naming of the azimuth vary, readers who are not using the same book of tables as the writer are advised to take careful note of any instructions on these rules given with their particular A, B, and C Tables. If your A and B tables go up to only 90° for L.H.A., and your L.H.A. is greater than 90°, subtract your L.H.A. from 180°, and use the result when entering the tables, *e.g.*, the "A" and "B" figures are the same for 75° as they are for 105°.

Amplitudes

Most books of nautical tables include an Amplitude Table. By its means the true bearing of the moon at the moment of rise or set may be found very speedily. All that you require are the moon's declination at the appropriate time, and the latitude. The declination is found as before from the nautical almanac, and for the present purpose it will suffice to take both it and the latitude to the nearest half degree.

Enter the amplitude table with these two quantities, and you will obtain the angular distance of the moon from due east (when rising) or due west (when setting). When the

declination is north the amplitude will also be north, and when the declination is south the amplitude will be south.

Example: In Lat. 51° 04′N., Long. 01° 05′E. on June 17, 1953, to find moon's true bearing at set.

Approximate GMT of moonset in position given:

	23	24	00
Long. in time		− 04	20
=	23	19	40 GMT

At this time Declination to nearest half degree = 5°N. From amplitude table with lat. 51°N. and dec. 5°N., the amplitude is W8°N (since moon is setting and dec. is north). This gives a true bearing of (270 + 8) = 278°.

Conclusion

The method shown above may equally well be used to determine the altitude and azimuth of any of the other heavenly bodies whose G.H.A. and declination may be obtained from the nautical almanac. It is one commonly employed in navigation and has been used at sea by the writer for many years. Another method involving special Altitude-Azimuth tables published by the United States Navy Department has recently come into use, and is rather quicker for navigation by means of position lines using a "special" position. Here, however, the writer has deliberately chosen the older, basic method; first, because the U.S. Navy tables may not be generally available, and secondly because he considers it more suitable for the present purpose, which will almost always involve working from a fixed and known position.

Although at first reading the problem may seem lengthy, it is emphasised that with a little practice, it can be done extraordinarily quickly and easily. A further example, showing the working straight through as it would normally be set out, is appended.

Example 2: June 13, 1953. 0940 GMT. Lat. 55° 52′ N. Long 4° 15′ W. Required: Altitude and Azimuth of the Moon.

	291° 36.6′		24° 33.9′ N.
	9° 32.7′		4.1′
	5.9′		
			Dec. = 24° 29.8′ N.
GHA	301° 15.2′		
	4° 15.0′		
LHA	297° 00.2′		
LHA(E)	62° 59.8′	(Log hav)	9.43613
Lat.	55° 52′ N.	(Log cos)	9.74906
Dec.	24° 29.8′ N.	(Log cos)	9.95903
	31° 22.2′		9.14422
(nat)	14618	(nat)	27878
			14618
			42496
Az. A =	+ .752	Zen. Dist. =	54° 53.9′
B =	− .511	TRUE ALT. =	35° 06.1′
C =	+ .241		

AZIMUTH = S 82°E True = 098°

Compass Errors in D/F Work

SOME NOTES ON TEST RESULTS

R. A. TITT (G3CMJ)

NOW that the D/F season is on us some recent observations on compass errors as they apply to amateur D/F may be of interest to those who are still puzzled by last year's failures.

A compass, if it is good enough for accurate D/F work, is a sensitive instrument and is very susceptible to stray magnetic fields. Any article of iron or steel, whether it is a permanent magnet or not, will distort the earth's magnetic field to some extent and introduce an error in compass readings taken in the vicinity.

The importance of errors of the size quoted below will be realised if one considers that in an ordinary D/F contest an error of only one degree can mean being out by nearly a quarter of a mile in the estimate of location of the hidden station.

Influence of Headphones

A pair of good moving coil headphones worn while taking a bearing with a prismatic compass (as used in all these tests) introduced an error of 1.5 degrees in the bearing. In the same way a pair of reed phones, rather old, but by a very well-known maker, introduced an error of no less than 20 degrees!

Influence of Motor Cars

In these tests a 10 h.p. Morris of pre-war vintage was used with the engine running. Compass bearings were taken on a distant

point in line with the car with the compass at various distances away both to the side and to the rear.

Compass to Near Side

Distance	*Bearing*	*Error*
40 yds.	32.5 deg.	0 deg.
20	32.5	0
10	35.0	2.5
5	49.5	17.0

Compass to Rear (Bearing on a different mark)

Distance	*Bearing*	*Error*
50 yds.	310 deg.	0 deg.
40	309	1.0
30	311.5	2.5
20	308	1.0
10	307	2.0
5	297	13.0

Note the irregularity on the readings taken at 30 and 40 yards. This turned out to be due to the presence of a galvanised steel stay wire on a power line pole a few yards to one side of the road.

These few results went a long way to explain the reasons for last year when we spent too much time in the early stages of a contest floundering with contradictory bearings, though we were getting sharp null readings and our map work was beyond suspicion.

The conclusions are simple, namely:

(1) Always remove headphones before you read the compass. Even crystal phones will have a steel headband.

(2) Always get well clear of any car or van (or any galvanized steel shed or large structure). At least 20 yards from a car and more from a larger object.

(3) Keep a sharp look-out for odd bits of iron such as fence wires, gates, stay wires and so on; all these can also spoil your compass accuracy.

If you are using a good compass—which is really necessary for operations of this sort—it is essential to take precautions to allow the instrument to give you an accurate reading. The better the compass, the greater its sensitivity to stray fields. One of the most accurate and sensitive compass instruments made is that known as the Miner's Dial, with which first-degree surveys are carried out underground. It would be the ideal instrument for amateur D/F work, since it is capable of giving bearings within the sharpest null likely to be obtained on the D/F aerial.

SOLON ELECTRIC IRON - INSTRUMENT MODEL

This new soldering iron has been specially designed for soldering operations in the compact assemblies of modern constructional designs. It is exceptionally light (only 3¼ ozs.) and easy to handle, being but 9ins. long. Rated 25 watts for 220-240 volts, each Instrument Solon is tested to 1,000 volts against earth, and must melt resin-cored solder within 2½ minutes from dead cold. The chisel-edge bit is only 3/16in. in diameter, and can readily be replaced. The price of the Instrument Solon, complete with 6ft. of 3-core flex in an efficient sleeve cord grip, is 19s. 8d., and the makers are: W. T. Henley's Telegraph Works Co., Ltd., (Engineering Sales Dept.) 51/53 Hatton Garden, London, E.C.1.

WELL OVER TWO MILLION

The total of TV licences in issue as at the end of May last was 2,316,600, showing an increase of 113,257 over the previous month. The total number of licences issued — including sound broadcasting, TV and car radio — was 12,945,828 by the end of May 1953.

SUMMER CALL BOOK

This is now available, and is as large and as impressive a compilation as ever. The 21-page U.K. section of the Summer 1953 edition of the *Radio Amateur Call Book* contains in its 61 columns the call-signs, names and addresses of some 7,500 licensed amateurs in the British Isles, and includes all QTH's and changes of address as published in our "New QTH" feature in *Short Wave Magazine* up to and including the April 1953 issue. The price of the Summer Edition complete is 25s. post free, or 10s. for the *Call Book* less the American section. In this country, it can be obtained only from: Publications Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

G3ELP/A AT SOUTH SHIELDS

During the three days August 28-30, the South Shields & District Amateur Radio Club will be operating G3ELP/A in the Bents Park, on the occasion of the South Shields Annual Flower Show. The operators of G3ELP/A will be anxious for QSO's daily, between 10 a.m. and 9 p.m., on the 20, 40 and 80 metre bands. Reports and QSL's should be sent to: G3ELP/A, c/o Pier Pavilion, South Shields, Co. Durham. A special QSL card is being made available for the event.

PERHAPS OUR YOUNGEST READER?

A nicely typed letter from SWL A. H. Ford, of Banstead, Surrey, informs us that he is but 13 years of age — the lucky lad — and modestly adds that he would like us to know that "at least one junior reads the Magazine." He hopes in due time to get his own ticket, and says he would be glad to hear from any other reader of about the same age who is also interested — letters will be forwarded if sent *via* our Office.

Random Jottings by the Old Timer

CONSIDERING how many amateurs there are in the world, there is a surprising degree of ignorance about us and our hobby. Anyone who has operated a club station at an Exhibition will have noted the number of people who view the whole thing with blank amazement and have never even heard *of* an amateur, let alone heard one on the air. We have quite a large literature and press of our own; we figure from time to time in the daily papers, on the BBC, and certainly in the columns of local papers. Yet there are still countless people in blissful ignorance of all that goes on. Should we publicise ourselves a little more, or is it a sounder policy to lie low? Certainly the type of publicity given by uninformed write-ups is far from desirable; and that other kind, resulting from TVI or BCI episodes, is even less so. But an occasional "blurb" in the press should surely stir up some of the sleeping grey matter and awaken a dim consciousness of our mere existence.

OLD TIMERS' QUIZ

Here are the answers to last month's Quiz. (1) G2NM and G2KF. (2) A "Schnell-and-one-step" was Americanese for a detector and one stage of audio, the detector using a Schnell or modified Hartley circuit. (3) The same Mr. Fred Schnell went round the world with the call-sign NRRL, working from parts of the Pacific that had never been put on the radio map before. Incidentally, he sent his call-sign, appropriately, to the tune of "The Keel Row"—whistle it and check for yourself. (4) For a short time amateurs omitted the "de" and sent the two prefixes between the call-signs. For instance, G7AB calling F9XY would send "9XY 9XY 9XY fg 7AB 7AB 7AB." This happened roughly between 1926 and 1928. (5) Each European country started up with a different figure in the call-sign. Great Britain first used 2, then 5 and 6 indiscriminately; France had 8, and later 3; Denmark used 7; Belgium used 4; Italy used 1; Switzerland used 9; and Holland Ø. Note how many of those figures are *still* used by the countries who started off with them.

THE TRIMMINGS

We have often said that the calibre of an amateur can be measured by his attitude to ancillary equipment, or "gadgets." Having recently seen some fine home-built gear of this kind, we are amazed at the poorness of the average man's apparatus. We have been inspecting home-built frequency meters which put the BC-221 in the shade; home-built and calibrated wobbulators; oscilloscopes; panadaptors; electronic sequence-switching devices; and all kinds of "trimmings"—but all useful, and, one begins to think, essential. And yet some of us spend so much of our time just communicating (or, worse still, just nattering without having anything to communicate!) that we get by with a haywire monitor and a borrowed absorption wavemeter, with the promise of the "loan of a frequency meter occasionally to check things up." Perhaps we have among us some sensible types who are taking advantage of this long spell of bad conditions to build themselves really outstanding stations ready for the air in 1955?

SPEAKING VERSUS WHISTLING

After hearing a crack or two from telephony stations about "that outmoded form of communication carried out by whistles," we feel like rallying to the defence of the CW fraternity. At all events, we will say one thing—that CW is probably a *quicker* means of communication than telephony. And, lest your eyebrows are arched at that, we will add that the CW man says what he wants to say in a very few minutes; and so does the phone man, but the latter goes on for another half-hour inventing things to say because he just can't bear to go off the air. Thus many a CW contact gets through as much in ten minutes as a corresponding phone contact would do in half-an-hour. (Yes, we know that a phone contact is more *personal*; you can tell by the chap's voice whether he is smiling or not, and all that. But who cares, anyway?) It's fortunate that there *is* so much enthusiasm for CW, and the phone men would do well to foster it—if everyone came on phone they would feel pretty sick about the QRM!

DONNER UND BLITZEN

It's all very well to earth or disconnect your aerials during a storm, but it has to start somewhere, and many aerial coils of receivers have been burnt out or damaged before anything could be done about it. We recently had such a storm—one that started with a magnificent crack less than half-a-mile away—and we didn't relish the usual business of disconnecting the feeders outside the window. To be caught hanging on the end of a long wire, with one's feet on the damp ground, when the *next* flash goes off is a situation that we always try to avoid! This time we succeeded in doing a smart disconnection, but half-a-minute afterwards, with the ends of the feeders dangling about six inches above the ground, we saw them all crack over with a lovely fat spark as another flash of lightning went off quite close by. It is possible, had we taken thirty seconds longer to unscrew a couple of wing nuts, that you would not have been reading this—or do we exaggerate the dangers?

NEW QTH's

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

G3GXV, R. W. Livermore, 256 Grove Green Road, Leytonstone, London, E.11.

G3HIF/A, Cpl. A. Reid, Hut 648, Roman Camp. No. 30 M.U., R.A.F. Stoke Heath, nr. Market Drayton, Salop.

G3IBJ, C. C. Asher, 12 Falaise Close, Lordswood, Southampton, Hants.

G3IJV, R. D. Harvey, 182 Oxford Road, West Hartlepool, Co. Durham.

G3IMK, S. C. Walters, 12 Chesley Gardens, East Ham, London, E.6.

G3IPZ, D. A. Allen, Brickyard Farm, Dean Row, Wilmslow, Cheshire.

G3ITZ, R.A.F. Stoke Heath Amateur Radio Club, Roman Camp, No. 30 M.U., R.A.F. Stoke Heath, nr. Market Drayton, Salop.

GD3IYS, J. D. Sheard, Stonehaven, Union Mills, Isle of Man.

G3IZK, A. J. Hagon, 1 Purley Close, Barkingside, Ilford, Essex.

G3IZQ, H. Hyman, 89 Brantwood Road, Tottenham, London, N.17.

G3JAA, Mrs. P. J. Pitt, 103 Bellshill Crescent, Belfield, Rochdale, Lancs.

G3JAF, A. H. Trigell, Lynwood, Everton Road, Hordle, Lymington, Hants.

G3JAX, R. S. Gibson, 71 Boswell Road, Cowley, Oxford.

G3JBG, S. E. Harding, 55 Raynham Road, Edmonton, London, N.18.

G3JFW, F. S. White, 30 Whyburn Lane, Hucknall, Nottingham. *(Tel.: Hucknall 3409).*

G3JLH, I. L. Hampton, 35 Stanfield Road, Winton, Bournemouth, Hants.

G3JMG, J. M. Gale, 104 Bentley Lane, Meanwood, Leeds 6. Yorkshire.

CHANGE OF ADDRESS

EI3B, S. Merry, B.E., B.Sc., Kilrush Road, Ennis, Co. Clare.

G2BWP, H. W. Palmer, Brydon Lodge, Alexandria Drive, Herne Bay, Kent. *(Tel.: Herne Bay 667).*

G2BYK, J. C. Payne. 194 North Allington, Bridport, Dorset.

G2CIC, H. S. G. Clark, Estaires, Ashley Road, Ashley, Box, Wilts.

G2CKM, M. N. Salmon, 24 Oakwood Park, Leeds, 8. Yorkshire.

G2FKY, V. R. Ledger, 81 Uplands Road, Bournemouth. Hants.

G2FRI, T. J. Swain, 2 Monroe Drive, West Temple Sheen, East Sheen, London, S.W.14.

G2RF, H. D. Bramwell, 14 Whole House Road, Seascale, Cumberland.

G3AAN, D. E. Meekins, 65 New Road, Bengeo, Hertford, Herts.

G3ARK, D. Barnard, 216 Barton Street, Gloucester.

G3CEW, W. Sansom, 58 Bourne View, Greenford, Middlesex.

G3CWZ, D. R. Layzell, Hillview, Cann Common, Shaftesbury, Dorset.

G3DJQ, B. H. T. Olver, Bonehill Lodge, nr. Tamworth. Staffs. *(Tel.: Tamworth 710).*

G3EAT, W. H. Burden, 12 Staff Qtrs., Leyhill, Falfield, Glos.

G3EDD, B. Armstrong, 8 Green Street, Duxford, Cambs.

G3ELS, B. Rudd, 4 The Rise, Palmers Green, London, N.13.

G3EMH, T. A. Morris, 54 Maidenbower Avenue, Dunstable, Beds.

G3EPG, M. N. Fletcher, Eaves View, Tean Road, Cheadle, Staffs.

GM3FUU, W. B. Henniker, 6 Lovedale Grove, Balerno, Midlothian.

G3GDB, G. A. Bird, 18 Linsted Court, Restons Crescent, Eltham, London, S.E.9.

GW3GQN, W. T. Walters, Cein Fan, White Gate, Peniel Green, Swansea.

G3GUK, H. J. Wheeler *(VS9AW)*, 25 Culverden Avenue, Tunbridge Wells, Kent.

G3GXS, H. Ness, 19 Borrowdale Road, Mirehouse, Whitehaven, Cumberland.

GI3GXU, Portadown Amateur Transmitting Club, 5 Alexandra Gardens, Portadown, Co. Armagh.

GM3GZC, C. H. Fraser, Inverbeg, Glencoe, Ballachulish, Argyll.

G3GZN, E. Buckingham, 26 Cardiff Road, North End, Portsmouth.

G3HGD, V. S. Best, 7 Burleigh Terrace, Denby Dale Road, Wakefield, Yorkshire.

GW3HWR, H. W. Rees, 15 Castle Avenue, Mumbles, Swansea.

GM3IBA, T. Miller, 28 Crofthead Crescent, Orbiston, Bellshill, Lanarkshire.

G3IEC, G. E. Verrill, 64 Forton Road, Gosport, Hants.

G3IOA, A. B. Langfield, 287 St. Mary's Road, Moston, Manchester 10, Lancs.

G3ISG, S. E. Green, 23 Roslyn Road, Redland, Bristol 6.

G3ISY, L. F. P. Hollis, 58 Swanton Road, Erith, Kent.

G3ITB, T. H. Bartlett, The Bungalow, Beeston Road, Sheringham, Norfolk.

G3JKF, 4067874. Cpl. Franklin K. V., R.A.F. Hope Cove, nr. Kingsbridge, S. Devon.

G5AM, C. P. Cowell, Mus.B., 2 America Hill, Witnesham, Ipswich, Suffolk.

G5CP, C. R. Plant, Lynton, Nottingham Drive, Wingerworth, nr. Chesterfield, Derbyshire.

G6RW, L. N. Wilkins, 8 Ashlands Road, Arle, Cheltenham, Glos.

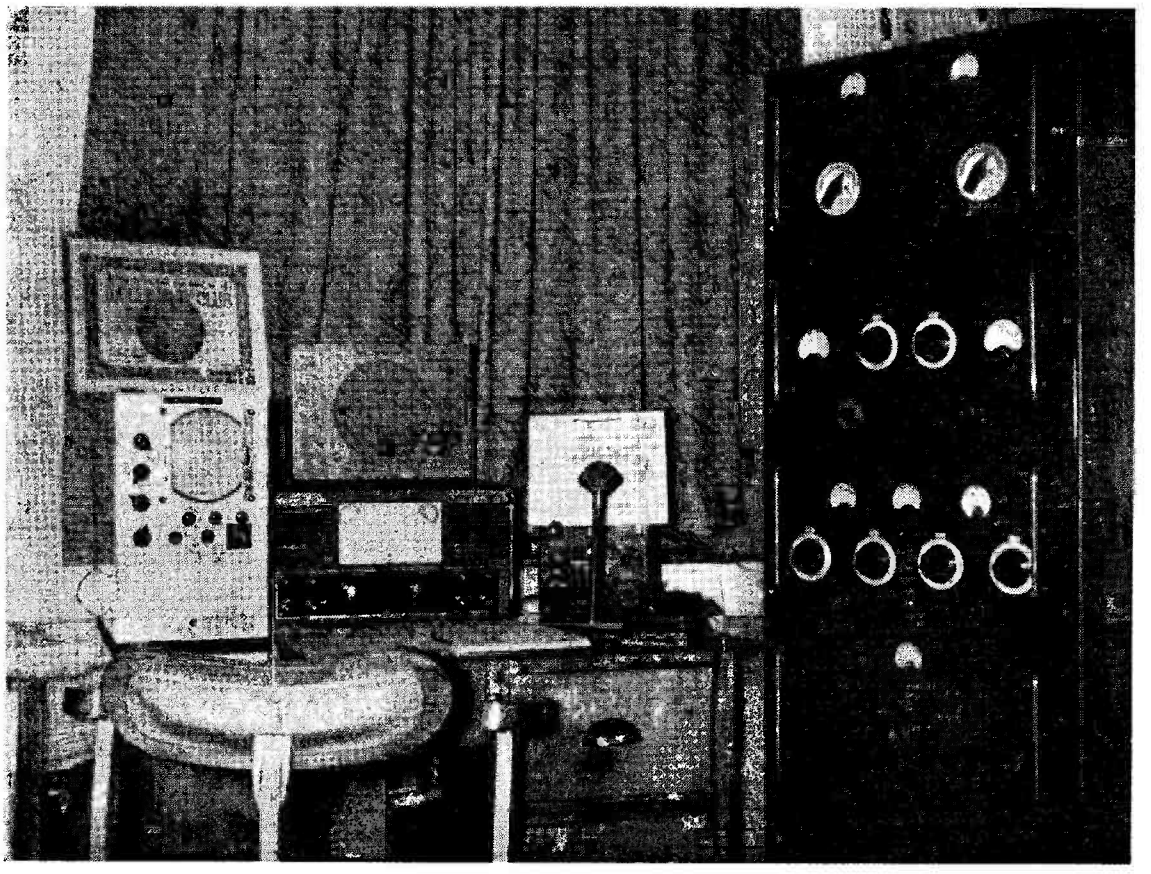
G6UI, W. T. Bassage, 14 Ryecroft Avenue, Penn, Wolverhampton, Staffs.

CORRECTION

G3AVO, S/Ldr. G. Kirkwood McKay *(ex-GM3AVO)*, c/o 20 St. Kilda Drive, Glasgow, W.4.

The Other Man's Station

G3AMM



THE neat station pictured here is G3AMM, owned and operated by G. F. C. Layzell, 26 Newland Drive, Scunthorpe, Lincs., who first came on the air in 1946, after five years' war service with the R.A.F.

His main receiver is an Eddystone 504, and the auxiliaries include an oscilloscope using a VCR-97, and a Class-D Wavemeter. The big transmitter runs a pair of PT15's, in push-pull in the PA, to 150 watts. From a 3.5 mc VFO and the necessary buffer-doubler chain, this transmitter can be operated on all bands from Eighty to Ten. Modulation is by a pair of 807's in zero-bias Class-B. The Tx is TVI-proof against most commercially manufactured TV receivers — except those using IF's in the 14 mc band !

Aerial system at G3AMM is a 68ft. top, with centre phasing stub, Zepp-fed at one end for 14 and 28 mc. For the 1.8-21 mc bands, this aerial is operated as a " long wire." Main interest at the station is DX on the 14 and 28 mc bands, 145 countries having been confirmed. A morning schedule with VK3ASD has produced a total of 164 contacts — that was when conditions on 14 mc made that kind of thing possible.

G3AMM is also equipped for Two Metres, with a modified SCR-522 and a G2IQ converter, and he can likewise perform on the Top Band — so that coverage and activity actually embrace all bands from 1.8 to 144 mc. G3AMM remarks that, as an aside from DX, he is very fond of a " nice natter " on any band, and his future plans include some /P operation.

As science master at his school, G3AMM is also one of those who are quietly making an important contribution to Amateur Radio by helping and encouraging the young — he runs the radio club at Foxhills Secondary Modern School, which can be heard on the air under call G3IHZ.

The Month With the Clubs

It is usually during this month that the first announcement is made about "MCC," the popular MAGAZINE CLUB CONTEST *which we organise for a period during November each year. In view of recent happenings on the Top Band, on which this Contest is traditionally held, we have had to marshal our ideas very carefully for this year, since it would obviously be inadvisable to run an event which would bring stations into bad repute with the authorities.*

The long ranges which can be covered after dark on the Top Band have made it inadvisable for "MCC" to be continued as an event which takes place, as hitherto, over several consecutive evenings, and we have therefore decided to run it on two succeeding week-ends.

The rules will remain exactly as they were last year, but the operating periods, totalling sixteen hours instead of thirty-two, will be from 1430 *to* 1830 *GMT on Saturday and Sunday, November* 14 *and* 15, *and again on Saturday and Sunday, November* 21 *and* 22.

Towards the latter hours of these periods it will be quite easy to cover most of the country, and the inter-Club contacts should not suffer ; possibly the fact that they will have to be worked for a little harder will add a further touch of excitement to the scoring.

Full details of the Eighth MCC will shortly be available in the form of printed sheets of Rules, and will be forwarded to the Secretaries of all Clubs known to be active.

And now follow this month's reports, from 32 *Clubs. Next month's deadline for news is* **first post on August 12,** *and they should be addressed to "Club Secretary,"* SHORT WAVE MAGAZINE, 55 *Victoria Street, London, S.W.*1.

Birmingham & District Short Wave Society

Activities continue at a high level, and next month's meeting includes a mock auction. Talks by members and a "forum" are also planned. Visitors will always be welcome at the meetings on the second Monday of the month, at The Colmore Inn, Church Street, Birmingham.

Clifton Amateur Radio Society

Recent events have included a Hi-Fi demonstration by an SWL member, a Junk Sale, an interesting Quiz devised by G3FNZ, and the first "Open to Clubs" Field Day—D/F event. G3GWD, a Club Member, is ex-VQ4CW, recently returned from Kenya.

Derby & District Amateur Radio Society

On August 1 members were to visit Sutton Coldfield, and later they are meeting for a demonstration of a home-built tape recorder by G3FGY. This event will be held in Room No. 4, 119 Green Lane, Derby, at 7.15 p.m. A special Coronation issue of the society's magazine includes photographs of NFD and cartoons ; the whole thing (except the photographs) is produced inside the Clubroom.

Kingston & District Amateur Radio Society

Membership now numbers 78, and the recent meetings have covered QRP Operation, Wobbulators, Transformers and Communications Receivers. On August 26 there is a lecture by Goodmans Industries, and on September 9 G5LC will be the speaker. Meetings are fortnightly, on alternate Wednesdays at Penrhyn House, 5 Penrhyn Road, Kingston, at 7.45 p.m.

Lancaster & District Amateur Radio Society

At a very successful July meeting, this Club had a talk from the local GPO Radio Interference Officer. There will be no meeting in August, but on September 2 there is to be a Film Show. Meetings are normally held on the first Wednesday.

Leicester Radio Society

Attendance has greatly increased during the past three months. The society, which is now in its 40th year, is believed to be one of the oldest in the country. A very extensive programme of winter events has been arranged, meetings being held on the first and third Mondays in the Clubroom, Holly Bush Hotel, Belgrave Gate, Leicester.

Liverpool & District Short Wave Club

An interesting afternoon was recently spent at Holme Moss, when two engineers showed a party of members round the entire station, even including the stores ! Another interesting event was the Club's first D/F Contest, when first prize—"The Malcolm Trophy and one Guinea"—was won by G3CK, assisted by G3EGX. All service personnel stationed in the Merseyside area, and any amateurs or SWL's, are invited to the meetings—Tuesday evenings at St. Barnabas Hall, Penny Lane, Liverpool 15.

Medway Amateur Receiving and Transmitting Society

Their Coronation Hamfest was held on July 12 and was, we understand, an enormous success. Unfortunately the advance notice did not reach us until after the last issue had gone to press.

Norwich & District Radio Club

This club is now flourishing in its newly-acquired headquarters at The Old Comrades' Club, St. Faith's Lane. The committee has put in a lot of hard work in getting the clubroom into shape, and the results have justified it. A programme of films, talks, outings and so on has already been compiled to take the club up to Christmas. New members will be welcomed at any meeting.

Nottingham & District Short-Wave Club

Now affiliated to Sherwood Com-

Derby & District Amateur Radio Society produce their own " G3 Experimental Radio Derby " magazine, and each month there is a printing and production session, with editor G3FGY doing the thinking on his typewriter while the workers wait for copy! Others in this photograph are G2CVV (secretary, nearest G3FGY), G3IBL, G3IFX, and members Brown, Richins, Richardson and Taylor.

munity Association, they have a new clubroom in the C.A. building at Woodthorpe House, Mansfield Road, and meet there on Monday and Thursday evenings. Two stands were to be run at the Sherwood C.A.'s garden party in late July—one with a working amateur station and the other with a demonstration of tape recorders. Lectures, both elementary and advanced, are being arranged for the coming season. Note QTH of new Secretary—in panel.

Singapore
Amateur Radio Transmitters' Society

We are asked to state that this Club's postal address has been changed and is now P.O. Box 176, Singapore. The Secretary and Treasurer is Mr. S. P. Shotam.

Southend & District
Radio Society

Recent events have included a talk on Frequency Measurement, NFD, and a demonstration of the two Field Day transmitters. The talk on LF Amplifiers (July 10) was the last before the summer break, but on July 18 there was a Garden Party, and on July 25-26 the Club lent a hand at the International Radio Controlled Models Contest in Southend.

Torbay
Amateur Radio Society

The autumn Hamfest has been fixed for Sunday, October 11, at the Oswalds Hotel, Babbacombe. Entries for the Constructors' Cup have been coming in, but judging had not taken place at the time of writing. Intending visitors to Torquay and district are invited to communicate with the Hon. Secretary or any member. Meetings are held on the third Saturday at the YMCA, Torquay.

West Lancashire
Radio Society

This club is now meeting once again at its original headquarters—above Gordon's Sweet Shop, St. Johns Road, Waterloo, Liverpool 22. Meetings will be held at 8 p.m. on Tuesdays, starting in September, and will include film strips, films, lectures and Morse and Technical classes.

Wanstead & Woodford
Radio Society

Meetings take place every Tuesday evening, the shack having been reorganised and provided with a work-bench for those interested in constructional activity. The Club Tx, G3BRX, is on the air every Tuesday evening on Two Metres and occasionally on the Top Band. Morse classes have now begun, and are held in alternate weeks. Five members took the Radio Amateurs' Exam. on May 1. Visitors are always welcome at the meetings.

Hastings & District
Amateur Radio Club

This Club put on a very fine show

at the local Hobbies' Exhibition, and their station, G6HH/A, brought the Club some good publicity for the entire week. A display of members' home-constructed gear was also staged, and this attracted much attention and favourable comment. Meetings continue at the Saxon Cafe, the next being on August 11 and 25. Amateurs visiting the town on holiday are cordially invited to attend.

Army Apprentices School Radio Club

Summer evenings are actually bringing increased attendances, and the Clubroom and shack have been crowded with Apprentice Tradesmen busy with constructional work or grouped round the audio oscillators for Morse. There are several enthusiastic Burmese members, whose verbal comments on the Morse (which they send in English) are said to be amusing !

Brighton & District Radio Club

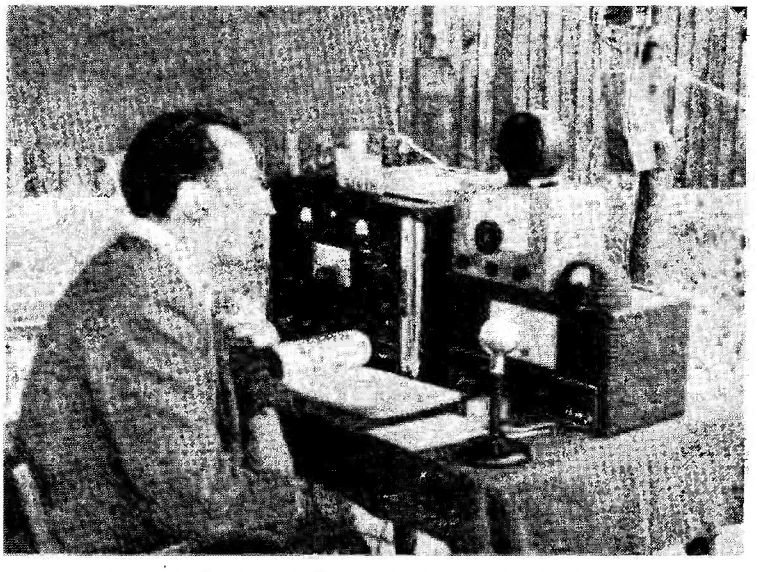
August will be completely informal except for a special meeting on the 18th. The autumn season opens with a talk on Crystal Microphones and Pick-Ups, on September 8. The Club Tx, G3EVE, will be on the 80-metre band on the first Tuesday of each month, from August onwards. All visitors to Brighton will be welcomed at the H.Q. (Eagle Inn, Gloucester Road) on any Tuesday during August, meetings beginning at 8 p.m.

Malta Amateur Radio Society

At the AGM Mr. J. Spafford, ZB1BZ, was elected President and Secretary, and Mr. Schinas re-elected Treasurer. Meetings are on the first Sunday of the month (from October to June) at the De La Salle Palace, Kingsway, Valetta, and a hearty welcome awaits visitors.

QRP Research Society

Although this Club holds no meetings and has no Clubroom, it caters for an enthusiastic band of amateurs who believe in using the smallest possible power for their communication. A monthly journal is published, and members are kept in touch with each other's achievements and with the latest developments in this interesting sphere.



A portable occasion for the Purley & District Radio Club, when G2AYM was operated /A for a Coronation Fete at Purley on June 6. G3FTQ was at the controls when this was taken, the equipment used being a Panda PR-120-V and an Eddystone S.640 with Radiovision Preselector. Operation was on 20-and 80-metre phone.

South Manchester Radio Club

Forthcoming lectures cover The Absorption Wavemeter and Field Strength Meter (August 14) and Experiences in Building a TV Receiver (August 28). The RAE course is well under way, and new members for this course will be welcomed any Monday evening at the Hq.—Ladybarn House, Mauldeth Road, Manchester 14.

South-West Essex Radio Club

Meetings continue on Tuesdays, 8 p.m. at The Shack, 367 Rush Green Road, Romford for informal discussions and constructional work. It is hoped to have the Club station, G3FZF, on the air again after some months off owing to TVI trouble. A Field Day has been arranged for September 6, and gear is being collected for this occasion.

Grafton Radio Society

Grafton held a very successful Field Day on Parliament Hill during the week-end June 20-21 ; three stations were operated in the 3.5, 7, 14 and 144 mc bands, and many interesting contacts were made. Grafton wish to thank all those stations who helped to make it their best Field Day as yet. They are now closed, until early September, for the summer recess.

Slade Radio Society

Recent events were a talk on Insulation for Radio Purposes, and a D/F Contest which attracted a very satisfactory number of entrants. On August 21 there will be a talk on the Radio Amateur's Workshop, and on September 4 a Junk Sale. Both meetings, as usual, at Church House, Erdington, Birmingham.

Soar Valley Radio Club

This Club has just been formed in Loughborough, and 23 members turned up to the inaugural meeting in July. All future meetings will be held at the Great Central Hotel, Loughborough, on the third Wednesday of the month, the next being on August 19 at 7.30 p.m. All branches of electronics, from transmission to tape recording, will be covered, and a beginners' class will be arranged if there is sufficient demand.

Wirral Amateur Radio Society

Two D/F Contests have been

held this summer, and a record entry was expected for the event on July 19. A talk on the subject was given by G3AKW on July 8. Meetings are held every other Wednesday at the YMCA, Birkenhead, the next two being on August 5 and 19.

Yeovil
Amateur Radio Club

The weekly meetings (Wednesdays) continue, and a recent event was a talk on SWL activities by John Hall, of Croydon. Tests have been carried out concerning BCI on the Light Programme from TV receivers, and various makes have been classified in this respect. A 21-mc Ground-Plane aerial has been erected and is under test in conjunction with G3CMH, the Club station.

Cannock Chase
Amateur Radio Society

At the July meeting the officers for the year were elected, and G3HRR demonstrated his microphone pre-amplifier. Next meeting is on August 6, when G2AMG will speak on the Basic Theory of Aerial Radiation. The Annual Dinner will be held on Thursday, October 15, at the Central Hotel, Bradford.

Ixworth Radio Club

The recent AGM confirmed a very satisfactory year's work. G3GIH was re-elected Chairman, and all the committee continue in office. Future meetings: August 15, Junk sale; September 19, "1155 Conversions"; October 17, "TV Theory."

Stockport
Radio Society

Meetings are now held in new premises at ATC Headquarters, St. Petersgate, Stockport, on alternate Wednesdays at 8 p.m. The August lectures are fixed for the 5th and 19th with Morse practice on the intervening Wednesdays. A recent contest between this Club and the South Manchester Club was much enjoyed in spite of adverse local conditions.

Surrey
Radio Contact Club (Croydon)

The August meeting is informal, and YL's, XYL's and friends are invited to a non-radio film show to be given by a member. In September the usual Sale takes place, and a programme of talks, visits and so on has been arranged to fill the winter season. All meetings are on the second Tuesday at the Blacksmiths Arms, South End, Croydon.

Chester & District
Amateur Radio Society

Something of interest is laid on every Tuesday evening, and the Club would like to see new faces at any of these events. The full winter programme will be notified later. Note the Secretary's change of address, as shown in panel.

NAMES AND ADDRESSES OF SECRETARIES REPORTING IN THIS ISSUE

ARMY APPRENTICES SCHOOL: F. A. Hall, G3GBU, Tels. Dept., A.A.S., Arborfield, Reading.
BIRMINGHAM: A. O. Frearson, 66 Wheelwright Road, Birmingham 24.
BRIGHTON: R. T. Parsons, 14 Carlyle Avenue, Brighton 7.
CANNOCK CHASE: C. J. Morris, G3ABG, 58 Union Street, Bridgtown, Cannock.
CHESTER: N. Richardson, 23 St. Mary's Road, Dodleston, Chester.
CLIFTON: W. Wooller, G3GYZ, 7 Neptune House, Neptune Street, London, S.E.16.
DERBY: F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.
GRAFTON: A. W. H. Wennell, G2CJN, 145 Uxendon Hill, Wembley Park, Middx.
HASTINGS: W. E. Thompson, 8 Coventry Road, St. Leonards on Sea.
IXWORTH: P. G. Wright, Thurston Road, Great Barton, Bury-St.-Edmunds.
KINGSTON: R. Babbs, B.Sc., G3GVU, 28 Grove Lane, Kingston, Surrey.
LANCASTER: A. O. Ellefsen, 10 Seymour Avenue, Heysham.
LEICESTER: W. N. Wibberley, 21 Pauline Avenue, Belgrave, Leicester.
LIVERPOOL: A. D. H. Looney, 81 Alstonfield Road, Knotty Ash, Liverpool 14.
MALTA: J. Spafford, ZB1BZ, Argus House, Paceville, St. Julians, Malta.
MEDWAY: D. H. Brett, 14 Connaught Road, Luton, Chatham.
NORWICH: D. Youngs, 53 Salisbury Road, Norwich.
NOTTINGHAM: N. D. Littlewood, 129 Standhill Road, Nottingham.
QRP RESEARCH SOCIETY: J. Whitehead, 92 Ryden's Avenue, Walton-on-Thames.
SINGAPORE: S. P. Shotam, Box 176, Singapore.
SLADE: C. N. Smart, 110 Woolmore Road, Birmingham 23.
SOAR VALLEY: K. B. Roulston, G2BJN, 28-9 Church Gate, Loughborough.
SOUTHEND: J. H. Barrance, M.B.E., G3BUJ, 49 Swanage Road, Southend.
SOUTH MANCHESTER: M. Barnsley, G3HZM, 17 Cross Street, Bradford, Manchester 11.
SOUTH WEST ESSEX: B. W. LeGrys, G3GOT, 75 Shaftesbury Road, Romford.
STOCKPORT: G. Phillips, G3FYE, 7 Germans Buildings, Buxton Road, Stockport.
SURREY (CROYDON): S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon.
TORBAY: L. D. Webber, G3GDW, 43 Lime Tree Walk, Newton Abbot.
WANSTEAD: C. Stevenson, 45 Dacre Road, London, E.13.
WEST LANCS: T. Searle, 11 Sefton Drive, Thornton, Liverpool 23.
WIRRAL: L. Roberts, G3EGX, 18 Croxteth Avenue, Liscard, Wallasey.
YEOVIL: D. L. McLean, 9 Cedar Grove, Yeovil.

Station GW3HPM/A of Chester & District Amateur Radio Society, on the air for N.F.D. in June last.

SMALL ADVERTISEMENTS

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

OFFICIAL APPOINTMENTS

WIRELESS STATION SUPERINTENDENT required by the NIGERIAN GOVERNMENT Posts and Telegraphs Department for one tour of 18 to 24 months in the first instance. Commencing salary according to experience on scale £864 rising to £1,392 a year. Gratuity £100/150 a year. Outfit allowance £60. Free passages for officer and wife and assistance towards cost of children's passages or their maintenance in the United Kingdom. Liberal leave on full salary. Candidates must have had wide practical experience of modern radio techniques and equipment, in particular V.H.F. equipment, and preferably also V.H.F. multi-channel equipment.—Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/28927/SQ.

SITUATIONS VACANT

WIRELESS MECHANIC required for maintenance of V.H.F. R/T equipment. Must have sound knowledge of wireless engineering, with at least three years' experience of maintenance of wireless communication equipment, including V.H.F. apparatus ; able to use technical equipment and simple machine tools. Ability to drive car an advantage. Pay 149s. 11d. x 2s. 6d. — 164s. 11d. per week of 44 hours net, plus overtime and allowances averaging about 50s. per week when employed on shift duties.—Applications in writing to Wireless Engineer, Metropolitan Police Wireless Station, Grove Park, S.E.5.

TRADE

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

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

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

45/- PAID for new boxed 813's ; 20/- for TZ40's, 24G's, 811's. Send details other new surplus valves.—Box 1280, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

UM1's by Woden, 44/-, post paid ; manufacturers' surplus. New, unused, in original packing.—Woodsons, 76 Regent Quay, Aberdeen.

VALVES (over 3,000 in stock): 12AT7, 6BW6, 6CH6, 6SN7, 807, 6V6, 9/-; EF91, 6AM6, EC91, EL91, 6J6, 6SJ7, 12AX7, 7/6 ; 6C4, 6J5, 6J7, 6N7, EF92, EAC91, 6/-.—Skillman, Franchise Street, Weymouth.

SMALL ADVERTISEMENTS, TRADE—*continued*

45/- EACH offered for 813 type valves.—Pype Hayes Radio, 606 Kingsbury Road, Erdington, Birmingham 24.

FREQUENCY METERS, 1.700-2.000 mc fundamental in 8 ranges, 100 kc and 10 kc calibration points of .002% accuracy. Full vision or vernier dial; VFO output. Also made: VFO units. Send for particulars.—Box 1282, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

WANTED: BC610 Hallicrafters, ET4336 transmitters SX28's, AR88's, receivers and spare parts for above; best prices.—P.C.A. Radio, The Arches, Cambridge Grove, W.6.

WANTED: R.C.A. Speech Amplifiers, type MI-11220 J or K, and aerial tuning units BC939a.—Offers, stating quantity and price, to P.C.A. Radio, The Arches, Cambridge Grove, W.6.

WANTED: Power Supply Units for No. 33 transmitters (Z.A.10729). — Call or ring, P.C.A. Radio, The Arches, Cambridge Grove, W.6 (*Riv. 3279*).

RADIO OFFICER'S Training. Day, Evening and Postal instruction.—Supervisor, The Wireless School, Manor Gardens, London, N.7.

READERS' ADVERTISEMENTS

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

AMATEUR selling up. Complete B2 with three crystals, £13; Eddystone Bug Key, £2 10s. or offers; many valves, components, *RSGB Bulletins* from November 1949. Please write for list.—Williams, Flat 4, 571 Kingsbury Road, Kingsbury, London, N.W.9.

AR88, Commercial 25w. Tx, Phone and CW, 3 to 60 mc, with HRO-type plug-in coils; 200 Rx valves, 30 Tx valves, 4 CRT's, power supplies; 30 m/c meters, power chokes, transformers, etc.; £65 the lot. Buyer collects. — Box 1281, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

EDDYSTONE 750, with meter. Rees-Mace ship's radio, AC/DC; E.M.I. amplifier, 30-watt modulator, rack mounting; TV 10in. and 9in., table models; require repair; less than 12 months' use; AC only. Disc Recorder and PA 10-watt speaker, portable. Offers wanted; s.a.e., please.—Rich, 10 Wemyss Road, Blackheath, London.

COMMERCIAL 'SCOPE, £10; Motek Deck, £10; amplifier for same, £5; 50-watt all band-switched Tx (Labgear couplers), £15; TVI-proof 813 PA, bandswitched, £10; Q-Max 150-watt Turret, £8; home-built Communications Rx, £15; 6-stage P/P modulator and P/Pack, £10; CRM 121A,. £5; VCR97, 10/-; 813, £2. WANTED: Camera Tube; prop motor.—Call or write: Hill, 13 Staffordshire Street, Peckham, London.

SMALL ADVERTISEMENTS, READERS—*continued*

FOR SALE: 1224A, as new, with circuit, 70/-. WANTED: National 1-10, good working order. —B. Cheffings, Grimoldby, Louth, Lincs.

B2 Tx/Rx P/Pack, good condition. Offers, please. Prefer local sale. R107 modified, £7. Buyer collects. — Morris, 54 Maidenbower Avenue, Dunstable, Beds.

PROFESSIONAL 150-watt Phone/CW Transmitter, VFO, power/packs, 10, 20, 40, 80, complete rack. Offers?—G3ATL, The Limes, Hugglescote, Leicester.

BC348N modified 200/250v. AC, new, £21 or near offer.—Austin, 20 Buckland Road, Maidstone.

VIBROPLEX Champion Bug-Key for sale, £2. o.n.o. Or exchange waterproof car cover.—Thomas, 1 Vale Terrace, Resolven, Glam.

URGENTLY need good camera, will exchange following receivers: R107, MCR1, CR100 (no case), valves, phones, speaker, etc. Buyer collects.—Box 1283 (Wilts.), Short Wave Magazine, 55 Victoria Street, London, S.W.1.

VRL Communications Receiver 1.4 - 28 mc ; 19 valves, two RF's, Xtal filter, Xtal calibrator, etc., manual ; little used ; £20. — Brown, 62 Caernarvon Close, Shotton, Nr. Chester.

VALRADIO Converter-type 50.S; input 50v. DC, output 230v. 50 cycles AC ; little used ; cost £17 12s. 0d. What offers? — R. Robbins, Kewaray, Belle Vue Road, Henley-on-Thames, Oxon.

AMATEUR emigrating. Lots of good gear, including Woden De Luxe HT and Filament Transformers, Tx valves ; fair prices. Send for list. —Box No. 1284, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

G3DA disposing (locally, if possible) new BC342, rack mounting 144 mc receiver with CV53 and 717A RF stages, 717A mixer, three IF's BFO, etc.; three-stage manually-tuned oscillator. Reasonable offers or exchange camera or enlarger.—91 Central Avenue, Liverpool 19.

LM7, modulated and spares, £25 ; BC453, £2 ; CV105 oscillator, £2 ; R115N, boxed (and spare valves), £6 ; 6ft. standard enclosed rack, £3 ; 6V6-6N7-parallel 807 all-band Tx, valves, meter, etc., £5. Numerous variable condensers, valves, switches, slow-motion dials, meters, etc.—186 Garretts Green Lane, Birmingham 26.

NATIONAL 1—10, complete range coils, handbook, £8 (carriage paid).—Box 1286, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

WANTED: Operating Manual for Taylor Model 45 valve tester. Large selection of old-type receiving valves (new) for sale at 10/- each.—GM2BMJ 5 Burntscarth Road, Locharbriggs, Dumfries.

SMALL ADVERTISEMENTS, READERS—*continued*

EDDYSTONE S740 for sale, with 8in. speaker in black crackle case, £30; both in excellent condition. West London area.—Box 1287, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

WANTED: *Bulletin*, August 1926, February 1928, October 1934, February 1941. *QST*, before 1925, April 1945. *CQ*, 1945/46. *Practical Wireless*, Nos. 441, 457, 459, 511. 512. Most *Radio, R/9, Amateur Radio, Break-In, QRP*, November 1949.—G3IDG, 95 Ramsden Road, London, S.W.12.

FOR SALE: Hallicrafters SX28, mint condition, £50. WANTED: Good AR88D. Will collect.—80 Ellesmere Street, Moss Side, Manchester 16.

WANTED, privately, Automatic Morse Sender, tape perforator; Morse recorder; El-Bug. Must be in good condition.—Details, please, to Box 1288, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

AR 77 (continuous 0.55 to 30 mc, separate dial amateur bands, limiter, xtal filter, etc.). Best offer?—G3COI, 65 Hurst Street, Birmingham.

WANTED: Manual 358X (your price paid); also coil units (state price).—61 Salt Street, Manningham, Bradford 8, Yorks.

EXCHANGE AR88, mint condition, plus cash adjustment for ET4336. Exchange set HRO bandspread coils for BC-221. FOR SALE: RCA 'Scope, £15; MCR1, complete, £5 10s.; Homelight 28-volt lighting set, new, £8 10s. Will collect.—Box 1290, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

WANTED: Prop Pitch Motor and pair of Selsyns.—Write or 'phone G3DJQ. Olver, Bonehill Lodge, Tamworth *710*.

VALVES at 3/6; 6A7, 6B7, 6C6, 6H6M, 6SC7, EB34, EF36, EF39, 5/-; 6J6, 5Z4M, 5Z4G, 6X5GT/G, VR105/30, EF91, EL91, EB91, EAC91, 6SN7, ECC35. Also xtals, relays, meters, dynamotors, carbon mics. transformers, Taylor "60" Signal Generator, etc.—Box No. 1289, The Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

358X EDDYSTONE; 10-2000 metres, xtal, flywheel tuning; direct calibration, meter, handbook; good condition; £14.—16 Coniston Road, Reddish, Stockport.

832s, unused, 21/-; KT44's, 3/-; PT15's, 5/6; Acorn triodes, 2/-. All post free.—G3CTO, 47 Warwick Avenue, Slough, Bucks.

WANTED: S640 Receiver, even requiring adjustment or less valves; state condition and price. SALE: SCR522 Tx, complete valves, AC, p/pack, £5; BC-455, IF regeneration, AC, p/pack, 65/-; 21 mc converter, 20/-; 6in. TV receiver, 45 mc, works FB, £15 o.n.o.—G8TS, 80 Byworth Estate, Farnham, Surrey.

HALLICRAFTERS Sky Champion S20R for sale (due owner's death); excellent condition; nearest offer £10.—Mrs. Edwards, 34 Montpellier Road, Exmouth.

WANTED: Communications Receiver, condition unimportant; also junk, valves, Tx gear, etc.; anything considered.—6 Mount Pleasant, Moorside Edge, Slaithwaite, Huddersfield.

SMALL ADVERTISEMENTS, READERS—*continued*

WANTED: AR88D, good condition.—Write: R. Saker, 46 Old Farleigh Road, Selsdon, South Croydon, Surrey. (Or 'phone: *Sanderstead 2907* after 6 p.m.).

SALE: Tape Recorder, Clifton MQ1, in mint condition, hardly used, with Reslo mike and 4 reels tape, £30 o.n.o.; or exchange 50-60 watt amp./mod. with cash adjustment.—Upperton, 72 Kingsmead Avenue, Worcester Park.

SALE: 50-watt Woden Modulator, good condition, working; pair 807's; UM2, etc.; £17. BC-348H, good condition, working; internal 230v. P/Pack; £17.—Roberts, Glencoe, Belmont Grove, Rawdon, Nr. Leeds.

WANTED: Table-top Transmitter, 50-150 watts; preferably bandswitched and TVI-proof; power/pack immaterial. Also compact 2-metre Tx.—Box 1297, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

522 Tx, brand-new; complete all valves and 8 mc xtal; £5. 6AG7's, brand-new, unboxed; 8 only; offers for each or lot? Wolf Cub ¼-inch electric drill, unused, in maker's carton, £5. *Electronic Engineering*, 25 copies, 1947-51, 8/6; *A.R.R.L. Handbook*, 1948, 10/-. WANTED: National HFS VHF Receiver; SX24, S2OR; top prices paid if in mint condition.—Box 1293, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

VHF CONVERTER, 18-205 mc, Q-Max RVA 2, 12AT7's, P/P RF, Mix/Osc., internal 200-250 AC power pack; full vision, 6in. calibrated dial; black crackle cabinet; IF output 14 mc; excellent performance. Original cost £26. Absolutely brand-new and in mint condition; £17 10s. 0d. o.n.o.—Box 1294, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

150 WATT DE LUXE Tx 10, 20, 40, 80 metres; Northern Ireland area; Phone/CW; standard all-band tank; six-foot rack, cellulose grey; five meters; S640 Rx, D104 mike, VFO stabilised calibrated all bands; self-contained P/Pack, EF50-6J5-807; station-controlled single switch; £60 (or sell separately).—Box 1292, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

TWO G.E.C. TRANSFORMERS, 115v. pri., 1250-0-1250v. 150 mA, £1 each; Denco Turret, 4.5 m-2000m., 6 bands, bandspread tuning, with two 1.6 mc IFT's, new, £5 10s. 0d. — Gosling, Walton-le-Welds, Loughborough, Leics.

FOR SALE: Eddystone S640, good condition, very little used, recently overhauled and re-aligned, £15. Buyer collects (Manchester). — Box 1285, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

BC221 with self-contained p/pack, £20; 145 VFO, £4; RF27, £2; RF25, 12/6. WANTED: TV Freq. Meter, "Viewmaster."—Box 1295, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

LICENSED AMATEUR clearing up shack. Sale: Hambander, little used; also APR4 plus TN16. WANTED: AR88D, perfect or partly dismantled. Offers, please?—Box 1296, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

EDDYSTONE 680, well maintained, £65 (carriage paid); 1952 *A.R.R.L. Manual*, 10/-.—R. Grain, 15 Waverley Gardens, Grays, Essex.

BARGAIN: Complete Station for sale; professionally-built Tx, rack-mounted; 10, 20, 40, 80 metres; CW/Phone; linked coupled throughout; VFO; hard valve regulated supply; aerial relay, xtal mike, Rx Hallicrafter 38's; AC mains. Stacks extras, trar valves, GDO, coils, etc.; £50 the lot.—G3HMS, . ppleby, 69 Matilda Street, London, N.1.

SALE: WT Unit, 120v. (DC), stabilised (30/-); TZ40 (15/-); 832 (15/-). Also 10m. converter (30/-).—80 East Bawtry Road, Rotherham.

SALE or EXCHANGE: B28 (CR100) Rx, superb condition, £22 10s. 0d. WANTED: Portable Typewriter; TV parts.—G2YN, The Croft, Wilton, Salisbury.

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