

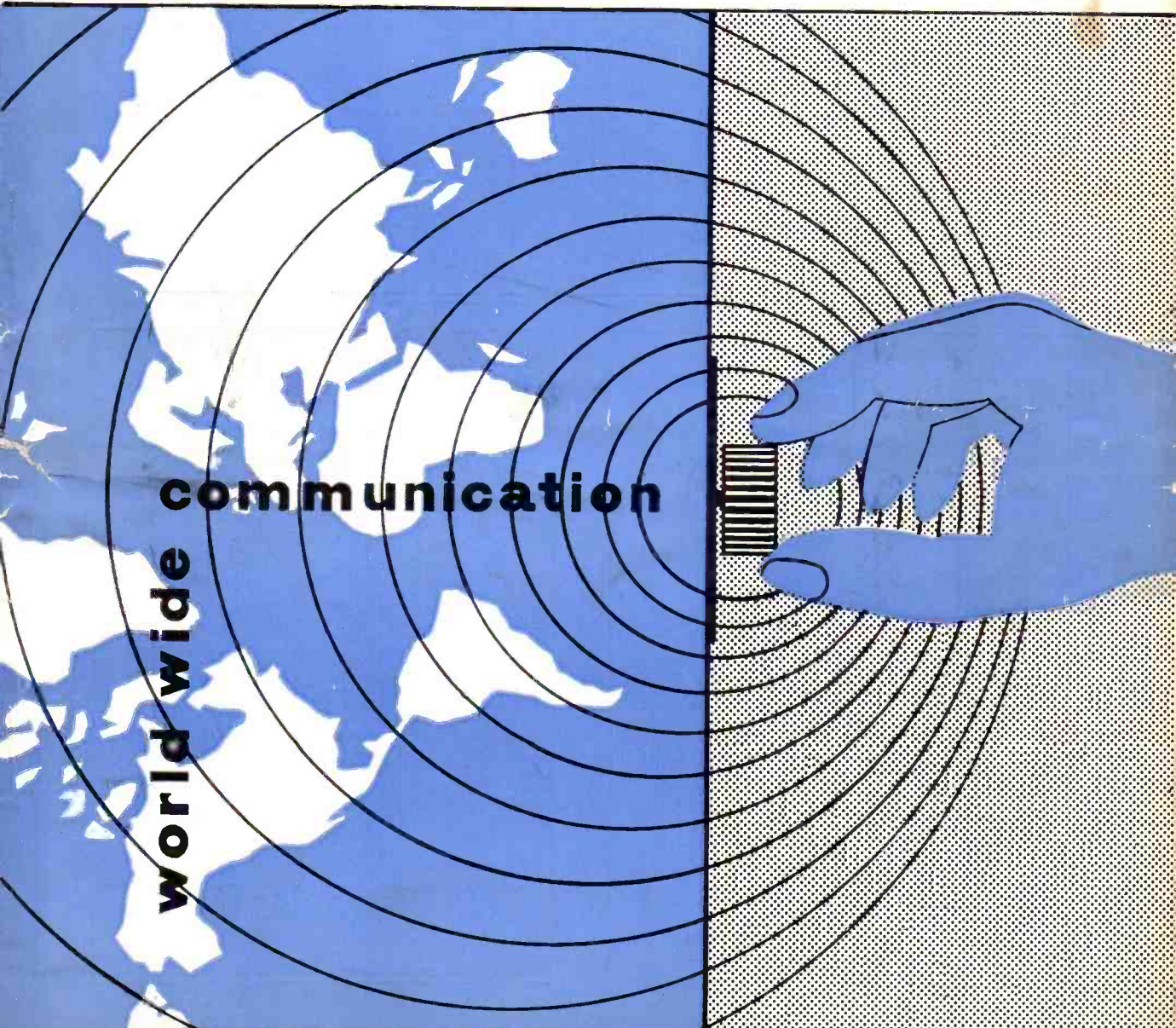
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# The SHORT WAVE Magazine

VOL. XVI

JUNE, 1958

NUMBER 4



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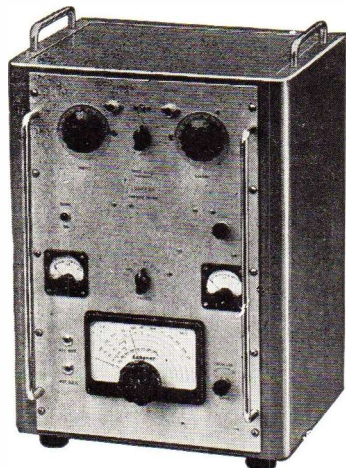
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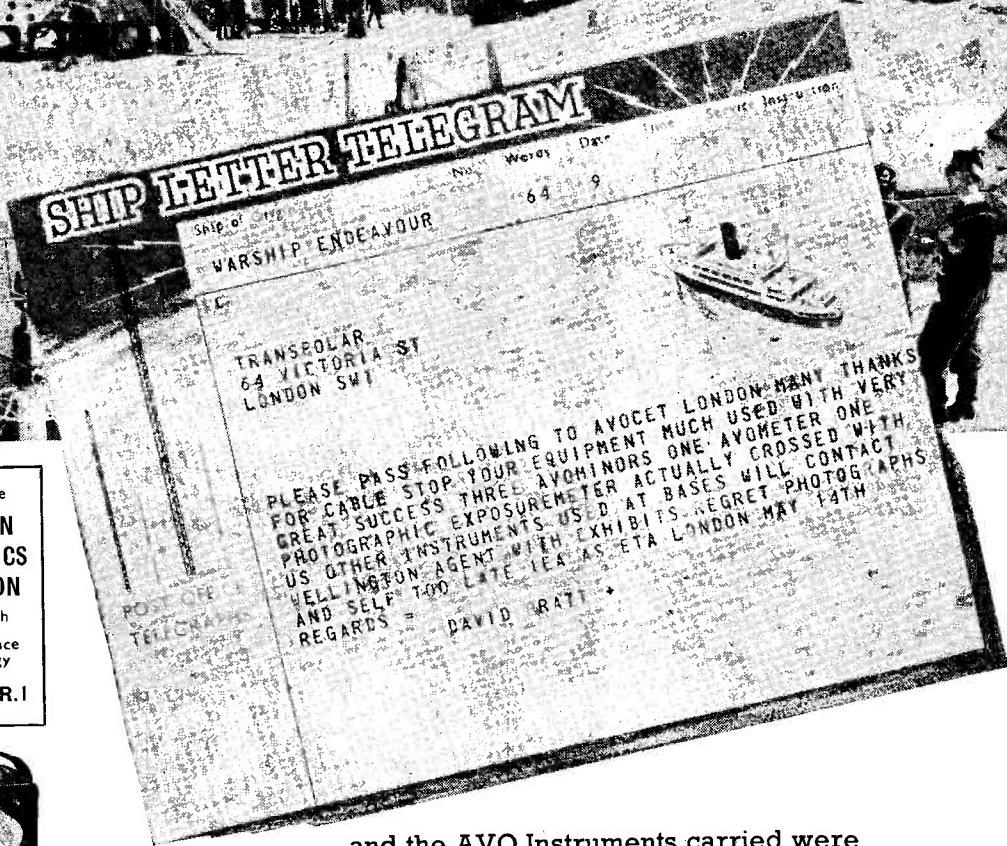
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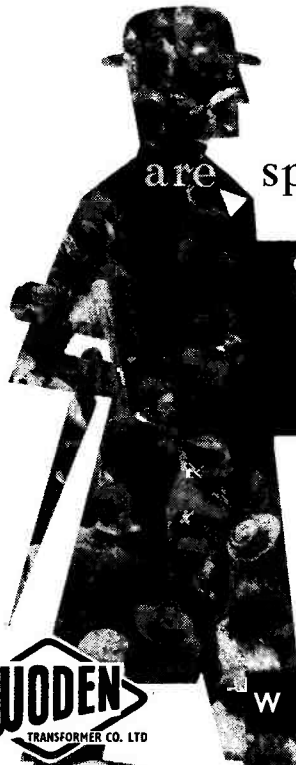
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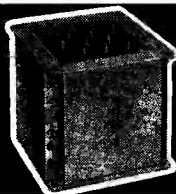


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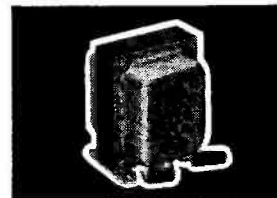
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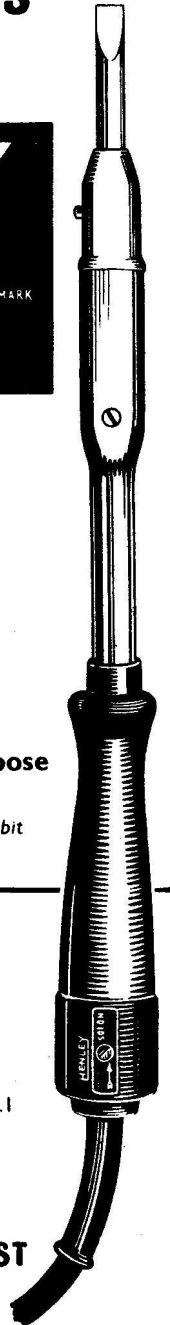
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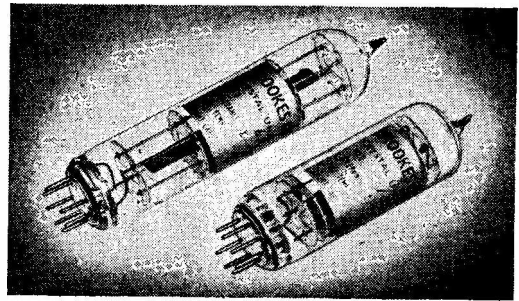
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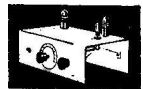
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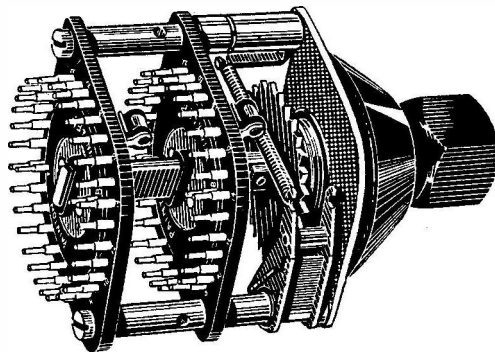
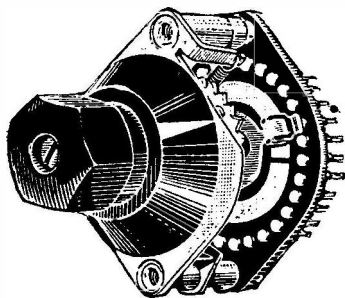
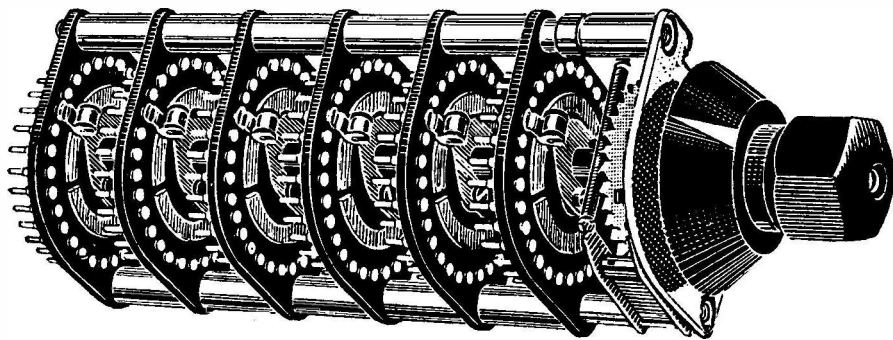
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# The SHORT-WAVE Magazine

## EDITORIAL

**Purpose** Under the headings of "Allocations," "Equity" and "Justification" we have, in the last three months, outlined broadly what might be called the Argument for Amateur Radio in face of the Pressure on Ether Space—it being agreed that the ether is free for all to use, subject to reasonable safeguards.

Now to deal with some other questions so frequently asked—"What good are amateurs?"—"What do they do?"—"Can they serve any useful purpose?". The quick answer is, of course, that the mere fact of there being some 10,000 of them in the U.K. alone, and about a quarter of a million in the world of the West as a whole, is by itself a good enough reply to these questions. If no benefits flowed or advantages accrued from the pursuit of Amateur Radio, it could not possibly exist on such a scale—and continue to expand at the rate it does.

It is this fundamental interest in and practical knowledge of radionics which make the radio amateur, and the Amateur Radio movement, so important from the national point of view. As a nation, we are leaders in the Electronic Age into which the world has now moved. Amateur Radio is one of the influences by which radionics engineers and technicians of the best type are produced. This is not an imaginary or high-falutin' conception of the value of Amateur Radio, nor even a theoretical appreciation of its potential usefulness, but is actual fact, proved over and over again. These lines will fall under the eye of some of the leaders, senior engineers and executives, of the radio industry, to say nothing of many "lesser lights" in it—let them ask themselves how much they owe to Amateur Radio, and whether it was not as amateur transmitters that they got their start!

For its educative influence alone, therefore, the healthy development of Amateur Radio is of the utmost importance to the nation. Those who, as juniors, learn the fundamentals simply because they want to get on the air, go on to take out a licence, and then have ideas of becoming professional, are regarded within the radionics industry itself, and by the Services, as being of the very best.

And in the larger picture, can it be seriously suggested that tens of thousands of radio amateurs, in daily communication with one another all over the world—and to a lesser degree the correspondence, personal contact and mutual interest which such communications entail—do not together contribute anything to the international understanding and co-operation which has so far eluded the politicians?

The fact is that the true potential of Amateur Radio is as yet only dimly realised even within the circle of its own adherents!

Austin Fobell  
G6FO.

# Controlled Carrier Modulation Unit

## PRINCIPLES OF OPERATION AND A PRACTICAL CIRCUIT

J. A. PLOWMAN, A.Brit.I.R.E. (G3AST)

*Here is another approach to the problem of efficiency modulation. In this circuit, the audio drive on the screen of the PA produces the effect of amplitude modulation to a much greater extent than is usual with efficiency systems. Coupled with this is a high degree of carrier control, in that the actual carrier level increases in proportion to the audio. The action of the circuit is such that though the PA may be driven to peak input at a higher HT voltage than normal, it need not be over-run. The system is claimed to give good quality, far superior to "clamp control," and an 8 : 1 ratio of resting to full carrier is recommended as a result of practical tests.—Editor.*

It is not often that one has the time (or the inclination) to study a problem from first principles—but the writer was forced into just such a situation when he went into temporary accommodation while awaiting completion of a new QTH in the West Country.

The object of the study was to evolve a system of modulation that was neat, particularly compact, free of serious distortion, and yet allowed the RF power amplifier to run at

more nearly rated CW conditions.

It became quite clear that if the objective was to be realised, *i.e.*, the production of a table-top rig capable of forty or fifty watts 'phone, efficiency modulation was the only answer. Thus, the decision to adopt efficiency modulation triggered off a long series of studies and experiments that have culminated in the production of the prototype at present being used, as described in this article.

First, it is essential to realise why efficiency-modulated RF PA systems seem to compare so poorly with their anode-modulated counterparts. Consider a typical 807 PA stage running at an HT of 425 volts at the anode, the screen being fed from a voltage divider from the same HT rail to provide 300 volts. On CW, using the voltages quoted, the input would probably be in the region of 40 watts, a typical all-round input figure. When, however, the requirement is that this stage be modulated:

- (a) Using anode modulation and maintaining the PA voltages as they stand, at 100% modulation depth the instantaneous amplitude of the modulator voltage is equal to the HT rail voltage, such that the anode will swing between 0 and 850 volts, the screen swinging between 0 and 600 volts. The peak input is therefore *four times* the CW input, as the PA, running Class-C, presents a pure resistance to the modulator, and thus consumes twice the current at twice the HT. The peak power input with anode-and-screen modulation is thus 160 watts.
- (b) With screen modulation, and assuming the same HT rail voltages are available as before, we have to consider another

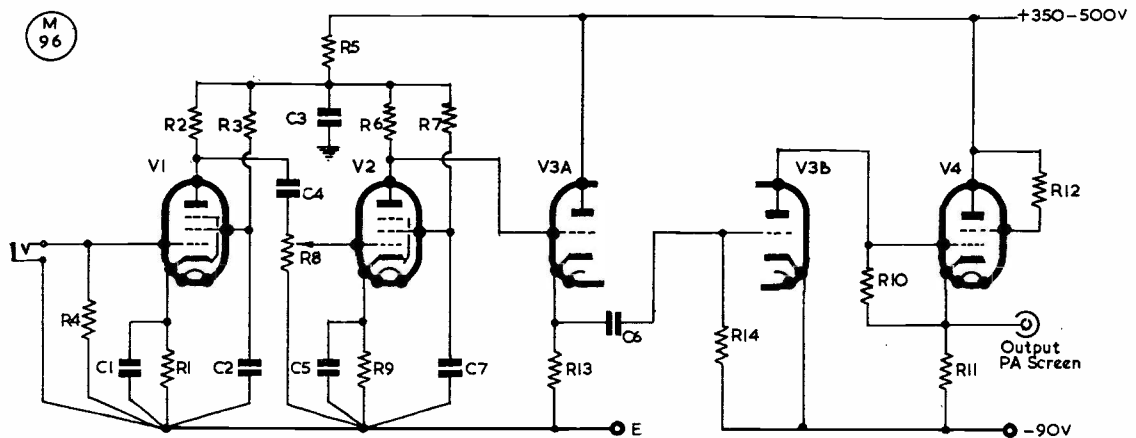


Fig. 1. Circuit complete of the controlled-carrier modulation unit designed and described by G3AST. The modulator drives on the screen of any tetrode or pentode PA, from a 6AQ5 to an 813, and it is possible to run the PA up to full CW rating under modulation. The action of the circuit is explained in the text, and the output waveform shown in Fig. 4.

factor, that of linearity: instead of taking the CW input as corresponding to no-modulation level, the latter has now to be referred to the peak modulation conditions, *i.e.* at peak modulation, corresponding to a "maximum efficiency" demand from the modulator, the PA is running flat out in the CW condition, at only 40 watts input in this example.

"No modulation" conditions require that, to preserve linearity, the input be reduced to one quarter of this value, which cuts the valve back to a mere 10 watts.

By comparison, therefore, the efficiency (screen) modulator takes a very second place, and it is easy to see from these figures that at the receiving end a 40 watt CW transmitter efficiency-modulated sounds like a 10-watt transmitter anode modulated.

This is one of the most obvious reasons why the CW man who occasionally works 'phone, by the introduction of efficiency modulation into his PA stage, seldom pursues the latter mode, as his range "seems reduced." Were it realised more fully that the efficiency systems at present in general use, if correctly adjusted, automatically reduce the apparent on-the-air power of the main transmitter by a factor of four, no doubt their users would be less critical (and dissatisfied!).

The purpose of the author's design study was to overcome, as far as possible, some of these shortcomings, and the first step was to arrange that two HT rail voltages be available—the nominal voltage, say 425 volts, corresponding to normal CW operation, and twice that value, 850 volts, as required for 'phone



The controlled carrier Modulator as built up by G3AST and described in the article. It will give enough output to drive any PA, up to a pair of 813's, on the screen, with good speech waveform and linearity — see Fig. 4.

operation under peak AM conditions.

In the latter case, however, the screen divider has to be disconnected, or the valve would exceed the maximum screen dissipation. But once the screen voltage has been reduced to a value low enough to keep the anode dissipation to reasonable limits, the amount of peak-to-peak swing available on the screen is so small, using conventional methods, that the PA would at best be very poorly modulated, and not running at anywhere near its full output capabilities.

### The Design Evolved

The object of the modulator system born of these cogitations is two-fold: (1) To produce high percentage modulation of the Class-C PA stage, and (2) To clamp the screen voltage to a low value until the onset of modulation, whereupon the clamp "lets go," and provides just sufficient carrier to be modulated by the average amplitude of the audio.

The circuit is provided in Fig. 1. V1 and V2 are standard pre-amplifier stages, except that the coupling condensers are a trifle "thin," in order to give a slightly drooping AF charac-

### Table of Values

Fig. 1. Circuit of the Controlled Carrier Modulator

C1, C5 = 4 $\mu$ F, 12v.	R8 = 1 megohm potentiometer, gain control (see text)
C2, C7 = 0.25 $\mu$ F, 150v.	R10 = 18,000 ohms (see text)
C3 = 8 $\mu$ F, 350v.	R11, R13 = 47,000 ohms
C4 = 01 $\mu$ F, 350v.	R12 = 150 ohms
C6 = .02 $\mu$ F, 350v.	V1, V2 = 6BR7, Brimar
R1, R9 = 560 ohms	V3 = 12BH7, Brimar
R2, R6 = 110,000 ohms	V4 = EL81, Mullard
R3, R7 = 470,000 ohms	
R4, R14 = 1 megohm	
R5 = 120,000 ohms	

teristic. (The necessity of this will be appreciated later.)

V3 is a twin triode, the first half being used as a cathode follower output stage. The second half of V3 is used as a voltage amplifier feeding the "bootstrap" connected output stage. It should be noted that although the anode load of this triode is only 18,000 ohms, it is also the grid leak of the output stage, and appears to be many megohms to V3b. There are other advantages to this mode of connection besides the realisation of almost full amplification from the driver valve. (A pentode, for instance, in this connection will give a gain of three or four thousand quite happily.) The established circuit is convenient, easy to build up, and singularly free of vices. Enough power is available from V4 to supply the screens of two parallel-connected 813's—which was the original conception.

A remaining vital duty is carried out by V3b, which, it will be noted from the circuit, has no cathode bias. This means that the grid current causes a DC restorer action, and clamps the positive-going audio peaks with respect to earth. It should be noted that this clamping action occurs at all amplitudes and should not be construed as "clipping," or in any way inhibiting the amplitude of the audio voltage. The action is merely to reference the positive-

going peaks to earth. The cathode-follower output of the preamplifier reduces waveform distortion, due to this clamping effect, to such a low level as to be undetectable on an oscilloscope. During modulation C6 is of course charged negatively *via* R14. The time-constant of this combination is of special significance.

In order to cancel the standing DC cathode drop across V4, the cold end of the cathode resistor, R11, is not returned to chassis, but to a negative rail of 90 volts, provided with a fair margin of stability by the 90C1 glow regulator V5 (*see* Fig. 2).

With no audio signal applied to V3b grid, the valve is passing maximum current through R11, and V4 is biased back, the output cathode standing at about 15 to 18 volts positive with respect to earth—which happens to be a very satisfactory value when an 807 PA is being used. The value of R10 is very critical, a thousand ohms or so either side of the figure given in the table resulting in quite considerable changes in resting cathode voltage at V4. The value of this resistor will have to be established for each particular installation, and its HT voltage conditions.

The output voltage from the cathode of V4 is limited by:

(a) The clamping action at V3b grid, when the output from V4 is negative-going. (This is set at 15-18 volts for an 807 for reasons given later.)

(b) The onset of cut-off at V3b when the output of V4 is positive going.

Not only is the output voltage of V4 cathode varying at a syllabic rate, but the mean value is always half the peak-to-peak amplitude *plus* the standing voltage—in the example given, 15 volts.

### Audio Response

The time constant of the circuit varying the operating point (C6, R14) is chosen such that it corresponds to several cycles at the lowest frequency of modulation. Too long a time constant here will result in a peculiar hang-over effect. The values quoted "sound" just about right. This explanation also qualifies the reason for the drooping AF response—it also results in the PA valve running a shade

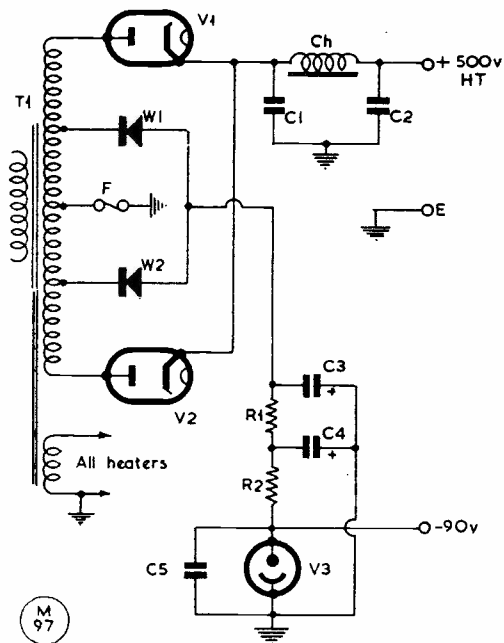


Fig. 2. Suitable power supply arrangement for the Modulator described in the text, for which all values are given in the table.

### Table of Values

Fig. 2. Suitable Power Supply Unit

C1, C2 = 8 $\mu$ F, 600v.	W1, W2 = Silicon diode
C3, C4 = 8 $\mu$ F, 250v.	1N112, or similar
C5 = 0.1 $\mu$ F, 350v.	T1 = Mains transformer,
R1, R2 = 1,000-ohm, 2w.	450v./150v. HT's
V1, V2 = R18, Brimar	F = 100 mA fuse
V3 = 90C1, Mullard	Ch = Smoothing choke

cooler, as it "shuts down" faster (even between words) although this is quite undetectable. The low-frequency droop is not particularly marked, and commences very gently at about 620 cycles/sec. At 300 cycles the attenuation is quite steep, for at 40 cycles the output is negligible.

As regards high frequency response, the normal RF bypass capacity at the screen of the PA will have some effect on the output impedance of the modulator, although the latter is very low. The prototype was sensibly flat from 620 to over 8,000 cycles.

**Setting Up**

The point marked "Output, PA Screen" in Fig. 1 is connected to the screen of the RF amplifier — the normal screen feed being opened, disconnected entirely, or switched in for full CW output—and, with full drive and increased plate HT voltage, the PA input ("resting carrier") is adjusted by careful setting of R10, which could be made variable for the purpose. The HT supply to the PA (in the case of an 807 or 5B/254M) should be 700-850 volts, and the screen by-pass condenser actually used in the model is .001  $\mu$ F. with a 56-ohm screen stopper.

As already indicated, the PA is very sensitive to changes in the value of R10; with an 807 (or 5B/254M) the resting voltage, measured at the junction of R10, R11, should be 15-18 volts only. This will give, under normal drive conditions, a carrier level, or "resting carrier," of about 8-10% of the maximum. Other valves, such as a 6146, may need less resting screen voltage, and an 813, or a pair of them, rather more.

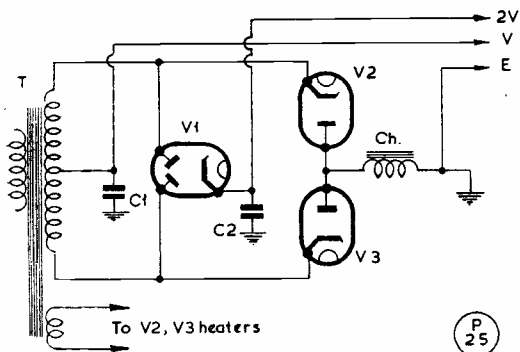


Fig. 3. Showing how a standard 450v. power supply can be modified to provide a high-voltage HT tapping for the PA in the controlled carrier transmitter; with this circuit, about 800v. HT can be obtained, suitable for an 807 operated as suggested in the article. V1, C1 and Ch. are the existing components; V2, V3 can be R18 rectifiers; and C2 is made the same capacity as C1, but is rated at double the voltage.

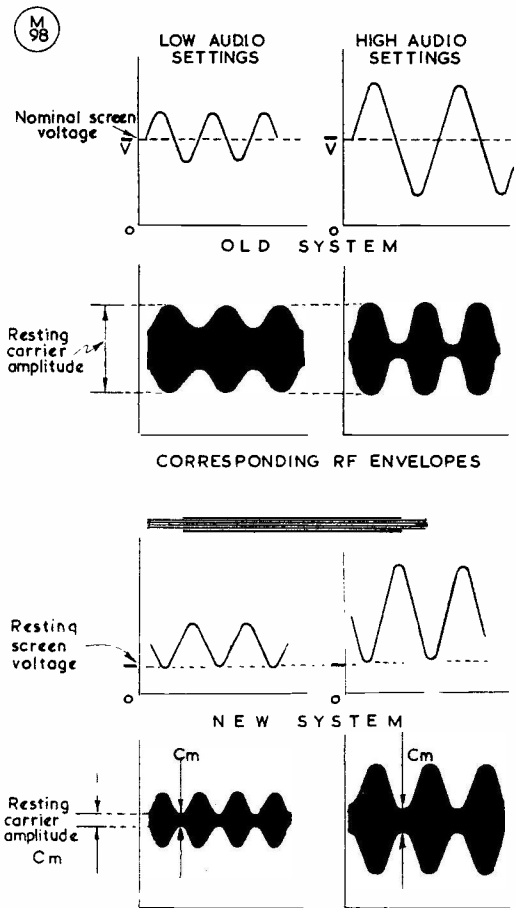


Fig. 4. Comparison of speech waveform envelopes under screen modulation (above) and controlled carrier conditions. The latter is the system discussed by G3AST. With controlled carrier modulation, over-controlling is impossible, the modulation percentage is constant, and the modulated carrier waveform is identical with that of an AM transmission, except that under modulation the carrier level constantly varies from a resting minimum to a maximum.

All adjustments for resting carrier must, of course, be made with the microphone unplugged, or the gain control firmly at *nil*. Any noise input to the speech amplifier, however slight, will produce a drive voltage at the output end, which could confuse the initial setting-up procedure.

The modulator has such complete control over the output of the transmitter that it would be quite in order to use the audio gain control (R8 in Fig. 1) as a carrier-level control.

Several experiments were conducted setting up values of resistors such that no carrier was provided between modulation periods; for this, a slight negative voltage is required at V4 cathode. The results of these tests were found

to be unsatisfactory, as nothing is left to tune on unless the operator is talking, although the peculiar "hush hush" characteristics of clamp modulation are entirely absent.

A figure of 8:1 carrier ratio was found to be optimum—that is, the ratio of resting to full modulation. Carrier ratios higher than about 15 to 1 get rather intractable to tune, as the pilot carrier (no modulation) is often difficult to find in bad conditions.

### Results

As G3AST was off the air during construction, the unit as described here was designed from first principles and tested on dummy loads, using an audio oscillator and oscilloscope to check for distortion in the waveform. The results were so gratifying that the prototype was re-assembled at G3KAZ and air-tested, with great success. Not only was the audio quality excellent, but the modulation was full and clean, with a crisp bite and "attack," giving an unusually readable transmission. Due to the basic characteristics of the signal, and the peculiarities of the voice waveform, the output of any exciter unit using this mode of modulation may conveniently be fed to a linear amplifier intended for SSB. Such amplifiers usually run very warm and inefficiently when fed with normal AM, but use of carrier-controlled "bootstrap" modulation allows them to run only very slightly warmer than in the SSB condition, as the resting carrier level is so small.

It is well to remember, however, that should the construction of a linear amplifier be envisaged, with the idea that the unit should "sound" like 150 watts of anode-modulated carrier, then the PA stage feeding the aerial must be capable of linear outputs up to 600 watts peak.

It should be realised, too, that although the system proposed is something of a novelty, it is neither a "gimmick" or a trick. The PA stage is not being over-run, and the system amounts to a method of using efficiency modulation in a context more nearly that of anode modulation conditions.

Finally, a few notes are appended below for those who may wish to experiment with existing rigs.

*Increasing power supply voltage:* The output voltage from a conventional full-wave power supply can be conveniently doubled by utilising the full-wave bridge connection, and inserting the filter choke in the negative line. The circuit shown at Fig. 3 is for a conventional power supply that might be employed

with an 807 PA. For larger supplies, the two additional rectifiers would have to be in keeping with those already in use, but the principle involved is the same. Only the very cheapest of transformers will not tolerate the extra primary current involved, particularly when the load is intermittent, as with the system proposed.

### OBITUARY

*We very much regret to have to record the deaths of:*

Arthur Simons, G5BD, of Mablethorpe, who died on May 2, following an accident. Well known on the VHF bands, and active on 23 cm as well as on 70 cm and two metres, G5BD had a distinguished record in the pioneering field of Amateur Radio, his experience having gone right back to 1926, long before the VHF's as we know them now had come under amateur investigation. Though suffering always under a serious disability (he had only one arm) he nevertheless tackled, very successfully, the whole range of constructional work. A keen supporter of all amateur activities, and a familiar figure at meetings, G5BD was strictly a "non-professional amateur" in that he had no business or commercial interest in radio. He always set a high standard, and his enthusiasm and determination were an example to all who knew him. He had personal friends all over the country, and friends made on the air all over the world. G5BD will be a great loss not only to the VHF fraternity, who knew him so well, but also to Amateur Radio itself.

\* \* \*

George Hume, G5UX, of London, who died on May 5, at the age of 50 years. First licensed AA as 2ASL in 1927, G5UX operated almost exclusively on the DX bands, and had nearly 200 countries confirmed. At the time of his death, he was chairman of the Mitcham and District Radio Society, and at his funeral on May 9, South London radio amateurs were well represented.

\* \* \*

*We offer our sympathy and sincere condolences to the family and friends of G5BD and G5UX in their sad bereavement.*

### ARTICLES AND PHOTOGRAPHS

We are always glad to see material of Amateur Radio interest—practical, theoretical, or discursive—which may be suitable for publication in SHORT WAVE MAGAZINE. Payment at generous rates is made for articles and photographs good enough to achieve print.



# Improving the R.208

## NOTES ON SOME MAJOR AND MINOR MODIFICATIONS

L. S. WRIGHT (G3AIM)

The receiver discussed in this article has been available as "surplus" for some time. Though lacking in many of the more desirable features of an amateur-band receiver, it has very good HF coverage, up to 60 mc no less, and is therefore particularly useful for general listening across those frequencies above 30 mc not

OVER the past ten or so years various types of receivers have found their way on to the "surplus" market. Amongst these receivers is the R.208, of which little information has been published. The writer has used an R.208 for several years, both in its original form, and later as the "front end" into a BC-348, getting very good results. However, it was felt that refinements and modifications were possible to bring it into line with the more orthodox communication receivers. The frequency range of the R.208 (10-60 mc, in three switched bands, 10-20, 20-40, and 40-60 mc) makes it an ideal receiver for anyone who

usually within amateur tuning range. Though a good R.208 may not need much more than re-valving and re-aligning to restore it to normal performance, several desirable modifications are possible, as this article shows. Since the R.208 is strongly built and of generous dimensions, it is more than usually accessible for modification purposes.—Editor.

is interested in the 14, 21, 28 and 50 mc bands, as is the case at G3AIM—though it will be appreciated that it has not got much bandwidth, somewhat compensated for by the fact that it is fitted with a good slow motion dial assembly. And it is self-contained for power, six-volt battery or 100-250v. AC mains, with a built-in speaker.

### Some Possible Modifications

Due to the fact that it has a fairly high IF of 2 mc, the R.208 has negligible second-channel interference, and the "front-end" is ideal to run in a double-superhet, which was the idea put into practice by the writer. Some time ago, a set of "surplus" CR100 IF coils (complete with crystal and selectivity switch) were purchased, and set aside for future use. It was decided to utilize these components, in converting the R.208 to a double-superhet, and at the same time to fit a noise limiter and modify the AVC circuitry. Another improvement had previously been effected by changing the RF stage from the original EF39 to a

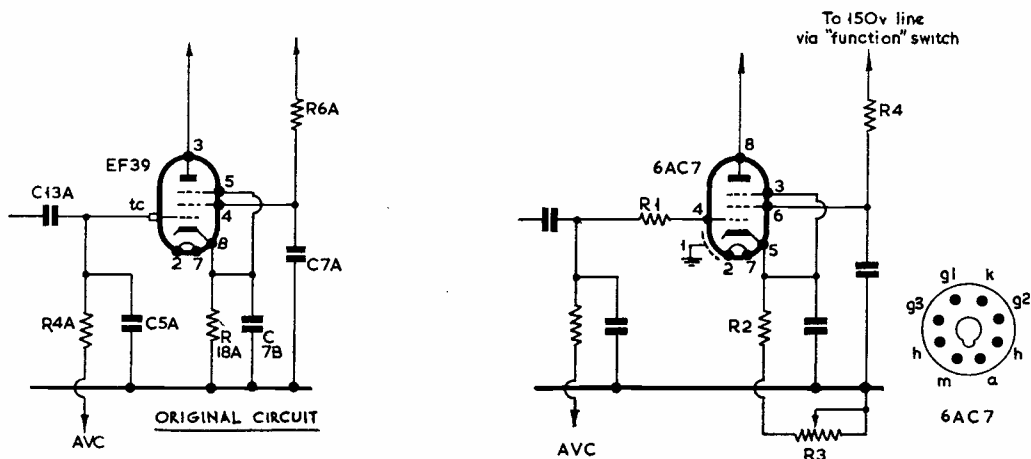


Fig. 1. A worth-while improvement to the R.208 is to change the EF39 RF stage valve to a 6AC7, as explained in the text. The modified circuit is shown on the right, new values being as follows: R1, 10-ohm 1/2-watt grid stopper; R2, 150 ohms, 1/2-watt; R3, 3,500 ohms (use R15A from original); R4, 47,000 ohms, 1/2-watt.

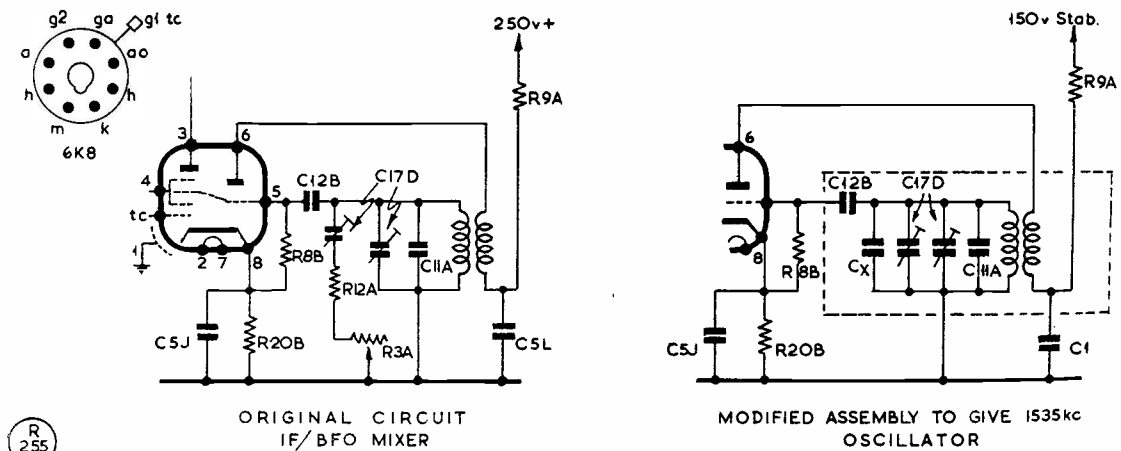


Fig. 2. The R.208 can be converted into a double superhet by modifying the original BFO to work on 1535 kc; as the first (original) IF is 2 mc, it is a simple matter to run the BFO as the 2nd local oscillator at the lower frequency. The modification details are given in the text, which also explains how a new BFO is fitted later in the chain. In the circuit above, C1 is .01  $\mu$ F, 350v. working, and Cx is 800  $\mu$ F silver-mica.

6AC7, which produced a marked increase in signal strength. For anyone not desirous of drastic changes to the basic R.208, the writer would recommend that only the RF section be modified. This simple operation is covered by "Stage 2" of the proposed changes set out herewith. To complete the transformation, the receiver is fitted with a standard 9in. panel, which considerably softens the "battleship" appearance of the original, and makes for a neater job.

### Stage 1—Wiring Changes

To commence the modifications, first unsolder all wiring and components from the last IF stage to the output stage, leaving only the loudspeaker transformer in position. Remove the loudspeaker from the front panel. Whilst taking out the large tag-strip from under the chassis, it is advisable to check components associated with earlier stages, and re-mount these components in the vicinity of their respective circuits. In an old receiver, some of the condensers and resistors are certain to require replacing. Remove all wiring connected to the test point panel that may still run to the RF, Mixer and IF stages. The 6v. vibrator power supply can be taken off the chassis by unscrewing four bolts, and this could be utilized as an external power supply for portable or field day use. If the chassis extension strips are left *in situ*, it will facilitate handling of the chassis.

### Stage 2—RF Stage Modification

Conversion of the RF stage from EF39 to

6AC7 may appear to be difficult, but if the wiring to the coil unit is marked as it is unsoldered, it will be a great help. Remove the dial from the condenser shaft, slacken off the nut locking the wave-change switch to the chassis and panel, then remove the screw from the panel holding the RF/Mixer valve screen. Now, by removing three bolts from the coil unit, the complete assembly can be withdrawn from the chassis.

Unsolder all connections to the RF stage valveholder, and rotate the holder through 180 degrees. The original top-cap connection is removed from the valve-screen and the tag-strip holding R4A and C5A (R.208 circuit notations as given on the cabinet lid) is mounted underneath the coil assembly adjacent to the valveholder. One end of R4A is connected to the grid pin of the valveholder via a 10 ohm grid-stopper, and to the other end of R4A is soldered a length of lead sufficient to wire into the AVC system. The cathode bias resistor is changed to a value of 150 ohms and mounted between pin 5 of the valveholder and a tag strip. To the free end of the resistor is attached a lead sufficient to reach to R15A which now becomes a separate RF gain control, and not IF gain as previously used (*see* Fig. 1). The valveholder is now re-wired to suit a 6AC7, utilizing the existing de-coupling condensers, replacing any that need it. The aerial lead to switch wafer S1A is replaced by a length of  $\frac{1}{4}$ in. coaxial cable which is brought out to the chassis back-drop for termination on a coaxial socket. The coil unit is replaced in the chassis, and the coded leads re-

**Table of Values**

Fig. 3. The second Mixer and 465 kc IF Stages

C1, C2,	R10, R14 = 4,700 ohms, ½w.
C3, C5,	IF2 = 2nd 2 mc IF (as fitted)
C7, C8,	IF3 = Mod. 2 mc BFO (see text)
C9, C10,	IF4 = ex-CR100, IF1
C11, C12,	IF5 = ex-CR100, IF2
C13, C14 = 0.1 µF, 350v.	IF6 = ex-CR100, IF3
C4 = .01 µF, 350v.	IF7 = ex-CR100, IF5
C6 = 7 µµF	VR1 = 5,000 ohms, w/wound
R1 = 470,000 ohms, ½w.	V4 = 6K8
R2 = 20,000 ohms, 2w.	V5, V6 = EF39
R3, R9 = 220 ohms, ½w.	V7 = 6SQ7
R13 = 220 ohms, ½w.	S1 = One wafer progressive shorting, and one wafer 1-pole, 5-way
R4, R8, R12 = 47,000 ohms, ½w.	
R5 = 15,000 ohms, 1w.	
R6, R11, R15 = 2,200 ohms, ½w.	
R7 = 100,000 ohms, ½w.	

Fig. 3. The second mixer and 465 kc IF stages, using CR-100 coil units, as explained in the text. While standard 465 kc IF transformers could be substituted, the point in having the CR-100 items is that IF5 in the circuit here contains the crystal unit in the 2nd IF stage of the CR-100 assembly. There is ample space on the R.208 chassis for working in the second IF chain.

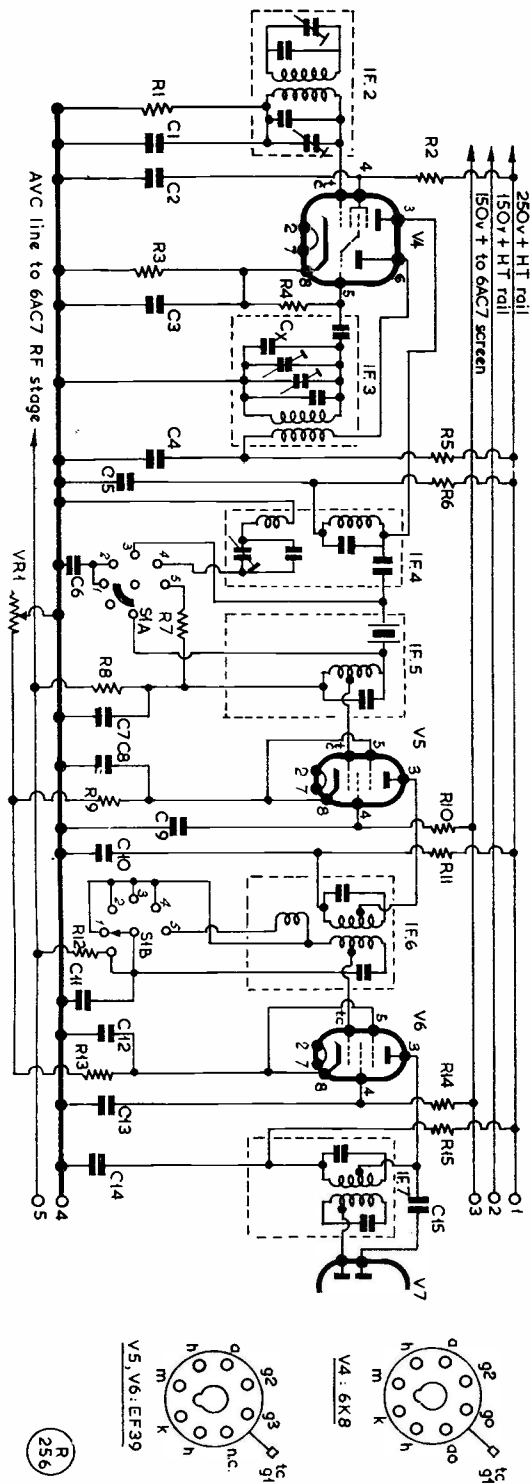
terminated. The only exception is that the oscillator anode resistor is now taken to the stabilised 150v. HT rail. For anyone interested in "hotting up" the front-end only, these modifications should suffice.

**Stage 3—Double Superhet**

To convert the R.208 to a double-superhet it is necessary to have a second local oscillator, and this can be provided by using the original 2 mc BFO coil assembly, modified as follows: Connect the two 100 µµF trimmers C17D in parallel and add fixed capacity also in parallel, until the coil assembly resonates at 1535 kc (in the writer's case a 800 µµF silver mica condenser was found to be sufficient). The 20,000-ohm resistor R12A may be left in the coil assembly and used as a support. The modified assembly is mounted in the position previously occupied by the last IF transformer, and the valveholder re-wired (see Fig. 2). The oscillator anode resistor R9A is taken to the stabilised 150v. HT rail.

**Stage 4—Selectivity**

The switched selectivity 465 kc IF amplifier section, shown in Fig. 3, may be wired next, having first mounted the additional IF transformers and valveholders on the chassis. IF2 containing the 465 kc crystal may conveniently be fitted in the position vacated by the 2 mc BFO transformer. When mounting the remaining transformers provision must be made—by holing the chassis—for feeding through the transformer leads and also for the adjustment of the lower iron-dust slugs. Variable IF gain, and IF selectivity controls are brought



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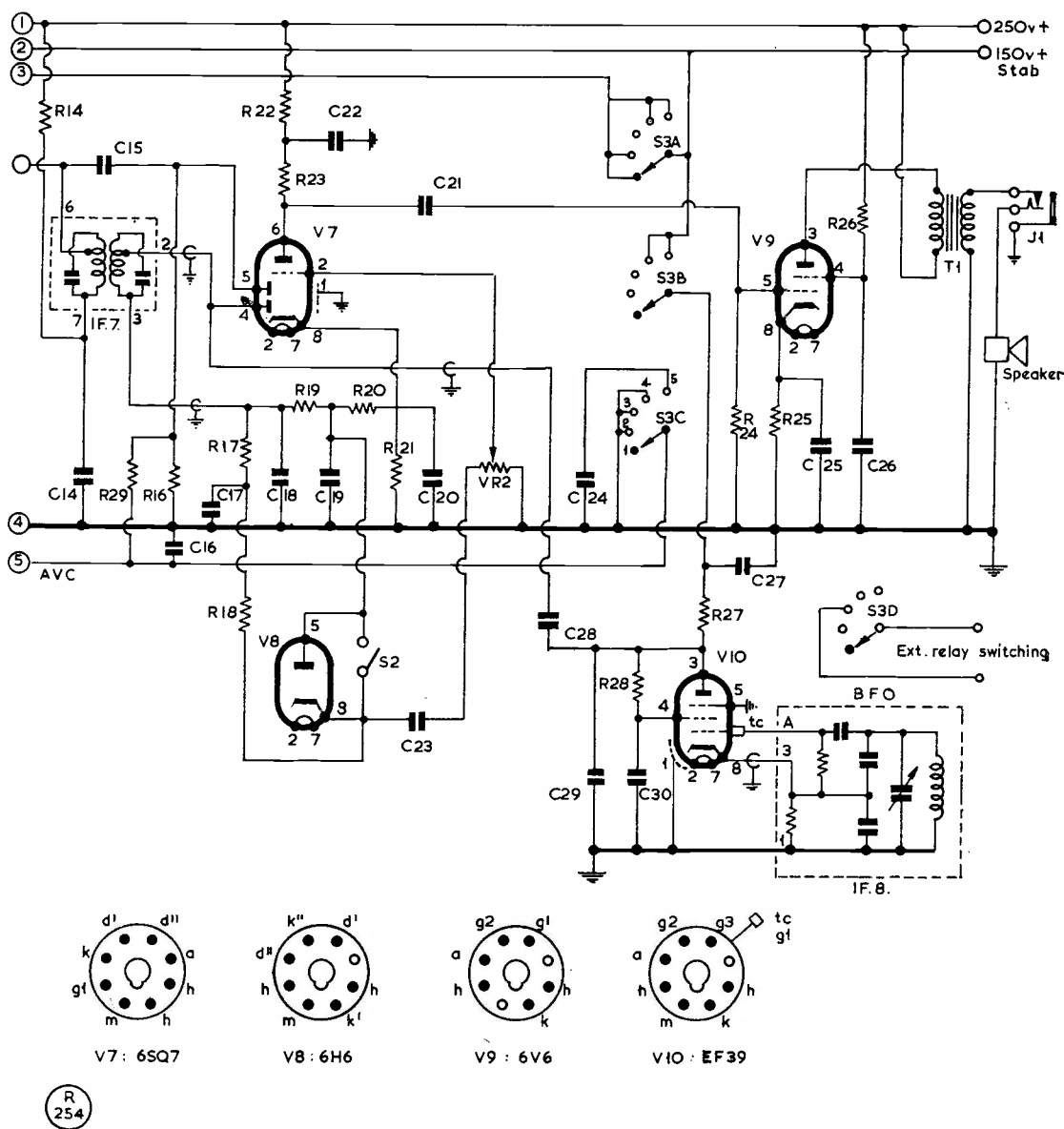


Fig. 4. The second detector, AF output, noise limiter and BFO section of the R.208 as modified by G3AIM. V8, though shown above as a single diode, is actually half a 6H6. The function switch S3 is arranged to give the following positions: Posn. 1, Phone, AVC on; posn. 2, Phone, AVC off; posn. 3, Stand-by; posn. 4, CW/SSB, manual control; posn. 5, CW/SSB, AVC on. The numbered terminations correspond to those on Fig. 3, p.185.

out to the front panel, as will be seen in the sketch of the 465 kc amplifier section. The original selectivity switch is too long to mount in the chassis and so must be modified. At G3AIM, this was stripped completely and rebuilt with two wafer sections only. The rear end of the switch assembly is supported by the L-shaped screen around the IF stages. Resistors for anode, screen and AVC circuits are

mounted on tagboards fixed to the screen. The AVC line is passed through the screen to the "Function" switch, as also is the 150-volt HT line from the "Function" switch to the screen grids. "Stand-by" is effected by breaking the HT supply to the screen grids.

**Stage 5—Output**

The output end of the R.208 can be modi-

**Table of Values**

Fig. 4. The 2nd Detector, Noise Limiter, BFO and AF Output for the Modified R.208

C15, C18,	R22 = 27,000 ohms, $\frac{1}{2}$ w.
C19 = 100 $\mu$ F, mica	R23 = 270,000 ohms, $\frac{1}{2}$ w.
C16, C17,	R25 = 250 ohms, $\frac{1}{2}$ w.
C27, C29,	R26 = 3,300 ohms, 1w.
C30 = 0.1 $\mu$ F, 350v.	VR2 = 0.5 megohm
C20, C25 = 25 $\mu$ F, 25v.	pot'meter
C21, C23 = .01 $\mu$ F, 350v.	S2 = SPST toggle
C22, C26 = 2 $\mu$ F, 300v.	S3 = Single-pole, 5-way,
C24 = 1 $\mu$ F, 150v.	4-bank, wafer
C28 = 30 $\mu$ F, mica	T1 = R.208 o/p xformer
R16, R24,	J1 = Close-circuit jack
R29 = 470,000 ohms,	IF7 = ex-CR100 IF5
$\frac{1}{2}$ w.	IF8 = ex-CR100 BFO
R17 = 1 megohm, $\frac{1}{2}$ w.	unit
R18 = 2 megohm, $\frac{1}{2}$ w.	V7 = 6SQ7
R19, R20,	V8 = $\frac{1}{2}$ 6H6
R27, R28 = 100,000 ohms, $\frac{1}{2}$ w.	V9 = $\frac{1}{2}$ 6V6
R21 = 3,300 ohms, $\frac{1}{2}$ w.	V10 = EF39

fied to any individual choice, but a circuit is shown as used by the writer. In the interest of stability the BFO takes its HT supply from the 150-volt line, again *via* the "Function" switch. The power supply can be the original unit, mounted in an external case (ideal for Field Day use), or a suitable unit fitted into the receiver itself. This might entail a little hacking out of the chassis, but makes a more compact arrangement for fitting in a cabinet. If it is felt necessary to "winkle-out" the more exotic DX, then a "Selectoject" could be fitted in the space between the BFO valve and the last 465 kc IF transformer. This vacant space could likewise be used to accommodate a switchable product detector for SSB—again, it is a matter of individual choice. AVC is applied to the RF stage (V1), and also to the 465 kc IF amplifiers (see Figs. 1 and 3).

**Alignment**

Alignment of the 465 kc IF amplifier may present some difficulty, unless a Wobbulator and Oscilloscope are available. A rough setting-up can be done by feeding a modulated 465 kc input to the signal grid of the second mixer stage (V4), and peaking the top and bottom sections of the IF's. The selectivity switch must be set to posn. 2 (3000 c/s), reducing the IF gain as the circuits are peaked.

For correct setting up, connect the Wobbulator to the mixer valve (as above), and inject a signal of 465 kc. The selectivity switch is set to posn. 3 (1200 c/s), and the IF gain control near maximum. The Oscilloscope is connected to the detector diode (pin 4) of the 6SQ7, and a resonance curve obtained. This curve may not coincide with the crystal peak (see Fig. 5), so it will be necessary to retune the Wobbulator until the two peaks coincide. The neutralising condenser under IF4 is adjusted until any "lump" on either side of

the curve is removed and well-balanced skirts remain. Peak the remaining 465 kc transformers, reducing IF gain as necessary.

To adjust the second local oscillator (triode section of V4), connect a Signal Generator to the grid of the valve and tune to 2 mc. The output can be measured on an AC voltmeter connected to J1. Tune the trimmefs of IF3, peaking the transformer at approximately 1535 kc. for maximum deflection of the AC voltmeter. With the same setting of the signal generator at 2 mc, peak the trimmers of IF1 and IF2. This completes the setting-up of the two IF channels and the coil unit may now be peaked up on the three ranges.

In conclusion, the only claim the writer makes for the effectiveness of the receiver is to quote the old saying, "If you can't hear them, you can't work them." Using mainly a 20-metre dipole for a number of years, and changing recently to a 20 metre ground-plane, the writer has had confirmed contacts with some 200 countries—which does not seem bad, using a receiver cheaper to buy now than when he got his, and which is easy to get into for modification purposes.

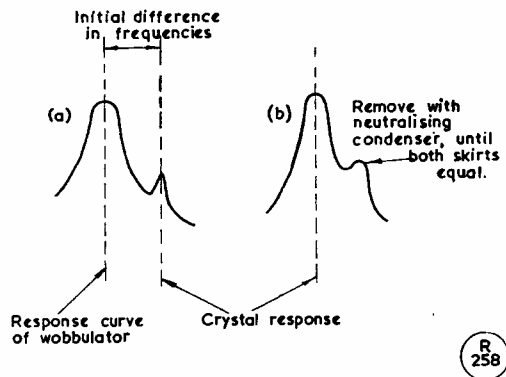


Fig. 5. Shape of the selectivity curves obtained on the R.208 when modified as explained in the article. The final aligning adjustment is done with the wobbulator and crystal filter curves at the same frequency.

**THE EXACT VALUE**

Among the many fascinating researches being conducted at the National Physical Laboratory — disclosed to those invited on the occasion of the recent official visit — is an investigation into the precise velocity of electro-magnetic waves. This has always been taken as 300,000 kilometres per second. It turns out that the true figure is 299,792.50 ± 0.10 km/s. This does not mean that all our aerial calculations have to be revised, as the percentage difference is negligible. But it does show what is possible in the way of accurate measurement.

# Vertical Transmitting Aerials

FOR 160 METRES, FIXED  
AND MOBILE

F. C. JUDD (G2BCX)

*While the erection of a full mast radiator may be too large an undertaking at many stations—and Top Band mobile systems are of no great interest to those without a vehicle from which to operate /M—this article is nevertheless of value in that it shows what is possible with vertical radiators on 160 metres. It is also worth mentioning that many operators have already found that a Top Band aerial constructed on the principle of the loaded whip—in the sense of a physically small, truly resonant system—can be made to give remarkable results as a fixed-station aerial. Try it, and see!—Editor.*

**I**N this article, details are given for a loaded vertical aerial, with a physical height of approximately  $\lambda/8$ , but with an electrical length of  $\lambda/4$ , intended for fixed site operation. Some notes are also included on a mobile vertical loaded aerial system for 160 metres. Both aerials have a low base impedance and are suitable for direct coupling to a  $\pi$  tuning network, or other aerial tuning circuit with a low impedance (40-70 ohm) output. Provision is made for correction to resonance and matching to a standard 70 ohm co-axial line.

The electrical length of  $\lambda/4$  is achieved in both cases by means of series inductance and added capacity along the length of the aerial, as indicated by Fig. 1.

## Fixed Site Vertical For 160 Metres

Several experiments were conducted before it was decided that a vertical radiator-mast would be both practicable and electrically efficient. The idea, like the aerial, grew from use of the now popular mobile loaded whip, and from experiments with kite aerials, of full electrical length, which included tests by direct comparison between the vertical quarter-wave wires and the smaller loaded versions. Improvements in electrical efficiency were also investigated and some notes on the results of the tests are given in the next column:—

- Signal reports of S8 to S9 + were obtained from a 4 kite aerial during both day and night transmission over distances up to 200 miles, with a transmitter input of 5 watts. The tests were conducted from different parts of the country with both the kite and the loaded mobile aerials, so that results on high and low ground could be checked.
- Useful transmitting ranges of up to 50 miles were obtained with the 8-12 ft. high loaded aerials. Signals naturally vary considerably whilst mobile, but operation from medium high ground has produced S7 to S8 signals over ranges averaging 30 to 40 miles. Again, tests were conducted all over the country with an input of 5 watts to the transmitter, on phone.
- Various methods of tuning and loading were investigated, both on 1.9 and 3.8 mc. (The reason for the higher frequency will be seen later.)

From a practical point of view and having regard to electrical efficiency and safety, it was concluded that the vertical fixed-station aerial should have a physical height of  $\lambda/8$  at 1.9 mc (about 66ft.). Final adjustments increased the total height to 72ft. and this was arrived at as follows:

The basic height of 66ft. (electrical resonant length  $\lambda/8$ ) was trimmed by inductive loading at the base and distributed capacity along the length of the mast and the final electrical length of one quarter-wave obtained by adding, in series, an inductively loaded section a small fraction of a wavelength long, but electrically

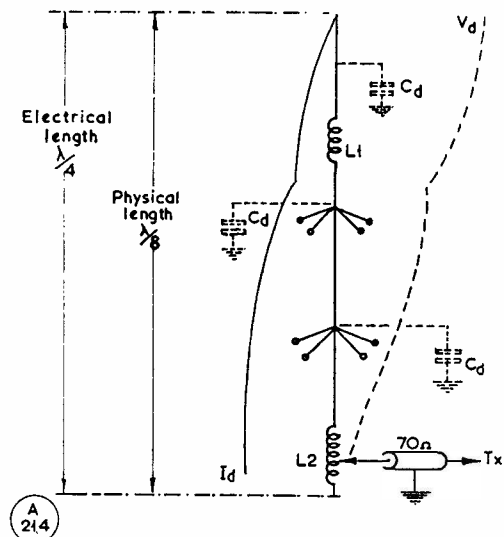


Fig. 1. The distribution of capacity, Cd; of current, Id; and of voltage, Vd, on the vertical 160-metre aerial described by G2BCX.

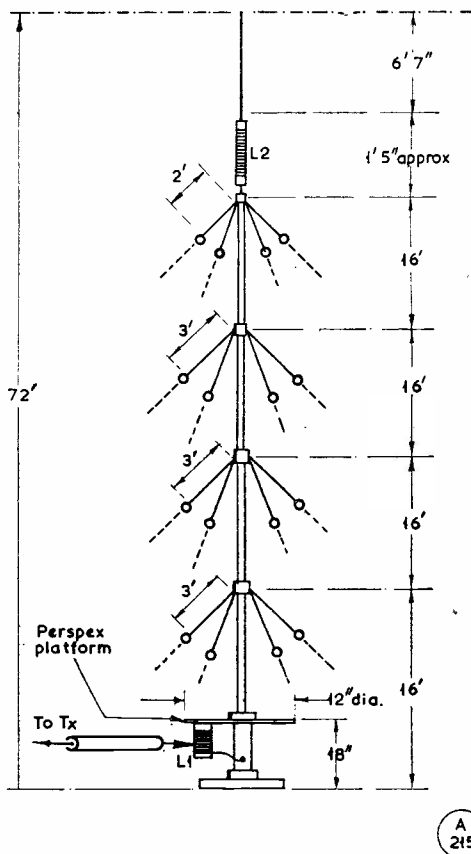


Fig. 2. Assembly of the quarter-wave vertical Top Band aerial, which is about one-eighth of a wavelength high physically. (Note: In this sketch, L1 and L2 should be transposed.)

$\lambda / 8$  at 1.9 mc. This combination produces the conventional current and voltage distribution (see Fig. 1), of a quarter-wave aerial. It will be appreciated that adjustment of the top loaded section to resonance (see Fig. 2) would be somewhat difficult after the aerial is erected. Therefore, a method of doing this beforehand had to be devised.

The top loading coil (L1) was attached to two whip rods, one 60in. long above and one 68in. long below, the coil. The inductance was adjusted to produce resonance ( $\lambda / 4$  at 3.8 mc), with maximum current at the base. Resonance could be determined with a GDO, but the writer preferred to do it by matching to a  $\pi$ -tuned output from the transmitter.

**Details of Top Loading Coil and Whip Section**

The loading coil L1 was wound on a 1½in. diameter paxolin former 16in. long, with fitted

dural plugs at each end, drilled and provided with set screws to take the whip rod at the top and for attachment at the other end to a stub at the top of the basic aerial (see Fig. 3 for details).

The basic aerial section was constructed from four 16ft. lengths of galvanised steel tubing, the first two sections being of 2in. diameter material, the third of 1½in. diameter and the top section 1in. diameter. Guy lines were arranged in groups of four from the joints at each section. The guy lines must be broken up into 10 to 12ft. lengths with insulators. Each of the four short lengths of guy line attached to the mast provide some capacity between the length of the aerial and earth (see Fig. 1). The whole aerial mast is insulated from earth and this was effected by fitting a threaded Tufnol plug between the base of the mast and

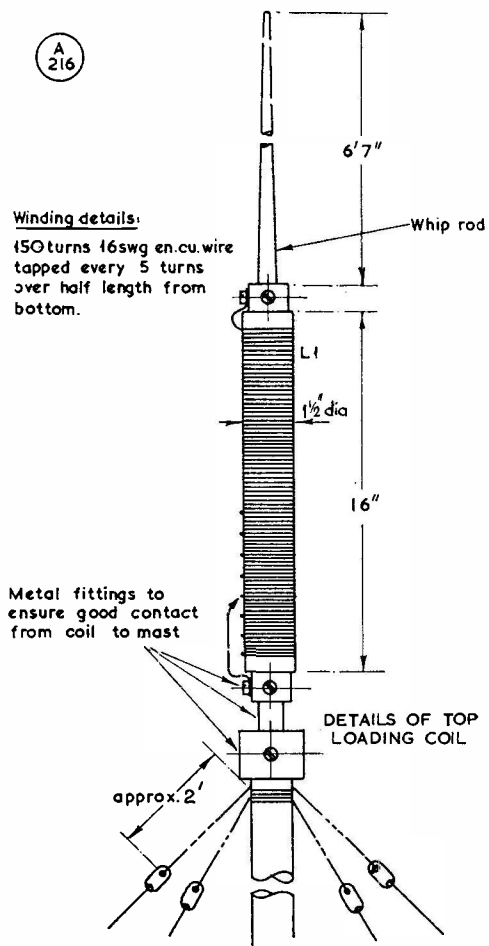


Fig. 3. Detail of the top section loading coil for the G2BCX vertical 160-metre radiator.

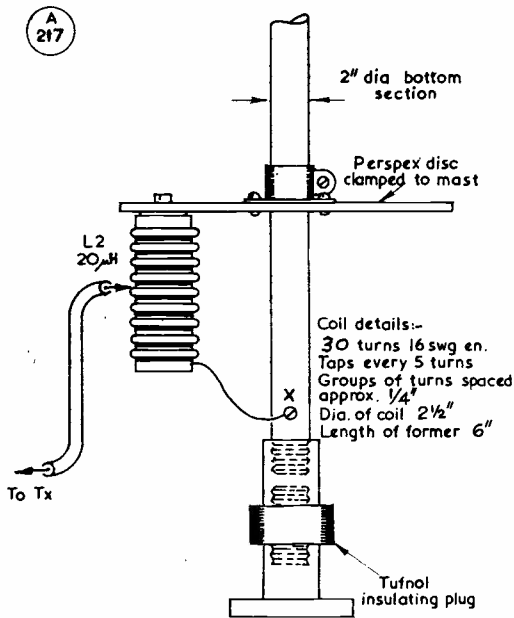


Fig. 4. A matching coil is required at the base of the mast, and the mast itself must be insulated from ground; this is done by the Tufnol block, cut to fit.

an iron base-plate (see Fig. 4).

Erection of the mast called for some agility (and nerve) and was completed in one week-end with the aid of a double extension ladder, hoisting pulleys and long ropes. The mast was erected in sections, each being *securely* guyed to support the ladder which was extended as the height increased, each new section being hauled up and fitted. The dangers of insecure guy lines cannot be over-emphasised. From 72ft. the ground is an awful long way down!

Final adjustment and matching is effected by means of a low inductance coil in series with a 70 ohm co-axial line and the base of the aerial. The coil was wound on a 2½ in. diameter former to give a total inductance of approximately 20  $\mu$ H (see Fig. 4). The co-axial line is tapped along the coil until maximum current is flowing into the base of the aerial (point X in Fig. 4). Approximately the same value of current should be going into the co-axial line at the transmitter end. The transmitter should be tuned to the centre of the band for these adjustments. The writer has used a buried co-axial line up to 60ft. long with little or no loss.

Finally, it should hardly be necessary to mention that such a mast should be well painted for protection against weather, and although the windage area is low, the mast has stood

up to gale force winds without stress. It would be well to insure an aerial of this height and also check that neighbours or the local council have no objections!

It might be mentioned here that a good buried radial earth system would be an asset to an aerial system of this kind.

### Mobile Loaded Whip Aerial

Most of the experiments involved the use of mobile type verticals and some details of a reasonably efficient version for 160-metre operation are given in the following notes. The aerial is  $\lambda/4$  resonant with a low base impedance and provision is made for resonating the system over the band 1.8 to 2 mc. Added capacity is provided by a circular "capacity hat" approximately 8in. in diameter. The hat can be constructed as a sheet metal disc or "spoked wheel" (the writer used a half section of metal recording tape spool), and is in contact with the upper whip rod and mounted directly above the loading coil (see Fig. 5).

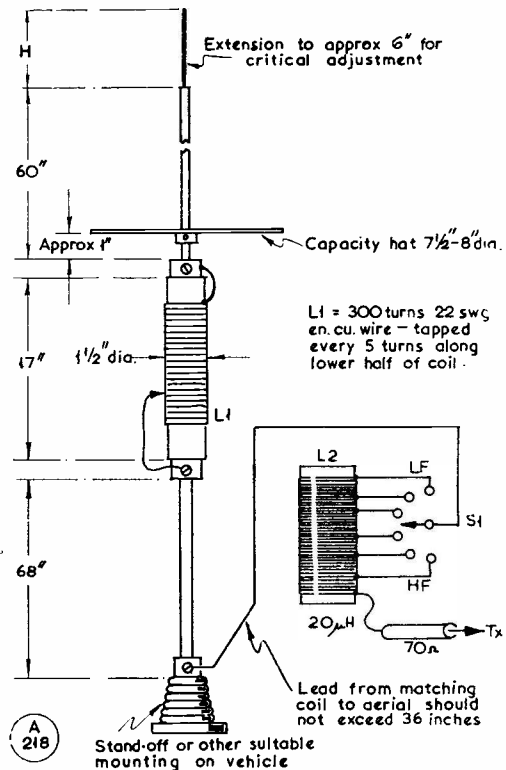


Fig. 5. A mobile whip aerial used by G2BCX/M. The self-resonance frequency of the system is made about 2 mc, final adjustment to working frequency being done by selecting a position on the switch and bringing the resonant point "on the nose" by variation of the 6-in. top section H. L2 is 30 turns of 22g. enamelled wire on a 1½-in. diameter former, with taps every 5 turns along the coil.



The tuning unit used on G2BCX/M may be of interest, but only the switched coil need be considered for resonating the aerial and matching to a 70-ohm source impedance, such as a  $\pi$ -tuned output or aerial tuner with a low impedance terminal. A coil of approximately 20  $\mu$ H total inductance is required with taps provided every 4 or 5 turns (see Figs. 5 and 6).

The main centre loading coil (L1 in Fig. 5) is wound on a 1½ in. diameter former 16 in. long. About 300 turns of 22 g. enamelled wire are required, tapped every 20 turns, along the lower half of the coil (see Fig. 5). The lower section of the whip is ½ in. diameter and 68 in. long, the top section whip is 60 in. long plus a sliding section to extend approximately 6 in. (H in Fig. 5), which is used, in conjunction with the taps on L1, to obtain resonance at 2 mc. With a stand-off insulator or other suitable mounting at the base, the total height of the aerial will be about 12 ft. 6 in. (The whip rods were made up from flexible steel "surplus" tank aerials.)

The tuner was constructed as a separate unit and mounted under the car dash board for ease of operation; in practice the six taps on the matching coil are more than sufficient to cover the entire band in steps of approximately 50 kc. For example: Position 1, 1.75 to 1.8 mc; position 2, 1.8 to 1.85 mc; and so on. Any selected tapping will overlap the frequency of those adjacent to it and tuning is broad enough to cover intermediate frequencies without serious loss of power. In practice the aerial is as electrically efficient as conditions will allow. It should be realised that this type of physically small loaded aerial cannot, ordinarily, be very efficient unless some means can be found of increasing the low value of radiation resistance. Some thought has been given to the possibility of Ferrite loaded aerials, but the idea was rejected on grounds of expense and flexibility. Ferrites could be used to tune the loading coil, but the measured Q of the coil actually used was around 200 and thought to be sufficient for the purpose. As mentioned earlier, useful transmitting ranges of up to 40 miles or more have been obtained with a transmitter input of 5 watts.

Finally, a quotation is appended for readers' interest: "Quite a large number of broadcast transmitter aerials feature the self-supporting tower design having heights either approximately a quarter-wavelength or slightly in excess of half a wavelength and serving as vertical radiators. Such an aerial can be excited by insulating the base of the tower from

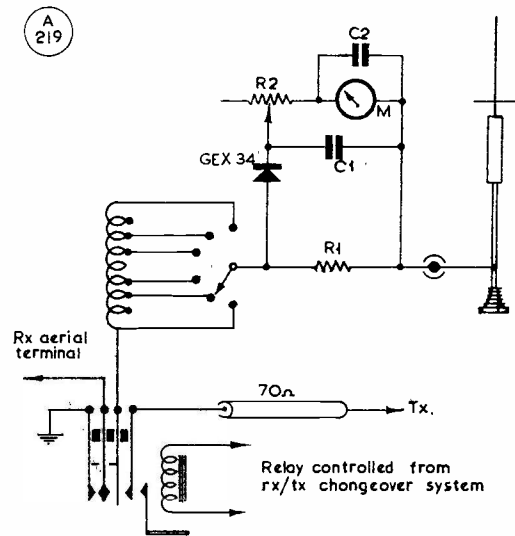


Fig. 6. Circuit of the aerial matching and change-over unit used on G2BCX/M. The series resistor R1, of about one ohm, should be adjusted for a convenient meter reading. Other values are: R2, 5000 ohms; C1, C2, .01  $\mu$ F; and M, 0-500  $\mu$ A.

ground or by making use of a loop formed by the ground and a wire attached to the tower above ground at a height corresponding to approximately 20% of the total aerial height. This loop, which is made resonant to the transmitting frequency by means of capacity in series with the line, carries a large circulating current which develops sufficient voltage across the section between ground and the feed point to excite the remainder of the aerial." (Section 137, page 709, *Radio Engineering*, by Terman.) This reference also provides other information concerning the methods of feeding and loading vertical radiators.

### IT GETS WORSE!

As well as the ridiculous appellation "ham," one has also to contend with the "we/our" parlance, where the speaker means "I/my." A correspondent quotes a prize example of this: A Far East amateur operator on phone was heard talking about *our* receiver, *our* weather here and announced that *we* are using a such-and-such aerial; this would have been quite all right if "they" had been a club station—but it wasn't, because "they" then came out with "*Our* wife joined *us* a month ago!" How fatuous does this make Amateur Radio sound! Anyone heard using the royal plural in this way should immediately be asked how many of them there are, and who holds the licence. A little plain (but, of course, polite) speaking over the air would soon check adolescent nonsense of this sort.

# DX COMMENTARY

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

THE majority of readers of this Commentary must have some sort of interest in the competitive aspect of DX work, which, in its turn, is tied up with various scoring systems, country-counting conventions and so on. We therefore think it is time to air our own views (and, we feel, those of many of our readers) on the subject of the present arbitrary list of countries. All evidence goes to show that the major power in this respect is the ARRL, for which body we have the greatest admiration in many ways.

Nevertheless, one can have no hesitation in stating that the list of "countries," as generally accepted to-day, is completely cock-eyed! Let us quote a few anomalies to prove the point:

Islands such as Fernando de Noronha, Trinidad Island, Clipperton Island—of which none of us had ever heard before a DX-pedition made a landing and put them on the air—are "countries" . . . but not Tasmania, or Dickson Island, or the Aleutian Islands or even Sicily, *with its own prefix!* For a hundred years the various islands of the Leewards and Windwards groups have been issuing their own stamps—islands like Antigua, Dominica, St. Kitts-Nevis, Grenada, St. Vincent and so on. They have counted merely as two groups—Leewards and Windwards—yet now, after the formation of the West Indies Federation, we are informed (not, mark you, by anyone in the U.K. or concerned with the Crown Colonies) that they will in future be counting separately!

Ruanda-Urundi, with stamps, boundaries and separate prefix of its own, simply counts as "Belgian Congo"—which it is *not*; yet a



W6YY

## CALLS HEARD, WORKED and QSL'd

rock with a lighthouse on it (Navassa) is a separate country.

Gold Coast and Ghana—the same place with the same people operating the same gear—count as two separate countries according to whether you worked those people before or after March 4, 1957. And if you worked an Englishman signing VP8 on, say, South Georgia, you could count that as a "country," but not if you worked the Argentinian or Chilean national sitting on the same piece of ground and signing LU or CE.

We could go on like this *ad infinitum*, or so it seems, but we hope that by now you have had enough, and that you realise that the whole thing is out of hand and chaotic. What's to do about it? We should be able to find some infallible non-radio yardstick for the countries of the world . . . it seems probable that such a body as the United Nations might possess a list! If, on the other hand, we want to go on

pretending that certain arbitrarily-chosen islands are "countries," then let's have The Lot, so that we can go and live on the Isle of Wight.

### The Countries List

Arising from the foregoing, may we suggest the following amendments to the Countries List, as published in the April issue: HN and YI were inadvertently shown as two separate entries; YI should read "Obsolete—see HN." The list of possible prefixes for Antarctica should, if you are pedantic, include OR, FB8, JA, LA/P, UA and ZL5. PYØ (Fernando de Noronha) and PYØ (Trinidad Island) should be added, and we don't see why you shouldn't also put in YNØ (Corn Island) for good measure, because some authorities admit it and others don't.

When Saarland reverted from 9S4 to DL8 (March 31, 1957) it ceased to count as a separate country; similarly, I1 (Trieste)

became "Italy" again on that same date. What happens to SU and YK contacts made respectively before and after the Federation we do not pretend to know. If you worked an SU and a YK before the Federation they counted as two countries; had you worked the same two stations afterwards, they could have counted as (a) two countries; (b) one country (a new one?); or (c) one country (but one of the old ones). Five points for a correct answer, if anyone recognises it when they see it.

All right, you try and work it out! For the time being, we don't intend to get involved in this business, as there are enough contradictory opinions in the market already. Count your countries as you think fit, and we won't quarrel with you . . . but we should like to drop the whole thing and embark on some scoring system that would keep still a little longer than the present one does.

We welcome all opinions on this subject—but please keep them separate from your routine letters concerning DX worked.

### Fifteen Metres

This band takes pride of place, as it has undoubtedly been the best for DX during the past month. Previous ideas of "best times" have gone by the board, and more than once it has been possible to hear all continents simultaneously. On one particular morning your Commentator found FB8XX, VS1BB/VS9 and VP5BL all on the same frequency, near 21080 kc. FB8XX was working a KH6; VS1BB was in QSO with a PY; VP5BL was being called by Europeans . . . six continents on the one spot.

On another occasion DU7SV, VR3A and KW6CM were worked in three consecutive QSO's (0845-0930). But it hasn't been like that all the time, and towards the end of the period conditions became quite poor.

And what a mess this band has become! Checking the CW end one evening with a frequency-meter, there were either teletype stations, jammers or other forms of jingle-bells on 21,000, 21,009, 21,021, 21,039, 21,061 and 21,081

kc—all of them S9 except for one feeble specimen. What with jammers that go "*splargle-splargle-splargle dit-dit-dah-dit dit-dit splargle-splargle*" all day and night, and useful little outfits that send "ODU 23 de ODU 23" for twenty-four hours, one often wonders how amateurs ever manage to communicate at all.

G3FPQ (Bordon) says conditions have been better than he has ever known them, with Pacific stations coming across with a rapid flutter and S9 signals time and again. KH6's have been there many mornings, also VR3A and KM6BK on CW. KB6BH was worked on phone with reports of S9 plus 20 both ways, other phones being KM6BK, KP6AL, VR3A, ZD1EO and ZS8I.

G2DC (Ringwood) has not had much time on the band, but managed to work CT3AB, CR7BN, EL1S, JT1YL, KG1GK, PZ1AQ and OR4VN—the latter comes in like a commercial and blocks his receiver.

G3BID (London, N.W.3) worked phone with PZ1AG, FM7WQ, OR4VN, VP8DG and VP8DH, plus W6's and 7's. (The VP8's are the same station, with different operators.) OR4VN was working a Belgian station for nearly an hour, S9 plus all the time, before G3BID got in.

Three new ones for G6VC (Northfleet) were FA9IO, TI2LA and UAØKAR. GM3FFQ found Pacific conditions very good, and worked several VK's and ZL's, although he was on only for short periods.

W8K1A (Defiance, Ohio) put his band total up to 171 with the help of VS1BB/VS9 on CW, and XZ2SY on phone. VO2NA (Goose Bay) collected CR4AD, EA8CF, FS7RT, HC1AGI, HH2Z and TI2VA on phone; CW raised CR6AI, F8BF, VP7NG, XE1PJ and 2FA, ZC4BL and innumerable Europeans.

EI6X (Limerick) stayed on Fifteen all the month, and his phone brought in YS1LA, OD5BZ, KZ5DN, HC1KV, VS2DW, HH2Z and a collection of VP8's (five in all). He now has two "W8JK" aerials (33-ft.) at right-angles, with a quick change-over at the operat-

ing position. Best laugh of the month came from two stations asking each other who JT1AA was, and where he might be!

G3JZK (Cambridge) collected DU7SV (phone) and VR2DG (CW) on an early morning spell; the latter is VE7AFP and uses only 15 watts, but was putting in a 569. OR4VN and VP8CQ (South Shetlands) were also new on phone.

G3FXB (Southwick) exchanged phone reports with FB8BX, FK8AU, HL2AJ, KB6BH, KM6BK, KX6AF, VR2AZ, VR3A, YN1LR and ZK1BS. As if that lot were not enough, he worked FB8XX, KB6BJ, KC4USA, UF6AB, UL7GP, VR2DG and a host of routine stuff on CW. FB8XX was worked at 1030 GMT, over the North Pole, and VKØKT heard, but not worked, the same way.

G5BZ (Croydon) worked XE2FL, VE5, VK and W6-7, but was away for much of the month. W6's were blocking his receiver one night . . .

G2HKU (Sheerness) worked ZD3G, UD6KAB and heard FB8XX, VP5BL, JT1AA and 1YL, and YA2AC. This was CW, on which G2BLA (Morden) raised JT1AA and OA4ED. G3JCQ (Barrow-in-Furness) worked phone with VU2PS, VS2DW, PJ2AX and some VK7's. G3ABG (Cannock) raised ET2US on phone, and his CW collection included XE1PJ, JT1AA, VP5BL, FB8XX, VS9AO and many others.

GW3AHN (Cardiff) has now worked 210 countries on this band—the highest score we know of by a long way. Recent ones have been FB8XX, HC1LE, VR3A and ZL5AC on CW, plus FB8XX, HS1E, KB6BH, KR6AL, VK9AA, VR3A, VR3Q, XZ2SY and 9G1AA on phone.

G3FPK (London, E.10) comments on the terrific echo from FB8XX—this we have noticed when he is coming over the long path; his short-path signal is also quite strong and naturally arrives in front of the other one.

G3LET (Westcliff) managed a good solid QSO with JT1AA at last, and also worked DU7SV, EL1P and VS1HQ—all CW.

### Ten Metres

This band has rather dropped out of the running recently, more from lack of activity than from poor conditions. G3FXB was one of the lucky ones who found VS1BB/VS9 on Ten, where he worked him on phone, together with HI8BE, VE3BQL/SU and VP8CC. CW supplied him with ZD7SA, who also uses phone on occasions but is suffering from bugs in the modulator at present.

G3FPK worked phone with ZD3E and OD5AA, with ZD7SA on CW. ZD3E was leaving for England, and there will be no ZD3 for the present. Good signals at midnight or even after have included ZL3JO, LU2JV and CR6AO.

G3JCQ raised KG6AGO, VS9AP, ZE2JA and OQ5IG—all phone. G3BID, also phone, raised MP4BCI, VP8CV and some W6's. G3AKX (Sale) accounted for FB8BP, VE3BQL/SU, PJ2CE, KG6AGO and CR6BX (all phone) with CP1AM as a near miss.

G3FPQ worked ZS8O on phone and ZD7SA on CW.

Known to be active on Ten phone are KB6BH, KM6BI, KX6BP and 6BU—but no one has been lucky enough to raise them, it seems.

### Twenty Metres

It is not often that Twenty is definitely inferior to Fifteen, but that does seem to have been the case this month. More and more of the rarer DX'ers are discovering that they are not so badly mauled by the rough EU's on Fifteen, and are migrating accordingly.

G3FPQ was very annoyed by certain W6's who did their best to break up his contacts with VR3A and KM6EVK (*why?*) and VR3A seems to have deserted Twenty, partly for this same reason. Other CW contacts for G3FPQ were FB8BD, FO8AC, KP6AL and VS1BB/VS9. On phone he got ZK2AB and heard KH6BEJ/KJ6 but didn't work him.

G3BID raised XE1CW, 1RM and 1UF, all on phone, around 2120 GMT. VE7ALE and W7GIG (Oregon) were worked in the early morning. EI6X got his phone through to XZ2KN, who

was causing a bit of a stir on the band.

VO2NA's phone raised KG1EE, VP2KM and sundry Europeans; CW collected KC4AF, KH6, KV4, OQ5, OY2H, VP7NG, YV5DE and, of course, more Europeans. Three new ones for G3JZK were VS1HU and UJ8KAA on CW, HV1CN on phone. The latter, he says, does speak reasonable "QSO English" after all. G2YS (Filey) bagged ZC5AL on CW for a new one.

G3LET thought Twenty excellent, and on CW he worked DU1RTI, FB8XX, KP6AL, XE1RM, YV3BI and ZK1AK. On one day between 1800 and 1815 he heard KP6AL, ZK1AK, ZM6AS, KM6EVK and FB8XX, all within a few kc of 14030.

G5BZ stuck mostly to Twenty, as usual, and came out of it with ZC5AL, 9G1CR, ZK1AK (long path), VKØKT, VR3A, VQ8AG and VS1BB/VS9, to mention only the best. He has been hearing a number of KH6's by long path (over the South Pole) but hasn't yet worked one.

G2HKU, also CW, worked VQ6AB, VS1HU, VS6EC, CT2AI and a bunch of U's. GW3AHN, on CW, collected FL8AC, KP6AL, LA2JE/P, VS1BB/VS9, ZC3AC, ZC5AL, ZK1AK and ZK1BG.

G3FPK winkled out JT1 and CT3 for new ones, along with HP3RL, KH6KC, TF5AD/3 and 4S7KD. The latter, in the course of a half-hour's CW natter, said he would very much like to work more G's.

G3JCQ reports a bunch of VE7's—he was born there and so goes after them! G3FXB raised KM6EVK (Phone) and JAØAQ (CW).

### Eighty and Forty

DX is scarce on the LF bands, but some of the persistent types manage to ferret it out now and then. G3JZK can now load his aerial on Eighty, but hasn't amassed any DX as yet; on Forty he had a report from BERS-195 (in VK-land) which cheered him up.

G2YS raised UL7UN and sundry other U districts on Eighty, also UF6KPA on Forty. G2DC actually collected three new ones

on Eighty, in the guise of UA, UP2 and CT3AB; he also worked the usual W's and VE's.

G3FPQ raised VP8AX (South Shetlands) on Forty and heard many other G's calling him. They all stood off during the QSO—unlike a DJ2 with a buzz-saw note who was calling the VP8 all the time he was actually transmitting to G3FPQ; this lengthened out what would otherwise have been a

### Short Wave Magazine

#### DX CERTIFICATES

*The following have been awarded since the publication of our last list, in the March 1958 issue:*

**WFE**  
No. 32 W6YY (La Canada, Calif.)  
33 G8GP (London, S.E.4)  
34 W8JIN (Cincinnati, Ohio)  
35 CE3AG (Santiago)

**FBA**  
No. 110 F3NG (Bethencourt)  
111 PAØSNG (Enschede)  
112 F9MS (Suresnes)  
113 G8JR (Aldershot)  
114 G3JVJ (London, S.E.22)  
115 G3DQO (Urmston)  
116 OH3RA (Hameenlinna)  
117 HA5BW (Budapest)  
118 SM6BDS (Molndal)  
119 W8JIN (Cincinnati)  
120 SM7MS (Malmo)  
121 G8DI (Liverpool)  
122 YU1NM (Belgrade)

**WNACA**  
No. 164 G8JR (Aldershot)  
165 OK3EA (Bratislava)  
166 G1KVO (Dungannon)  
167 G3KQS (Helston)  
168 GM3BCL (Aberdeen)  
169 G8GP (London, S.E.4)  
170 HBVP (Perugia)  
171 UR2KAA (Tallinn)  
172 G3JIM (Belfast)

**WABC**  
No. 166 G8JR (Aldershot)  
167 GM3COV (Thurso)  
168 G3IIS (Chelmsford)  
169 G3JDK (Rotherham)

**WBC**  
No. 94 W2GT (Rochelle Park)  
95 OH2VZ (Helsinki)  
96 VO2NA (Goose Bay)  
97 SM5AJR (Linköping)  
98 W3HQO (Philadelphia)  
99 W3EYF (Baltimore)  
100 WØGUV (Kirkwood, Mo.)  
101 DL9TJ (Solingen)  
102 PAØSS (Terneuzen)  
103 DL6CL (Tutzing)  
104 PAØSNG (Enschede)  
105 W8JIN (Cincinnati)

Details of MAGAZINE DX AWARDS and CERTIFICATES, and the claims required for them, appeared in full on p. 84 of the April, 1958 issue.

Overseas claimants (only) may send either (a) A check list, without cards, duly certified by the Hq. of their national Amateur Radio society, or (b) An uncertified check list, from which any or all cards may be called in by us.

Claimants from the U.K. should send the relevant cards for each award. A full list of U.K. Counties appeared on p. 82 of the April, 1958 issue.

quick QSO to half an hour, and must have made everyone hopping mad. For sheer stupidity and unnecessary QRM, this sort of thing is hard to beat. G3FPQ also worked HE9LAC.

G3FPK raised three new ones—OX, GC and YK1BA, all on Forty. G3LNR (Nottingham) worked seven East Coast W's on Forty while using only 10 watts; he also heard HK5KY, PY and LU, and raised UN1AH for a new one.

New for G2BLA were FA3KP, UO5IT and UH8KAA on Forty, as well as UA9, UB5, UC2, UP2 and UQ2 on Eighty. G2HKU raised LJ2F and UO5AA on Forty, SP6IR on Eighty. G3LET, working 40-metre CW, collected VP8AX (midnight), also OX3LW, HE9LAC, PY7AH and TF5TP. Forty is still a nice band for DX, if you can be on at the right time.

#### The "CQ" DX Contest — CW

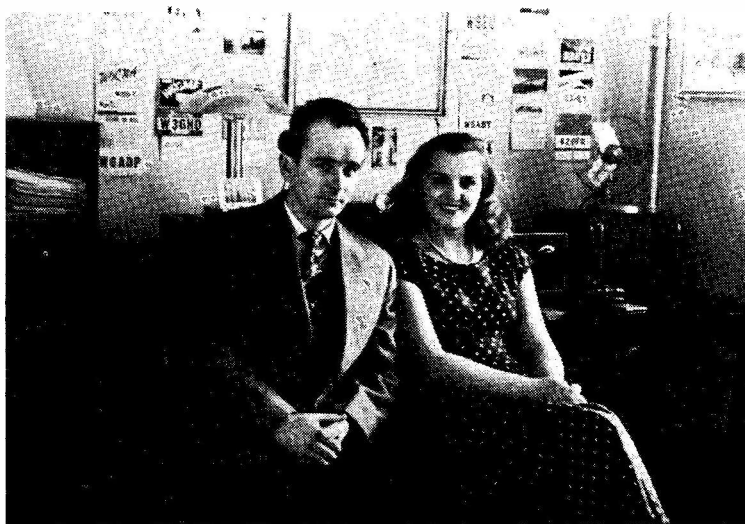
Full details of results would occupy the whole of this Commentary, so we must condense ruthlessly. First, *Single-Operator* Category: World Top Scorer and Trophy Winner was W4KFC (821,763). The rest of the Top Ten, all with scores over half a million, were KH6IJ, W3GRF, K2GL, W8JIN, VQ4AQ, PAØRE, 4X4BX, DJ1BZ and OK1FF. These were, of course, the all-banders.

On the *single bands*, the winners were: 28 mc, DL4AAP (253,680); 21 mc, CX2CO (193,719); 14 mc, G2LB (213,112); 7 mc, W3BVN (58,138); and 3.5 mc, SP5IA (6,936). Hats-off to G2LB for putting the U.K. into the Roll of Honour!

In the *Multi-Operator* category, the World-High was W6RW with a score of 1,171,088, followed by CN8IF, DJ3JZ, 5A5TE and KG6FAE, all around the 700,000 mark.

*Winning Club* was the New Jersey DX Association (3,502,080), very closely followed by Southern California with 3,134,771. Highest scoring Club outside U.S.A. was the Japanese DX Radio Club with 474,414.

The following U.K. stations also rate a mention: *Single-Operator*, All Bands: G3FPQ (429,975),



JT1AA/JT1YL in far Ulan-Bator, Mongolia. They represent the romantic and much sought-after area of Zone 23 which, it is fair to say, they have succeeded in making very accessible on the 15-metre band. This photograph was taken as recently as March and, for those who may wish to know, the only U.K. card actually visible here is that of G3HLY.

G3FXB (386,334) and G2DC (311,344). GI3AXI (169,176), GW3HJR (165,144), GM3GJ (55,650). They are the "tops" of their respective countries.

*Multi-Operator mentions:* G3IZW, All Bands (94,112); G3FUR, 14 mc (152,388).

Finally, reverting to the *Single-Operator* stations, we have G3HCL, G3KKP, G3EYN, G2HPF and G3JVJ, all with six-figure scores, following the Top Three mentioned above.

Once again the U.K. entry was relatively small, comprising only half the number, for instance, of the OH's, DL's, OK's or SM's, and being less numerous even than the SP's. There must be some reason for this, but we can't fathom it out at the moment and would be most interested to receive suggestions. Anyway, congratulations to all the above-mentioned operators for their devotion to the cause!

#### Operating Notes

Several times during the month we have been amazed at the inability of some people to read even strong signals accurately. Here are a few examples, actually heard on the bands: A DL station was heard calling "ZK1KT," which didn't ring true,

somehow, so we waited to see what happened. Back came OK1KTI! Within twenty minutes someone was calling "VY9AC"—this turned out to be 3W8AC . . . Next day VR3A was very plainly in QSO with a G station, and sending "KN" very forcibly, but this didn't prevent an LZ from calling "VR2A" right through the QSO.

A ZL3 being called at a time when no ZL's should have been around turned out to be a DL3 . . . a YU6 was hopefully interpreted as a KX6 by a whole wolf-pack who turned the air blue for ten minutes or more (but he asked for it by the way he sent his call). All the same, one wouldn't expect a KX6 to be S9 and T7/8 at 1430 . . .

While we are on the rampage, a few personal dislikes on the phone bands: "I won't hold it" (after 25 minutes of natter) . . . "Any possible final" (have you ever heard an impossible one?) . . . "I worked him last night on Charlie Whisky" (Ugh!) . . . "OK your 150 watts, OK your 3-element beam, OK your FB, WX, OK your HRO receiver" (in other words, OK!) . . . And as for "Calling Charlie Queen Dog X-ray"—one can't even think of a suitable comment! (over)

Pile-ups are showing more and more the complete futility of the long-winded call. Those we have observed during the month have shown that the station who usually gets his nose in early is the one who chooses precisely the right moment and frequency and simply sends "de G3XYZ" and nothing more. At least four times we have heard one of those beat all the windy gang to it. The great pity of the whole thing is that, the more futile you are, the more QRM you cause . . . the one that gets the prize causes hardly any at all. (But he has to suffer from the rest, just the same.)

#### Miscellany

SWL S. R. Smith (Crewe) says that VE7ALE will be on from Alaska with the special call VE7BCC, on 28, 21 and 14 mc.

GM2DBX (Methilhill) reinstates himself in the Five-Band Table, as he has been getting letters enquiring after his health! We are glad to know that he is still active, and hope to hear of more and more DX.

G3JZK says that the "U" thing on 14 mc (which has now disappeared) seemed to have been synchronised with other "U-senders" on other frequencies, suggesting that it was for propagation research of some kind. G3JZK, by the way, is playing with double-sideband suppressed carrier, which he finds very easy to get going; but he says the real SSB boys don't think much of it!

G3CMJ (Salisbury) asks us to state that he has no QSL cards and that the receipt of QSL and SWL cards is of no interest to him.

VP6WD (Hastings, Barbados) is ex-G2WD. He is licensed for 150 watts on the same bands as the W's (including 50-54 mc) and will shortly be on the air with QRP phone and SSB. He finds the VP6's and VP2's most friendly and co-operative, but repeats the old warning that anything in the way of gear has to be fetched out from the U.K. Spare parts are quite unobtainable except from other amateurs. However, as he rebuilt all his own gear in compact form and took the lot out with him, he hopes to be fully opera-

tional for some time to come. He finds that even VP6 is "DX"—he was with VP6ZX recently, they called CQ, and down came the rain about ten deep!

G2BLA lost the far end of his long wire, and as he is moving he didn't bother to get the pole down, but tied the aerial to the garage—since when he raised JT1AA at 599, and quite a few other nice ones. He advises long-wire exponents to break their halyards, flog their masts, and sit back working DX!

G3ABG is chasing a new certificate called "100 TVI Complaints when Not at Home" . . . and the GPO inspector was very impressed by the clear TV picture in G3ABG's shack when he was on the air! G3ABG also tells us that if you are chasing any American Counties awards, the *Rand McNally Atlas* is comprehensive and most helpful; they cost \$1.75, if you can get one.

G3JCQ confirms the item about VE7ALE, adding that the call will be VE7BCC/KL7, and is an expedition in connection with the British Columbia Centennial celebrations. VE7BCC/KL7 will be active between June 14 and July 13, on 21 and 14 mc phone.

An interesting note from ex-VE7AFP explains that he is now VR2DG at Suva, Fiji, and expects to sign that call for about another two years—originally, he intended to stay only one month, but "the lure of the tropics" got him, though what the travel folders *don't* mention is "the 120 ins. annual rainfall, and the large potholes in every road"! At present, VR2DG has only 15w. on 14/21 mc CW, with an indifferent aerial, activity being mainly around 1000-1300 GMT; some G's have been worked. VR2DG can be QSL'd via VR2AS, or direct to: B. R. Pooley, c/o Posts and Telegraphs Dept. (Radio), Suva, Fiji Is. He also mentions that VR2BC is now QRT, for U.K. leave. Thanks, Ben, and good luck.

#### Top Band Topics

Very little news of One-Sixty this month. The seasonal static is beginning to reduce the band to the usual collection of local Nets.

G3LBQ, however, worked a couple of new counties and got a 589 from HB9IN, who is confirmed by G2NJ (Peterborough).

G3FPQ reports hearing an OZZ on the band, or rather out of the band—working a G3 on about 1780 kc! G3LNR raised quite a few new counties, including G3IV (Durham), GC3HFE (Guernsey), GM3KHH/P (Perth) and GM3KLA (Shetland).

G3JHH (Hounslow) came across GM3KHH in Kincardine, and the Hastings Club's tour through Wales gave him Merioneth and Brecon. For those who may want Devon, G5PP/P will be on holiday in those parts from June 28.

#### SWL Corner

We have space only for really DX loggings this month. Please do not send long lists of "routine DX" while conditions are so good . . . S. R. Smith (Crewe) heard ZS8I and XQ8AG (*Ten*); CP1AM, FB8BX, HS1E, KM6BK, KX6AF, VKØKT and VKØTC (*Fifteen*); and HKØAI, HI8BE, TG7JD, XZ2KN and ZK1BS (*Twenty*)—all phone. P. Day (Sheffield) collected KM6BK, KX6AF, FB8XX, VP8CQ and OR4VN (*Fifteen* phone); XW8AI and KX6BJ (*Twenty* CW) and KC4USK (*Twenty* SSB).

B. Griffiths (Ventnor) heard VS9AP, VU2EJ and ZD7SA (*Ten* phone); L. D. Strange (Sutton Coldfield) logged VP2VB/MM (*Forty* CW, phone and SSB), YN1AP (*Twenty* SSB), SVØWN/Crete (*Twenty* phone), HS1E, YS1MS and ZP5HZ (*Fifteen* phone); VS9AP and ZC6UNJ (*Ten* CW).

M. Marment (Birmingham) heard ZS3E and 9GIBF (*Twenty* phone); the latter said that 9GICN/M has built a new multi-band mobile rig and wants mobile-to-mobile contacts.

#### DX Shorts

One of the very few possible "new ones" is Wrangel Island, whence UAØKSI is said to be located . . . The new West Indies Federation has apparently given rise to a whole rash of new possibilities, but we don't have them in detail as yet. However, six "new" countries may be expected (see also later paragraph).

VR2AP's tour continues (with QRP SSB) and he should show up from ZC5, CR10, VR4 and VR9 before he finally gets back to VR2 again . . . FB8XX (Kerguelen) has been very active on both 14 and 21 mc, Phone and CW . . . There are said to be several possibilities of PYØ operation from Trinidad Island during the summer. PYØNA was supposed to be there, early in May . . . The strange call 4UWZA emanates from a U.N. station in Switzerland (similar to ZC6UNJ in Jerusalem).

VS1BB/VS9 put in a lot of operation from the Maldives, although 'flu kept him off the air for a period. He is leaving the rig there, and further activity is promised during the summer . . . New and rarish ones on SSB are HL9KR and PJ2AA . . . Another possibility is VS90, in Oman.

Arrival of cards from VS1BB/VS9 and PY7AN/Ø has put W6AM's scores up to 253 on phone, and 280, all comers; he is now making anxious enquiries about Lord Howe Island! How many does one have to work before going back and starting from scratch?

VR3A showed up with a wonderful signal on 21 mc, where he managed to operate for several days with no pile-ups worth mentioning. Then the band went bad for the Pacific.

Pacific stations heard on Ten phone during a few very good days included KX6BP and 6BU, KM6BI, a bunch of KG6's and two VK9's. These "Pacific patches" are quite spectacular, and you are lucky if you catch them. They have probably finished for the summer.

G2DC has been keeping skeds with Danny Weil, who has been signing VP2VB/MM and VP2VB/CT3. He reports that Danny will be sailing direct from Madeira (reached on May 14) to KV4, whence one of his first expeditions will be to Aves Is., YVØ, in company with two YV amateurs. Two calls will be used—YVØAA and ØAB. Referring back to the West Indies Federation, and the remarks earlier in this piece, it is understood that several individual islands will count as new countries w.e.f. June 1, and one of Danny's

early jobs is to be put them all on the air. Among those mentioned are St. Kitts, St. Lucia, Dominica, British Virgin Islands and Antigua. In the reverse direction, it is suggested that Jamaica and the Cayman Is. will be re-grouped to count as only one country. Marvellous, isn't it? But all this sorting out should give Danny some pleasant cruising without leaving the Caribbean.

Some gossip items from SWL P. Day (Sheffield): W4RQR will shortly be on from FG7 and FM7, SSB . . . ZS8I and ZS8O both on 21 mc phone . . . ZL5AC (Antarctica) on 21 mc phone . . . HS1ME is on 28450 at 1600 GMT . . . ZS6UR looks for DX on 50.014 mc, weekends . . . HB9ET operates the queer one, 4UWZA, a UN station in Geneva, and suggests that it counts as a new country!

Items from G3FXB: VK2AIR will be on from Lord Howe Island in six weeks' time, for a short period . . . there is a 1 kW rig in the Sultanate of Oman ready to fire up when the official OK is given . . . ZC6UNJ will soon be QRT, and Paul, the op., will be

off to VU, AP and Kashmir for six months, hoping to be active from all three.

From SWL V. Porter (Lough-ton): The Trinidad Island expedition has been postponed again, according to PY1CK . . . the new UN station at Geneva has receiver trouble, but will be there for two years; the ops. are only allowed to use the call 4UWZA or 4UZA from the United Nations Building. Again, said to be confirmed as "a separate country"! Finally, a floating transmitter-ship ("Voice of America") based at Rhodes, is just coming on the air for DX and, of course, traffic to USA from the crew of one hundred. There are three separate transmitters permanently installed on board, one a Westinghouse job.

**Heading Photograph**

When you are looking for a rare one, he is one of the stations with which you may have to compete — W6YY of La Canada, California, owned and operated by John Knight (a frequent correspondent to "DX Commentary") is one of the world's super-DX stations. Licensed in 1952, W6YY

**FIVE BAND DX TABLE  
(POST-WAR)**

Station	Points	3.5 mc	7 mc	14 mc	21 mc	28 mc	Countries	Station	Points	3.5 mc	7 mc	14 mc	21 mc	28 mc	Countries
DL7AA	872	113	170	235	185	169	249	W6AM (Phone)	358	13	32	253	39	21	253
W8KIA	802	68	148	271	171	144	271	G3GZJ	332	29	60	102	96	45	136
G3FXB	761	73	131	213	194	150	243	G3IGW	309	44	65	86	66	48	121
G5BZ	733	64	118	252	178	121	259	G3FPK	301	30	67	112	62	30	135
G3FPQ	695	70	101	201	189	134	223	G3JZK	296	15	54	64	101	62	148
G2DC	669	77	101	205	148	138	223	G6TC	293	17	66	126	53	31	141
G3DO	634	24	46	235	162	167	252	G2BLA	267	32	48	66	67	54	110
W1VG	604	25	120	204	139	116	209	G3JJG	265	38	45	94	53	35	113
W2EQS	577	79	118	177	114	89	193	G3LET	252	11	49	125	50	17	135
W6AM	511	30	58	280	86	57	280	G8DI	251	25	56	68	59	43	107
G3WL	508	41	82	171	123	91	198	G2YV (Phone)	240	12	24	76	84	44	125
G2YS	489	71	87	160	109	62	178	G2DHW	225	20	27	124	40	14	133
G3ABG	483	45	84	170	99	85	190	G3DNR	216	10	21	83	45	57	101
G3BHW	468	15	32	171	136	114	203	VO2NA	157	13	17	82	34	11	86
GM2DBX (Phone)	425	34	31	160	102	98	176	G3IDG	105	11	15	24	33	32	46
G6VC	387	34	49	146	90	68	164	W3HQO	61	3	5	12	32	9	?

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

is active on all bands, CW and phone, with the full kilowatt. Separate Exciter-PA's are used for each band, with instantaneous band-switching; receivers are Collins 75A-2 and 75A-4. The radiating system consists of beams for each band 7-28 mc, with vertical aerials for 80 metres and Top Band. Our photograph shows only about half John's impressive station. His operating record is pretty impressive, too—233 countries in 39 Zones confirmed on phone, and 253C in 40Z on CW. And however expensive your gear, you have still to be a very good DX operator to show totals of that sort, particularly in face of

the competition there is for DX on the West Coast!

#### Late Flashes

The promised PYØ expedition during mid-May did not materialise after all; plenty more activity promised . . . VE3MR/VP1 has been heard on 21400 kc, SSB . . . VQ8AQR (formerly VQ8AQ) no longer on Rodriguez, so if you hear him signing VQ8AQ he will be on Mauritius. Meanwhile, VQ8AJC is supposed to be active from Chagos.

ZE3JO's *safari* (mentioned last month) should be under way by the time you read this. Look out for "JO" calls with various

prefixes . . . ZD9AF has been heard around, despite rumours that all ZD9's had vanished.

W4KC/KS4 is active most days, 2200 to midnight, various bands phone and CW . . . ZC3AC comes up on either CW or phone on the same frequency, 14107 kc.

So that's it for one more month, and we look forward to hearing from you all again by the next deadline. **first post on Friday, June 13.** Earlier than usual, owing to the calendar, so please note and get weaving now. Address everything to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Meanwhile, Good Hunting and 73.

## YEAR ON THE AIR

### EXPERIENCES OF A POLIO CASE

Paul Bates (G3MAC)

*In the August 1957 issue, an article by G2DVD told how G3MAC came to be licensed. Here is G3MAC's own account of his results, experiences and impressions after 12 months on the DX bands. It will be remembered that he is a very severe case of poliomyelitis, contracted on service in Malaya. Requiring artificially induced*

**T**HIS month sees the end of my first year on the air and, whilst I imagine that every amateur's first year is both rewarding and exhilarating, I doubt whether there are many who have experienced as much sheer enjoyment as I have during the past twelve months.

The rig throughout has been a Minimitter and an AR88. Modifications were made to these two enabling me to control, with a stick in my mouth, the main tuning and AF gain of the receiver and the VFO, PA, drive and audio gain on the transmitter. The first two fingers of the left hand were harnessed to two light switches, one for the VFO/tuning and the other for the "on/off" switch. It was then decided to run four bands—80, 20, 15 and 10 metres—and for these were chosen a half-wave dipole on Eighty and a G4ZU Minibeam for the DX bands.

The Minibeam was installed complete with rotating motor

*respiration, the only movement left to him is of his head and two fingers of one hand. Those who are free to walk out into the sunshine may pause, and give thanks.—Editor.*

and selsyn indicator; these are controlled by two micro-switches mounted on the receiver which are depressed when required by the ubiquitous stick.

All this was completed soon after the licence and call-sign had been allotted. The station was then ready for operation. CW, however, presented some rather outside problems, and so almost all the



Paul Bates, G3MAC, stricken in his early twenties by the onslaught of severe polio. He is almost completely paralysed, the only movement left to him being in his head and two fingers of one hand; even his breathing is by continuous artificial respiration. Yet he has found happiness and a place in the scheme of things through the medium of Amateur Radio. In his own words, he tells something of his experiences during his first year on the air, in the hope that it might help to sustain and encourage others who may have a similar burden to bear.



1,200 QSO's so far have been on phone. Eighty metres has claimed a large portion of these contacts, but helped by first-class equipment some DX has been worked and enjoyed. The present score is 62 countries in 26 zones, among them ZS8, VK9 (Papua), CR7, CR9, VP8, ZD6, VO, VQ6, JA, HZ, HC, W6/7, VK's, ZL's, and many VS1 and VS2 stations.

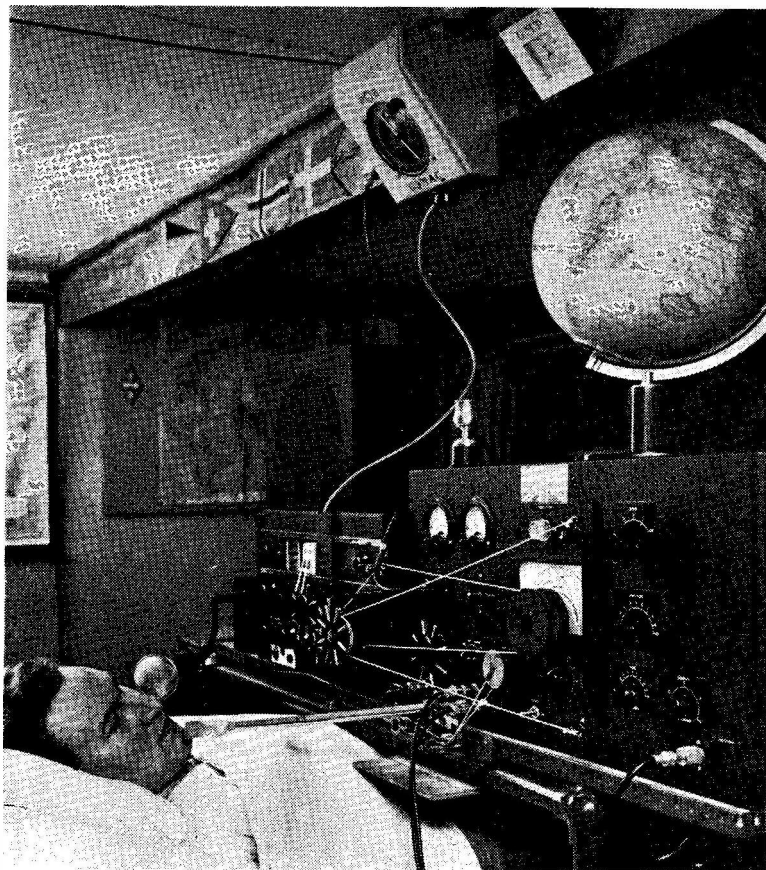
Most of the DX has come from 10 metres, except for VS1's and VS2's, which have been worked only on 15 metres. Although this is not a very formidable array of DX, as such, a far greater reward has been the many new friendships which have been established.

It is difficult to single out incidents that have happened, or individual friendships which have been made, but a few are very much worth mentioning.

There was, for instance, the moving occasion when a class of Zurich schoolchildren who, having read about my activities, asked their teacher to approach HB9J (Jean Lips) to ascertain if he would relay a message of Christmas greetings consisting of songs and a short piano recital. HB9J, in turn, obtained permission from the Swiss authorities for the special transmission, and shortly before Christmas a 15-minute "programme" was heard on 20 metres under good conditions. Since then the original tape-recording made in the class-room has been sent as a permanent record, and a weekly schedule has been kept with HB9J.

Most unusual was the contact with VP8AQ (Port Stanley). A new country for G3MAC, but more than this: After a ten-minute exchange of information about signals, rig and so forth, I asked, "Do you, by any chance, know Desmond King?" (A friend whose home and family are in Sussex, and whom I believed to be in the Falklands). To my complete surprise the nonchalant reply came back, "Des? Oh yes, he lives next door." I suppose there have been many greater coincidences, but that was enough for me.

The greatest thrill of all was a contact with VS1FZ (at VS1FJ's station) made recently on 15 metres. It completed the cycle, for it was VS1FZ who first introduced me to Amateur Radio after a chance meeting in 1954 when I was spending some leave in VS1. When he returned to England as G2ATM he learned that, in spite of being in the horizontal plane, I was still interested in Amateur Radio. After a visit it was he who set the ball rolling, culminating in my gaining my ticket last year.



The equipment layout at G3MAC, Slinfold, Sussex. The Minimitter transmitter is on the right and an AR88 on the left, the controls having been converted to capstan knobs so that G3MAC can manipulate them himself, by the stick held in his mouth. Change-over and VFO-net control is by finger-tip switches, as he has been left with some movement in two fingers. More than 1,200 QSO's have been made, on four bands, and much interesting DX phone worked, under the conditions shown in our photograph.

The most recent incident was the encounter with K9EAB, Cliff Corne, who operates under very similar conditions to myself—see p.91, April 1958, SHORT WAVE MAGAZINE. One difference is that K9EAB, a keen DX man, has to live inside his respirator, and therefore has to rely on someone else to tune for him. I am somewhat more fortunate in that with the method of breathing I use I can stand my respirator on one side out of the way of the rig, thus enabling me to operate for myself.

Apart from the theoretical and practical side of Amateur Radio, I have learnt a good deal about what is known as the "Ham Spirit"—so often said to be not what it was. But I can say that whatever help has been needed has been immediately forthcoming from all sources and in every way; sometimes, people have been kind almost to the point of embarrassment.

It would be invidious to single out any one individual, or any one incident, but I shall always be grateful for all the help that has unhesitatingly been given to me as G3MAC.

## SSB Topics

NOTES ON LINEARS — SOME NEW  
EQUIPMENT — AND ALL THE GOSSIP

Conducted by R. L. GLAISHER, G6LX

*In presenting "SSB Topics" this month, G6LX explains that much of the credit for its appearance is due to the help he has had from DL4SV. This is because our contributor is on attachment in Germany for his firm, and consequently has not himself been as closely in touch with SSB activity as he is usually. Until G6LX is home again, all correspondence for him arising from "SSB Topics" should be addressed c/o The Editor, through our office.*

IN introducing "SSB Topics" this month, we should like to touch on the subject of the art of communication—not in the radio sense, but in the more general field of letter-writing. The Question and Answer Department deals with an average of 20-30 letters on SSB during each two-months' period, and, because of space limitations, the majority of these queries have to be handled by direct correspondence. There are two other main reasons why the direct approach is necessary: the questioner does not always want his name or call-sign to be tagged to the query, or the subject is too specialised for general interest.

Letters that fall in the "specialised" category usually refer to specific technical problems of a semi-personal nature, e.g. difficulties encountered during the construction and testing of SSB equipment. The letters in this section (and by far the largest volume of correspondence in is this category) are often difficult to follow and usually do not contain enough information to enable us to understand the questioner's difficulties. At this moment, the pending file contains ten letters that cannot be answered without further factual information, and in one case six separate letters have been exchanged and the problem has still not been fully resolved.

Through this feature, the writer is always pleased to assist in advising readers as far as he can on specific problems in connection with SSB, but it is essential that we be given the fullest details; for instance, in the case of equipment troubles, very full background information must be given, including a circuit diagram and the exact nature of the trouble. Voltage and current readings are useful and a list of the test equipment available will often save an additional letter. It is absolutely hopeless writing in to say "My linear PA does not seem to work properly—can you help me?"! In fact, it is the asker of the question, or the correspondent with the problem, who has to do most of the work, in that he must supply enough information on which a clear-cut solution or suggestion can be based!

Questions in the specialised category also dictate the theme of this month's technical discussion. Following the publication of the G2NH circuit in the December 1957 issue of SHORT WAVE MAGAZINE,

many queries have been received relating to specific problems in the linear-amplifier field. These questions have ranged from a misunderstanding of basic theory, testing, and non-linearity problems, to requests for operating characteristics of amplifier valves to be grossly misused in ways that their manufacturers never intended!

Although most of the queries have been concerned with amplifier troubles encountered in practice, a general pattern has emerged which clearly indicates that there are a number of misconceptions amongst many of the newcomers to Single Sideband.

### Introduction to the Linear Amplifier

The purpose of a linear amplifier is faithfully to reproduce all of the amplitude variations of the input signal in the output circuit at a higher power or voltage level. Speech amplifiers are linear *voltage* amplifiers, and modulators (or audio power amplifiers) are linear *power* amplifiers. The only basic difference between speech amplifiers and RF linear amplifiers is the frequency involved. It is necessary to use the same operating parameters, e.g. anode voltage, bias, load impedance, and so on. Non-linearity in any type of amplifier will produce distortion, but this distortion will usually be more objectionable under RF conditions than in audio service. A small amount of RF distortion can produce splatter, which causes a wide signal or interference on nearby frequencies. The same amount of distortion in a similar audio amplifier is not detected by the ear and can only be measured with suitable instruments.

The application of RF linear amplifiers is well established in the commercial field, where their use dates back to the early broadcast transmitters. In the 1930's, amateurs frequently used the linear technique to boost the output of a low-level grid- or anode-modulated buffer-stage with a single, or a chain, of Class-B amplifier stages.

The removal of the carrier and the nature of the waveform of an SSB voice signal have provided the valve manufacturers with a new set of operating conditions to meet. In some cases, this has allowed them to up-rate the valve operating limits and publish sets of conditions applicable only to SSB operation. (Eimac and RCA are two such manufacturers that have adopted this practice.)

The amount of power to be expected from a particular valve type in SSB linear-amplifier operation depends on the nature of the signal being transmitted, the power dissipation and the operating conditions of the valve. The most convenient method of rating the amplifier output capabilities is to drive the transmitter with a single-tone signal (such as the output from an audio oscillator or by means of a sustained whistle into the microphone). The use of

such a test signal at full modulation (drive) level will operate the amplifier at steady maximum-signal conditions which are easily duplicated. This type of test allows the power performance of the stage to be easily checked by meter readings, but does not give any useful information about the linearity characteristic.

To study linearity by observation of the amplifier output, some means must be provided which will vary the output level through zero to maximum with a regular pattern. A simple means of obtaining such an output signal is to use two audio signals of similar amplitude to drive the transmitter. This procedure will produce an output signal made up of two steady signals separated by the frequency difference of the two tones. When observed on an oscilloscope, the output signal has the appearance of a carrier 100% amplitude-modulated by a series of half sine-waves.

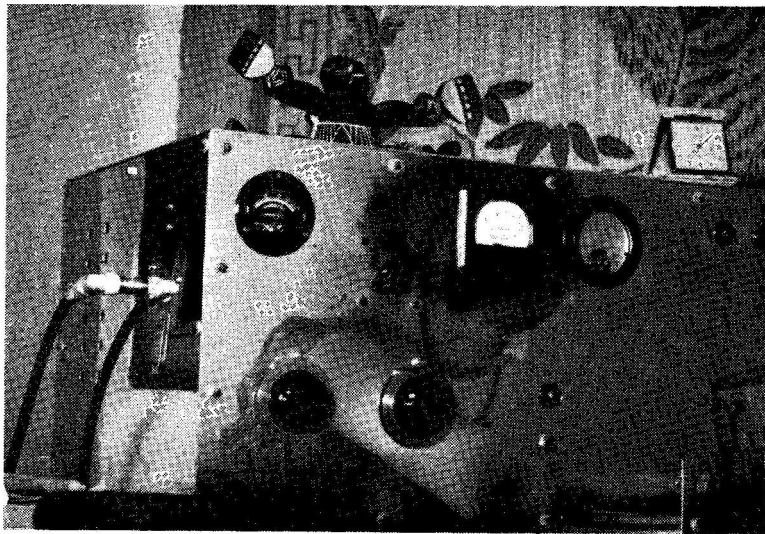
The two single-sideband handbooks (*Single-Sideband for the Radio Amateur* and *SSB Techniques*) discuss the theory and application of two-tone testing. They describe the several methods of deriving the two-tone signal, which varies depending on the type of sideband generator in use. This test procedure, in conjunction with an oscilloscope display of the output waveform, permits the linearity capabilities of the amplifier stage (or stages) to be examined and the operating parameters to be adjusted correctly.

Non-linearity in the amplifier chain will spoil even the best signal generated in an SSB exciter, and it is the opinion of the authors (yes, both of us!) that no new SSB transmitter should ever be air-tested or operated until two-tone testing has clearly indicated that the amplifier stages are linear. Regular two-tone testing should be carried out to ensure that valve emission changes and transmitter mis-adjustments have not caused a de-rating of linearity characteristics.

#### Choice of Valve Operating Conditions

In general, the criteria used in the selection of operating conditions for RF amplifiers are similar to those applicable to high-quality audio amplifiers.

Valves operated in Class-A exhibit a high degree of linearity, but the amplifier efficiency is relatively low (20% to 30%). Although this is satisfactory for low-power buffer stages, it represents a substantial power loss, in the form of anode dissipation, in the case of higher-powered amplifiers. Most of the advantages of Class-A operation can be obtained by running the amplifier in Class-AB1, with the added advantage that the efficiency rises to 60 to 70% (because the tank circuits act as energy storage systems, it is not necessary to use two valves in



QO5IE is the XYL of QO5GU, Stanleyville, Belgian Congo. This is a "double" photograph, in that the shot of the gear at QO5GU is superimposed on that of his XYL.

push-pull for Class-A, AB, or B, RF service).

If operation is advanced into the Class-AB2 region, the efficiency is slightly raised. This advantage is offset by more stringent requirements imposed on the driver stage, grid bias and anode power supply regulation. The variation in drive-stage loading as the amplifier grid is driven into the positive region can result in a compression of the modulation peaks and non-linearity (should the driver stage be incapable of furnishing the required drive current). It is usual when using Class-AB2 amplifiers to swamp the drive output by a resistor arranged to dissipate a large percentage of the drive power. With this swamping, the driver stage is more evenly loaded, so that when the amplifier grid is driven positive the relative increase in driver loading is small.

The next step up the efficiency ladder is full Class-B operation, and here figures of 70-75% efficiency are attainable. This advantage is only gained at the cost of a much higher power driver stage with considerable swamping, a stiff bias supply (unless zero-bias triodes are used), and a well-regulated HT feed.

For a full discussion on the advantages and disadvantages of each method of operation, readers are referred to Chapter 4 (linear amplifier theory) of the handbook *SSB Techniques*. The *QST* article (November, 1954), "Distortion in Single-Sideband Linear Amplifiers," and reprinted in the ARRL's *Single Sideband for the Radio Amateur*, also deals with this subject to a limited extent.

Comparatively high gain is required in SSB amplifiers, because the signal is usually generated at levels of 1 watt or less. To amplify from this level to the peak powers permitted under current licence regulations necessitates considerable gain. For this reason, the writer favours the use of a high-gain pentode or tetrode valve operated under Class-AB1 conditions. With this kind of arrangement, it is

often possible to go direct from a low-level Class-A stage to a high-power tetrode linear-amplifier and, by so doing, reduce distortion. (Each amplifier stage will introduce *some* distortion, and it is, therefore, an advantage to keep the number of stages to a minimum.)

The most important valve characteristic necessary for effective Class-AB1 operation is that the valve should be capable of permitting the flow of relatively high values of anode current at conditions of low instantaneous anode voltage and zero grid voltage. Most pentodes and tetrodes will satisfy the requirement if the valve is operated with a comparatively high value of screen voltage to offset the low grid-to-screen amplification factor, which is a normal characteristic of most pentode and tetrode valves.

The mathematical calculations to determine the design parameters for operating valves under SSB linear conditions are quite complex. Simplified calculations, together with a table showing the maximum ratings and typical operating conditions for a number of RCA valves used in linear application, have been detailed in *RCA Ham Tips* for December, 1954. It is not known if this publication is still available, but the RCA Tube Division at Harrison, New Jersey, U.S.A. (who normally issue *Ham Tips*) are putting out a lot of useful information related to this subject. Another very useful source of information is the Eimac Application Bulletin No. 8, *The Care and Feeding of Power Tetrodes*. This booklet can be obtained free of charge by writing to Eitel-McCullough Inc., San Bruno, California, U.S.A., mentioning "SSB Topics" in this *Magazine*.

#### New SSB Equipment

A new line of SSB equipment has recently been announced by Collins Radio, which should be of interest to most readers. Although not available for some months, preproduction specifications have been received and will be described briefly. The new equipment is composed of the 75S-1 Receiver, the 32S-1 Transmitter and the 30S-1 Linear Amplifier. The receiver and transmitter can be used independently, or with the receiver controlling the transmitter frequency for transceiver-type operation.

The receiver and transmitter have many design features in common. They both cover the HF range between 3.4 and 30 mc by proper selection of HF beating crystals. The band switch provides for a choice of 13 ranges, each over 200 kc, adequately covering the entire 80-, 40-, 20- and 15-metre bands. A choice of three 200 kc portions of the 10- and 11-metre bands is also provided. Both units use a double-conversion circuit, a permeability tuned oscillator operating between 2.5 and 2.7 mc, and a crystal oscillator working on either side of the 455 kc mechanical filter passband for sideband selection.

The 75S-1 Receiver is designed for SSB, CW and AM reception, incorporating the latest design features, such as switched selection of 2.1 kc selectivity for SSB, 0.5 kc for CW and 4 kc IF transformer passband for AM phone; AVC time constants for "fast attack" and "slow release," with a product detector, are facilities included for SSB reception. With only 150 volts on the valve

anodes and silicon diodes in place of the usual high-vacuum rectifier, less heat is generated, aiding improved stability and more compact design. Two plug-in patch cords between the receiver and transmitter enable the VFO and HF oscillators in the receiver to control the transmitter frequency. All-aluminium construction reduces the weight to 20 pounds, and the overall size is only 7 ins. high, 14½ ins. wide and 11½ ins. deep.—See Fig. 1 for block schematic.

The 32S-1 transmitter, outlined in Fig. 2, incorporates many of the designs found in earlier Collins equipment previously described in this *Magazine*. Power input is rated at 175 watts PEP on SSB, and 160 watts on CW. The pair of 6146's in the RF power amplifier are in the now commonplace pi-tank circuit.

Approximately 10 dB of RF feedback is used over the PA and driver for improved linearity, and 10 dB of compression is applied to the IF and RF amplifier stages through the automatic load-control circuit. Specifications state carrier and suppressed sideband are down 50 dB from the transmitted sideband.

Break-in CW operation is obtained through keying of an audio oscillator, which in turn feeds and operates the VOX circuit. Audio frequency response on AM and SSB is limited to 300-2500 c/s.

The transmitter is identical in size, appearance and construction to the receiver. However, the 32S-1 power supply is a separate unit, mounted in a matching cabinet, with sufficient space behind the front panel for mounting station accessories.

The 30S-1 linear amplifier is contained in a floor-mounting cabinet with its power supply. The new 4CX1000A ceramic tetrode is used in grounded-grid operating at 1 kW average power input on SSB and 1 kW input on CW. Drive requirements can be obtained from the matching 32S-1 or from any other source providing 70 to 100 watts. A panel switch permits a choice of 100 watts from the exciter alone, 1000 watts PEP or the full 1 kW meter average input on SSB. RF inverse feedback and automatic load-control circuitry is incorporated, as in the 32S-1.

The block diagrams of Figs. 1 and 2 show the general arrangement of these interesting equipments.

#### The SSB Contest

The 1958 *CQ Magazine* SSB Contest provided many thrills for all who participated; although no official information has been received to date, it has been estimated that about 50 countries were represented during the 24-hour period, with some stations reporting as many as 500 two-way SSB contacts logged. The main activity was concentrated on 10, 15 and 20 metres, with sufficient backing on the other bands to provide those all-important multipliers.

Many contestants noted that some of the old regulars on SSB were absent. Where were LA, AP2, VS6, GD, GI, SVØ and EI? It was reported that some of these countries were heard for short periods of time, usually on the band we had just left!

The standard of operating was generally very high, but many of our regular readers have commented on the behaviour of several well-known

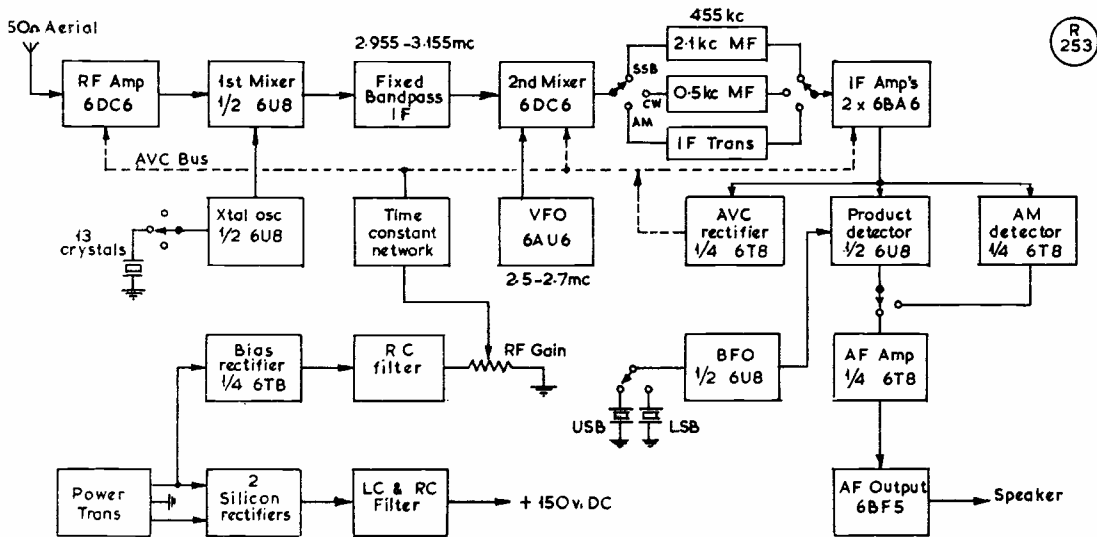


Fig. 1. Simplified block schematic of the new Collins 75S-1 SSB receiver, which has a frequency range of 3.4 to 30 mc by selection of HF beating crystals. An interesting feature of the circuit is that the 3.5 to 28 mc amateur bands are covered by sixteen 200 kc segments of the tuning range, selected by the band-change switch, thus giving very good bandspread through the amateur sections. CW/AM reception are also provided for on the 75S-1.

European Sideband operators. It seems that these chaps had forgotten the basic theory of linear amplifier operation and ran their transmitters well above the capabilities of the amplifier chain. (Let's keep our linears linear, even when chasing the rare DX!).

The task of checking is now under way and the results are expected in time for publication in the August issue of SHORT WAVE MAGAZINE.

**DX Notes**

A number of stations have been added to the Century list since the last "SSB Topics" in the April issue. Almost everyone seems to be having difficulty obtaining the prized 100 QSL's. Why can't "Two-way SSB" be indicated on every card?

Several of the top stations on the list have reported 120 countries worked, and at least three are known to have over 100 confirmed. Due to the absence of G6LX (out of the country on business), it has not been possible to obtain sufficient data to bring the Ladder up to date, but it is certainly intended to continue this feature in future "SSB Topics." So please let us know your current score, together with the number of countries *confirmed*.

VQ4EO is now back in England after winding-up the "DX-pedition of the year" in Freetown, Sierra Leone. During the last few weeks of operation, prior to boarding ship, he added FF8, FD8, ZD1 and a period from 9G1BF. While at 9G1BF he assisted with the installation of a new beam and had a few days' well-earned rest. Although fully intending to complete the journey back to the U.K. overland, the sight of a ship in Freetown, ready to sail to Liverpool, proved too much of a temptation! (Several G's are reported to have worked VQ4EO/MM during the sea voyage home!). QSL's for all

of the countries visited have been coming through quite quickly with the help of W4IYC, who is acting as QSL manager for the trip.

From time to time, "SSB Topics" has reported on possible SSB expeditions to the Channel Isles. Too late for inclusion in the April offering, a note was received from G3AAE giving details of a visit to Alderney during the period May 16-30. By the time these notes appear in print we will all know if this visit has been more successful than the previous ones, which never got beyond the planning stage. A KWM-1 transceiver was to be available, and G3AAE had the assistance of G3BQR, G3IFB and G3JUL. All QSL's for G3AAE will be answered promptly, as the cards are already printed.

A number of new countries are being heard quite regularly on 14 mc SSB, providing interest for those who pursue DX; VP5RD (Jamaica), ZK1BS (Cook Island), VP6AR (Barbados) and ET1US (Eritrea) can often be heard, while MP4QAI (Qatar) has been coming through around 0630 GMT. CE7AY and VS1FJ are now active on an infrequent basis, but can be found by the late (or early) birds in the U.K.

1958 has been full of surprises, with new DXpeditions appearing every few weeks. W4RQR has operated from VP4, VP5 and VP6, with early-May plans for FM7 and FG7. If all went well he should have been active from the Azores with a CS3 prefix late in May. (Sorry, but it was not possible to give prior warning about this.) The ZS group appeared on schedule in March with ZS6APS and ZS6AJH operating from ZS7. Shortly after, ZS6AJ/ZS8 provided further excitement and a choice SSB country.

W6UOU's little KWM-1 was flown down from Singapore to activate VS9JF (Cocos Is.) on Sideband,

Present plans are for the equipment to be collected by VR2AP in VS1, and thence taken *via* an extensive sea voyage to CR10, ZC5 and other rare spots while on the way to VR-land. It is learned that there may be some SSB activity from the Maldive Islands in the near future.

Reports indicate unexpected activity from CR6, with the popular KWM-1 providing the signal (no further details available at present). ZL3PJ advises that he is sending an SSB rig to his brother in 4S7, which will again activate that country. By the way, does anyone know what happened to 4S7YL, who was on for a short time?

W2SKE and W7KVU were very active during the early part of April from HKØKE and HH2KVU. W2NSD and the Ohio DX group created a stir with their Navassa Island expedition under the call of KC4AF—we thought that all KC4's were in Antarctica!

VE3MR joined the TI Sidebanders and journeyed to HKØ (San Andres Is.) and YN1 in early April. We haven't heard YN1 on Sideband since Wayne Cooper, ex-YN1WC/HR2WC, departed a few years ago; VE3MR then appeared from VP1 for a short period with hopes of YS3 operation, pending approval of the authorities.

One of the legendary operators of the Amateur DX world is VS6AM. (Ask him to tell you the story of how he defended his ship with a fire-hose

against a coastal pirate raid!). He anticipates joining the SSB group in the near future, using a KWM-1 installed aboard the ship. We will be looking forward to hearing VS6AM/MM. It is reported that K6GMA is now handling cards for VS4JT, while ZK1BS has likewise delegated K6EXO for QSL duties.

**Point of Procedure**

From Cyprus, ZC4PN reports good signals from an SSB net on 3790 kc during the evening of April 29-30; though all stations were RS-58/9, they were extremely difficult to identify! This was because of the fast VOX working, with very little signing, and then no clear enunciation of call-signs. In the circumstances, it would be unfair to name here the two G's thought (after 40 minutes' patient listening) to be involved—but as they were working DL6YE, F7AF and a Belgian station that could have been ON4CP, they should be able to identify themselves from this note! The moral is: Even while taking full advantage of voice BK, don't forget your procedure, and sign clearly and frequently.

G3WW (Wimblington, Cambs.) writes that he is now on SSB, using a G3AOO Exciter with a 3-4 mc Command Tx as VFO, a home-built 6AG7 Class-A amplifier, and a linear RF amplifier for the 3.8 mc band area consisting of a pair of 807's in Class-AB1. He also has a home-built G3MY-type 14 mc mixer

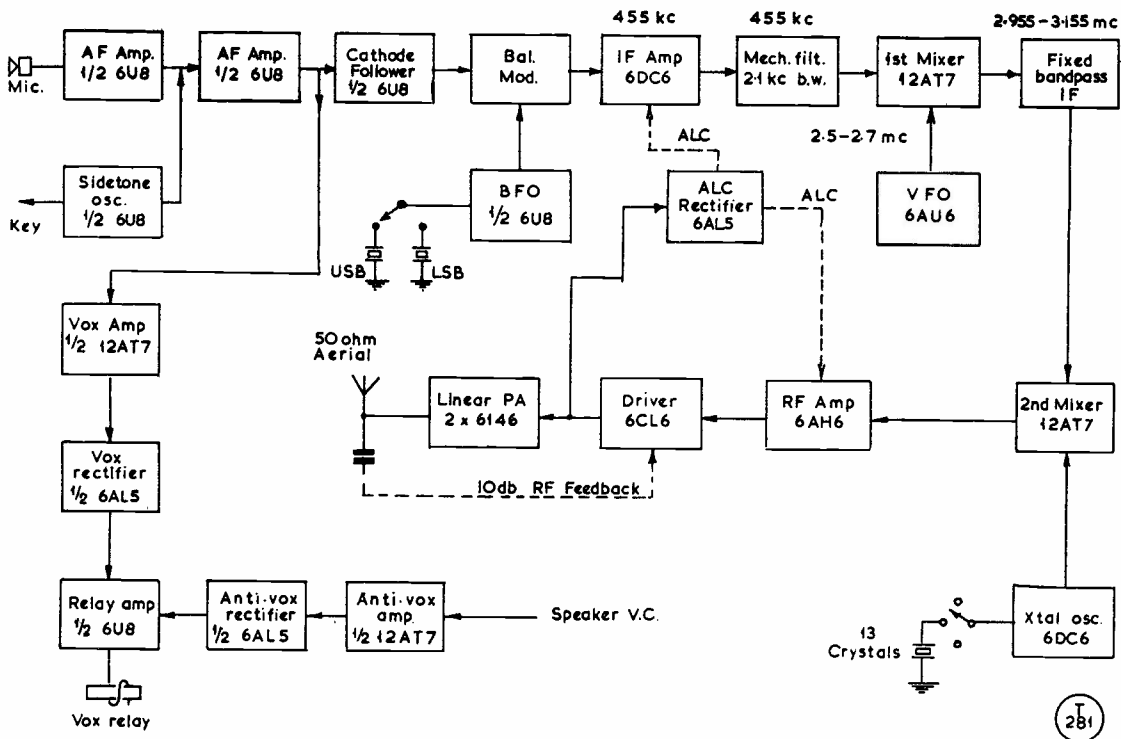


Fig. 2. The new Collins 32S-1 SSB Transmitter is designed to be complementary to their 75S-1 receiver, outlined in Fig. 1. The PA consists of a pair of 6146's, run at 160 watts input on CW, and 175 watts PEP on SSB phone. Suppression of the carrier and unwanted sideband is given as 50 dB down on the radiated sideband. For both AM phone and SSB, the speech circuits are limited to the 300-2500 cycle AF range, and full BK operation is possible on CW.

(as described in the February "SSB Topics") and a 21-28 mc mixer by G3AOO. The linear amplifier is the G2MA arrangement (see "SSB Topics," June 1957 SHORT WAVE MAGAZINE) but using 807's with 1000v. on the plates. (The original G2MA linear amplifier circuit suggested an 813.) On the receiving side, a BC-348 and an S.640 give satisfactory SSB reception by simple BFO manipulation, but a product detector is to be fitted to the S.640. G3WW finds that he is working U.K., Europe, North Africa and Near East SSB stations quite comfortably—and DX is hoped for in due course. And he wishes to acknowledge the help he has had, in all manner of ways, from many SSB operators, on the air and off.

G3COJ (who commutes between Maidenhead and Hull) says that though he is at the moment busier with 160-metre /M, trying transistors and ferrite aerials, he has not lost interest in SSB; indeed, he reports that when in Hull over Easter he had *Top Band SSB* contacts with locals G2FGQ, G3ALD, G3JXG and G5GX—so the 160-metre Sideband

activity certainly continues up there, even if it does languish somewhat in the South. Incidentally, G3COJ's SSB score is 61 countries on five bands, 1·8-21 mc. 56 countries having been worked on 20 metres and 14C on Eighty.

### In Conclusion

The writer would like particularly to acknowledge the great assistance he has had from DL4SV in the preparation of this month's "SSB Topics"; it has, in fact, been a joint effort. With the prospect of further long absences on the Continent, it will be difficult to deal expeditiously with all correspondence—but it is hoped that those who follow "SSB Topics" will continue to supply the fuel (and the ammunition) for the feature. Next appearance will be in August, for which all reports, claims, queries and comments should be in by June 30, addressed "SSB Topics," c/o Editor, *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. So now 73, *de DL4SV es G6LX*.

### INTERESTING "NEW QTH"

We were very glad to hear, from G5OG himself, that his old licence and callsign have been re-issued. He was active and well known in Amateur Radio circles in the 1930's, working CW and phone. G5OG is held by Mr. C. I. Orr-Ewing, M.P., Parliamentary Under-Secretary of State for Air, and he is the first Minister of the Crown to hold a current amateur licence. G5OG's parliamentary constituency is Hendon North, and before his promotion into the Government he was very helpful on several occasions in putting questions in the House on matters of Amateur Radio interest.

### NEW RUSSIAN SATELLITE VI

On May 15, the Russians announced their third successful satellite launching—the biggest space vehicle so far put in orbit by either side. S.VI weighs more than a ton and is 12ft. long, and under the right conditions is easily visible. Loaded with recording equipment and fitted with solar-powered batteries, S.VI has an impressive programme of scientific work to carry out; it is thought that the information obtained is being stored and then, when it is in a favourable position in the orbit, the Russians interrogate the satellite, which "shoots off" the recorded data in one high-speed burst. It is to be expected that these operations are being conducted on some VHF channel.

The regular transmitting frequency is again 20.005 mc, just HF of but beating with WWV, and the signal is easy to identify because it sounds rather like the Morse character "L," sent slowly. It has been regularly heard ever since the first announcement and (for the purpose of this note) the last reception recorded was during 0909-0922 GMT on May 23, when the signal peaked about S6. Apart from the now-familiar Doppler effect, other interesting characteristics have been noted. For instance, the incoming signal, up to passing time, lasts much longer than the

outgoing signal; the signal first appears very weakly, builds up a little, fades out completely, then starts building up again to passing time, with marked variations in level during the whole transit; it is not necessarily strongest when known to be over the U.K. and, unlike the previous Russian satellites, is sometimes heard weakly for periods of 5 minutes or so when the time is wrong for a transit. The orbital period is given as 106 minutes and the only frequency so far identified is 20.005 mc; S.VI is not on 40 mc (unless that frequency is being used for interrogation over Russia) or on 108 mc.

### MEASURE OF ACCURACY

When you are winding 40g. enamelled at 180 turns per inch (which is what it will go to, close-spaced) and having considerable difficulty in preventing turns overlapping, reflect that at the National Physical Laboratory they can cut a true thread to a pitch of 15,000 turns per inch—and on a 1-inch diameter brass cylinder at that. These highly accurate close-spaced cuts are used for the quantity production of diffraction gratings, which have many important industrial applications in precision machine work.

### IDEA FOR A HOLIDAY

It is nowadays possible to hire on short term a vehicle such as a Bedford "Dormobile," or some similar miniature bus, which is large enough to accommodate a small family for a holiday period under caravan conditions. It is not difficult to find room for some gear for /P or /M operation and it is a comparatively simple matter to build up a transportable station, suitable for holiday operation. One can leave the car at home, and take the family on a self-drive caravan tour with the minimum of expense. An idea worth investigating, if you haven't thought of it already.

IF only half the operators who were present at the London VHF Convention on May 17 were to take the risk of letting out a CQ every other evening, the two-metre band would sound a good deal more lively than it does. The attendance at this very successful event was well over one hundred—all, without exception, complaining of the lack of VHF activity, and the sound of a dead band whenever *they* were on!

However, there was one bright spot during the period, showing that the VHF interest and potential are just as strong as ever. This was on Sunday, May 4, for the two-metre Field Day. It was fine and warm over most of the country, with plenty of sunshine; as often happens on these occasions, conditions improved during the late afternoon and early evening, when more stations became audible from the North, and started to work southerly G's. There appeared to be about 45 portables out, and some 35-40 fixed stations available to work them, making a total turnout of approximately 90 stations on the air at different times during the period of the contest—though this, of course, can only be a rough estimate. To give some idea of the rate of scoring (and the activity), it was noted that G3AYT/P (nr. Leek, Staffs.) worked 66S between 1055 and 1845, and G3CGQ/P (nr. Luton), 47S between 1115 and 1855; other scores noticed were G6XM/P (nr. Leicester), who had 77S worked by 1830, and G3KMT/P (nr. Ludlow), who had 57S by 1805—all times being GMT. Of the active fixed stations, G3HBW worked no less than 35 of the portables from Bushey, Herts. Among the more northerly /P stations getting down south were G3APY/P, near Sheffield, and G3DVK/P, near Rotherham. The highest level of general activity was during the last hour or so of the contest; it was also interesting to hear several mobiles being called and worked, notably G2AHL/M, G2AK/M, G2DUS/M and G2HCG/M.

One of the individual reports received on the contest is from G12FHN (Bangor, Co. Down),

# VHF BANDS

A. J. DEVON

## Field Day Results and Comment—

### Tilttable Beams for VHF—

### Activity on Four Metres—

who also sends a useful calls h/w list—see Activity Report. He will be remembered as having been active on VHF since the early two-metre days. On May 4, he and G13BIL were /P together; they heard, mainly in the form of unresolvable carriers, much more than they could work, and their only CW contact was G5MA—which is good GDX by any standard. There was, in fact, very little CW being worked during the contest; it was quite evident that the great majority of the portables were not even listening for CW—and it is certain that thereby they lost some points which would have been well worth having. And even on phone, some of the /P operating was pretty woolly—with number groups repeated *ad nauseam* but obscure location names given once only, involving further repeats. There was also far too much calling and not enough listening QLH, QMH, etc., with the result that some contacts took a long time to make, and other possible QSO's were never made at all.

## Notes and News

At the VHF Convention, PAØBL (in technical charge of PE1PL) said that the PAØ's are most active between 7.00 and 8.00

p.m. and always hoping for U.K. contacts. It should be possible to work them from the London and S/E areas most evenings.

G12FHN gives the following as active up there at the moment: G12HML, G13AXD, G13GQB, G13GXP, G13IJM and G15AJ. They would all "like the opportunity to make a few entries in their logs."

At PE1PL, better conditions and higher activity were noted during April 15-May 19, and some good U.K. contacts were obtained—see Activity Report. Their best result was, however, with HB9RG (Zurich), who was worked on schedule no less than seven times, at a distance of 350 miles. The duty operator on PE1PL always looks for U.K. stations during 1250-1315 BST on Mondays, Wednesdays and Fridays, and 1250-1330 BST on Tuesdays and Thursdays. So, if you are home for lunch at these times, why not have a go.

## TWO METRES

### COUNTIES WORKED SINCE

SEPTEMBER 1, 1957

Starting Figure, 14

From Home QTH Only

Worked	Station
51	G5MA
50	G3KEQ
43	G3HBW
41	G3GHO
36	G8VZ
35	G2CIW
30	G3JWQ
27	GM3DIQ
25	G3KHA
24	G2AHY, G3GSO
23	G3KQF
21	G3KUH
17	G3DLU
16	G3MAX
15	G2HDR, G3CKQ, G3MLS

*This Annual Counties Worked Table opened on September 1st, 1957, and will run till August 31st, 1958. All operators who work 14 or more Counties on Two Metres in the year are eligible for entry in the Table. The first claim should show a list of counties, with stations worked for them, as soon as 14C have been achieved. Thereafter, the list can be added to as more counties accrue.*



EI2W (Dublin) writes that he is now fully operational again on two metres, and intends to keep like that till at least the end of September, when he starts up on 50 mc once more. Henry's outstanding results on six metres have been mentioned before—it now transpires that much of his success was due to the *tiltable* 50 mc beam he uses; EI2W was the only European to work W6/W7 on 6 metres, and it seems that, by being able to tilt the beam, he could use the reflecting layer more efficiently.

That the same thing may be true of two metres is suggested by some observations at G2HCG, on his PE1PL schedule. Using a beam with a low vertical angle, against PE1PL's beam with much more vertical radiation, there are times when G2HCG is weaker at PE1PL than he should be, judged by the PE1PL signal at Northampton: this could be because the low vertical angle of the G2HCG beam is not finding the reflecting layer as effectively as the PE1PL beam does.

What all this comes to, obviously, is that experiments with a tiltable beam head on Two should be well worth while.

### Summary of the Mail

SWL Winters (Melton Mowbray) not only puts in a good calls-heard list, but has been sending round some very useful reports to stations heard—so much so that he had a 33% response by QSL card within three days. He is also receiving PE1PL regularly during their lunch-hour session.

GC2FZC (Guernsey) says that though there have been good openings to the mainland, the only station he has worked consistently is G3JGJ (Paignton), with whom he has had "very fine QSO's." During the /P event on May 4, some interesting contacts were made (see Activity Report), but GC2FZC feels there should have been many more. He checks the band every evening during 1900-1915 BST, after his schedule with G3JGJ.

A new station making good progress is G3MLS (South Harrow), who has now got his foot on the Counties ladders,

## TWO-METRE ACTIVITY REPORT

*Lists of stations heard and worked are requested for this section, set out in the form shown below, with call signs in strict alphabetical and numerical order.*

**GC2FZC, St. Peter Port, Guernsey.**  
**WORKED:** G2DSW/P, 3FKO/P, 3GRA, 3ION/P, 3JGJ, 5DW, 8DA/P, GW3YZ/P.  
**HEARD:** G3GNS/P, GW8SU, 8UH/P (all called). (Sunday, May 4, only).

**PE1PL, The Hague.**  
**WORKED:** G2ANT, 2HCG, 2NY, 3APY, 3IRS, 3JWQ, 5UM, 5WW, 5YV, 6FO, 6LI.  
**HEARD:** G3ENS, 3KQF. (Month to May 20).

**G8VZ, Princes Risboro', Bucks.**  
**WORKED:** G3ENY, 3GSO, 3IRS, 3JWQ, 3JZG, 3KFT/P, 3KHA, 3LHA/M, 4MK, 5DW, 6XX, GW2HCG/M, 3FKO/P, 3YZ/P, 5SA/P, 8UH/P. (All over 50 miles only; April 18 to May 14).

**G12FHN/P, near Kilkel, Co. Down.**  
**WORKED:** G2NY, 3EQP, 3HII/P, 3HWC, 3HWS/P, 3IKV/A, 3JWQ/P, 3JZN/P, 3MAR/P, 5MA, 8SB/P, G13GX/P, GW3BOC/M, 3JGA/P, 3YZ/P.  
**HEARD:** G3AYD/P, 3AYT/P, 3CCH, 3DVK, 3ERD/P, 3GNS/P, 3HOH/P, 3MNM/P, 5BM/P, 5PP/P, 8QY/P, GW2HCJ/M, 3ATZ/P, 3GA/P. (Sunday, May 4, only).

**SWL Woodhouse, Storrington, W. Sussex.**  
**HEARD:** F3LP, G2AHL/M,

2AHP, 2ANS, 2ANT, 2AUD, 2BDP, 2BVW, 2CIW, 2CPX, 2DDD, 2DSW/P, 2DTP/P, 2DUS/M, 2FM, 2HCG, 2HDJ, 2HIF/M, 2JF, 2MV, 2NM, 2NM/P, 2TP, 2UJ, 2XV/P, 2YC, 3AFN, 3APY/M, 3AYJ/P, 3BA, 3BBR, 3BBR/P, 3BGL, 3BII, 3CGQ, 3CGQ/P, 3DFF/P, 3DIV/P, 3DOR, 3EEO/P, 3ENY, 3ENY/M, 3ERD/P, 3EVV/M, 3FAN, 3FCQ, 3FEX, 3FIH, 3FKO/P, 3FMO, 3FP, 3FQS, 3FVW, 3GGR/P, 3GHI, 3GHO, 3GNR, 3GNS/P, 3GOP/P, 3GOZ, 3GSE, 3GSO, 3GVZ, 3GZJ/P, 3HBW, 3HCU, 3HZJ, 3HZK, 3IAM, 3IBI, 3IBI/P, 3IIT, 3ION/P, 3IRA, 3IRS, 3IUL, 3JBN/P, 3JEO, 3JHM, 3JMA/P, 3JVV, 3JWQ, 3JWQ/P, 3JZG, 3JZK, 3KEO, 3KHA, 3KMT/P, 3KQF, 3KOR, 3KSR, 3KSR/P, 3LBM, 3LHA, 3LHA/P, 3LOK, 3LTF, 3MAR/P, 3MLM/P, 3MLS, 3MNM/P, 3MPS, 3NR, 3XC/P, 4DC, 4JJ/A, 4KD, 4PS, 4PS/M, 5BM/P, 5DW, 5HN, 5MA, 5NF, 5OB, 5PP/P, 5WW, 5YV, 6AG/P, 6FO, 6JK, 6NB, 6OU, 6OX, 6OX/M, 6XM, 6XM/P, 6XX, 8DA/P, 8DR, 8LM/P, 8OS, 8QY/P, 8SB, 8SC, 8SC/P, 8SM, 8VZ, GB2RS, GW2HCJ/M, GW8UH/P. (April 21 to May 19).

**SWL Tomlin, Malvern, Worcs.**  
**HEARD:** G2AK, 2DCI, 2FNW, 2HDF, 2NY, 2XV, 3BA, 3DJI, 3DKF, 3EJO,

3ENY/M, 3FAN, 3FCQ, 3FD, 3FTN, 3GGR, 3GSE, 3GTN, 3GUX, 3HAZ, 3HWC, 3HXN, 3IER, 3IOO, 3IRS, 3JGY, 3JWQ, 3JZG, 3JZN, 3KPT, 3KUH, 3LAY, 3LDW, 3LHA, 3MGR, 4GZ, 5MA, 5ML, 5YV, 6NB, 6SN/P, 6XM, 8VZ, GB2RS, GB3IGY. (April 1 to 30 week-ends only).

**SWL Winters, Melton Mowbray, Leics.**

**PHONE:** G2ACV, 2AHL/M, 2ANS, 2ANT, 2BVW, 2FMO, 2FNW, 3APY, 3APY/M, 3APY/P, 3AYT/P, 3CGQ/P, 3CRH, 3DBM, 3DVK/P, 3EEO, 3ELG/P, 3ERD/P, 3FAN, 3FDF, 3FUJ/P, 3FUW, 3GGR/P, 3GNS/P, 3GSO, 3GZJ/P, 3HBW, 3JBN/P, 3JMA/P, 3JWQ, 3JWQ/P, 3JZN, 3JXN, 3KQF, 3LHA, 3LKV, 3MAR/P, 3MNM/P, 4JJ/A, 4MK, 5CP/A, 5KG, 5JU, 5MA, 5PP/P, 5YV, 5YV/P, 6XM, 6XM/P, 8CZ, 8SB/P, 8VZ, GB2RS, GW2HCJ/M, 3ATZ/P, 3BOC/M.  
**C.W.:** G3APY, 3AYT/P, 3CGQ/P, 3EEO/P, 3ENS, 3ERD/P, 3JWQ, 3JWQ/P, 5MA, 6XM, 6XM/P, GB3IGY, PE1PL. (April 15 to May 12).

**SWL Button, Frome, Soms.**  
**HEARD:** G3AYT/P, 3GNS/P, 3ION/P, 3IRA/P, 3KMT/P, 3KSR/P, GW3YZ/P, 8UH/P. (Sunday, May 4).

having been much helped by field day results; his converter has been improved by the addition of a 6J4 pre-amplifier stage. G3KQF (Derby) has been having "near QSO's" with PE1PL (who, so far, only reports him as heard), but is hoping to do better with a new 5/5 slot-fed beam; G3KQF was with G3EEO/P for the field day and reports the QRM in the Peak District as "terrific"!

The only county wanted by G5MA for all-England is Westmorland, which has eluded Bob for years; G3HII/P warned him he would be there for the field day—but Bob still wants Westmorland, as nothing was heard of G3HII/P. However, G5MA worked G12FHN/P for Co. Down, and five /P's in the rarer Welsh counties, so had a good day on May 4 nevertheless, and is now out in front with 51C for the Annual.

G8VZ (Princes Risboro') also did well with the Welsh portables, and remarks on the good signal strength and high quality of most of the /P's and /M's heard on May 4. The best and most consistent GDY signal with him was GW2HCG/M in Radnor.

New to this piece is G3MAX (Manchester), who started up on Two on October 15 last, the day that he received his licence; since then he has booked in 16C, with G4DC as best DX, and has a very creditable total of 75 different stations worked. G3MAX runs a modified T.1540. 20w. input, with a 5-ele Yagi and an ON4BZ converter, as described in SHORT WAVE MAGAZINE for April, 1953.

### Activity on Four

We were very glad to hear from both G3JHM (Worthing) and G5MR (Hythe) about activity and results on 70 mc. G3JHM reports

contacts with G2DD (70.26 mc), G3CLW (Bromley), G3GDR (70.20 mc), and G3IUL (70.38 mc), also a very fine QSO with F8MW (72.3 mc) at 140 miles, and F8GH (72.5 mc), who is at Beauvais (150 miles). A station frequently heard but not yet worked is G3EHY (Banwell, Som., 70.31 mc). G3JHM has arranged 4-metre F/G test schedules as follows: Wednesdays, 2130-2230

BST; and Sundays, 0930-1100 BST, the F's, of course, being in their 72 mc band.

At G5MR, ten F's and six G's have been worked, and 15 other stations heard on the 70-72 mc band, including two FA's. G5MR is also in on these F/G 4-metre tests, and reminds us that the F's are all in the 72.0-72.8 mc band (and *use CW* a good deal!)

Reports and comments are also

acknowledged from: G3DLU, G3JGI, and SWL's Button, Juleff, Tomlin and Woodhouse — but space has run out!

#### Dead-Line —

This must be **Wednesday, June 18**, for the July issue, addressed: A. J. Devon, "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. 73, CUAGN July 4.

**LATE FLASH: All French amateur stations have been shut down by decree dated May 22, "until further notice."**

## REPORT ON THE RALLIES

CHELTENHAM, MAY 11—  
BOURNEMOUTH, MAY 18—  
AND FORTHCOMING EVENTS

CHELTENHAM'S first Mobile Rally on Sunday, May 11, attracted good support. The 50 or so mobiles present at various times during the afternoon ranged from small motor-cycles to large cars and they came from a very wide area, including London, the South Coast, East Anglia, the Midlands and South Wales. Among those booked in were G8SB/M from Manchester, and GW6HB/M and GW8UH/M from Cardiff.

The Rally, organised jointly by the Cheltenham groups, was held in Montpelier Park in the centre of the town; a running buffet was available throughout the meeting, and about 100 amateurs signed the book. Some of them subsequently won useful prizes in the draw.

Control stations were the Cheltenham Club station, G3GPW/P on Top Band—operating from a caravan with some very fine equipment lent by G3GMN, and using a 70 ft. vertical mast radiator, top loaded, which was provided by G8ML—and G3YZ/P on two metres. Both stations were backed up, by G3CWV/A on 160 metres and G5BM/M on two metres. Eight VHF mobiles were worked, the remainder being on Top Band.

G3BCC

\* \* \*

The location for the Bournemouth Amateur Radio Society's event was King's Park, Boscombe. Attendance suffered somewhat by reason of the rather miserable weather during the morning, and the fact that two other meetings were also being held that day.

Some 16 mobiles received their routes by radio, and were all talked-in safely. The control stations were G3HLW/P on 160 metres, who had 15 customers, and G2HIF/P on two metres, who had the rest! However, the two-metre mobile was G3EUU/M from Peckham, London, so G2HIF did not feel that his time had been entirely wasted. The mobiles handled by G3HLW/P included such distant visitors as G2BCX/M, G2CDN/M, G3BMO/M and G3JSJ/M from the London area, and G2FIX/M on his now-famous Triumph motor-cycle; still on Top Band, G2FIX has a loaded whip bolted to the carrier

bracket and the other items "strategically placed" round the machine. Even with small numbers, the day did not pass without incident. G3HCK/M from Hurst Green, Sussex, *burnt out* his aerial, and was led in by G3JEQ/M who happened to be passing.

The Bournemouth club have always made their Rallies purely social occasions, without any competitive events; this one was no exception, and after checking in many of the visitors went off to picnic on the beaches. For them, the day ended in brilliant sunshine.

S.S.

\* \* \*

The next Rally organised by the Southgate Club will be at **Wheathampstead Common, Herts.**, and will be an all-day affair, commencing at 10.0 a.m., on Sunday, June 15. Details regarding plans and routing can be obtained from: D. E. Bootman, 18 Worcester Crescent, Mill Hill, London, N.W.7 (Tel.: *MILL Hill 5156*.)

For Sunday, July 13, the Stockport and South Manchester Clubs have organised a Mobile Rally to take place at **Capesthorpe Hall**, near Wilmslow, Cheshire. This is a famous show-house, the home of the Bromley-Davenport family, and it will be open for the occasion. The house stands in magnificent surroundings, and contains many art treasures. It is on the A.34, about mid-way between Wilmslow and Congleton, and a separate car park will be available for those attending the Rally. Lunch and tea can be obtained on the ground, and the inclusive charge for admission to house, park and gardens is 2s. 6d. (harmonics 1s., but dogs not allowed!). The usual Top Band and two-metre talk-in stations will be in operation from about 11.00 a.m., the time for the Rally itself being 12.30 to 6.00 p.m. Further details can be obtained from: C. M. Denny, G6DN, 18 Willoughby Avenue, Didsbury, Manchester, 20.

#### MOBILE RALLY REGISTER

Further to the item on p.159 of the May issue of SHORT WAVE MAGAZINE, some 25 /M operators have already responded, and the first entries for the Register will appear in our July issue. All active mobiles are asked to send in just their QSL card, endorsed "Mobile," with a note of band(s) worked, make of their vehicle, and its registration number. QSL cards with the details requested should be addressed "Mobile," attention Editor, *Short Wave Magazine*, 55 Victoria Street, London, S.W.1.

# SIMPLE TONE EXPANSION SYSTEM

TO IMPROVE AUDIO  
REPRODUCTION  
ON TAPE

B. WARDMAN (G5GQ)

ONE of the biggest innovations of the last two or three years has been the introduction into popular use of tape recorders. These have been purchased either complete or as "tape decks," for which the home constructor has built his own amplifiers; again, this has led to a whole sequence of publications on the specific design requirements for this purpose. The results obtained have varied from the superb to the impossible, and in general most users have found first-class results to be rather more tricky than imagined. It is one thing to produce a recording as a stunt, but quite another for it to be acceptable as first-class entertainment.

There are two basic reasons for this: The first one is volume compression. Every musical piece has a minimum level of sound, and a maximum level. When it is played in a concert hall, each instrument plays as softly or loudly as required, making its impact upon the air and creating sound-waves. The air does not mind how loud or soft they are; it can take any variations of orchestral level in its stride. But the human ear has its limitations; there is a minimum level below which it cannot hear, and a maximum level above which everything sounds like a confused jumble and, indeed, if the sound becomes louder, then actual physical pain is set up. In other words, the volume range of the ear is really smaller than the volume range of a full orchestra. Again, characteristics vary from person to person, some ears standing more volume than others, and some not as much. This conception is most important; air can take any volume range, but all other *media* are restricted to varying degrees.

In the case of a broadcast transmission, the restriction is mainly imposed by the actual transmitter/receiver relationship. If an actual orchestral piece, with all variations from minima to maxima in loudness, were broadcast without any control, *i.e.* just put through the transmitter, listeners would either not hear the softest passages, or the transmitter would be so overmodulated on the loud ones as to pull the circuit breakers out and shut it down. Therefore, volume level control is introduced; the volume is turned up on the transmitter for the soft passages, and down for the loud ones; this is volume range compression.

Now, the important thing to realise is that the amount of volume compression used in broadcast is intended for just that purpose, *i.e.* for radio transmission and reception. The requirements for home recording may be, and usually are, quite different. For that reason, the average amateur finds that he gets far better results when transcribing from a

commercial disc to tape than from broadcast; the volume range is more appropriate.

Hence, on musical transmission, it is rare to get perfect results by just letting the recorder take a radio programme without any monitoring. To get real vitality, real contrast between light and shade, means adjusting the volume level the whole time so that the right balance between loud and soft passages, as concerns the tape's abilities, is preserved. That is a manual job which the owner himself must do. Once this factor is appreciated, the user has progressed far along the road to perfect recording.

Readers will ask, "Why should this be a manual job? Surely in these enlightened days it is not necessary for us to listen and turn the volume control up and down as we think fit. How about AVC?" The answer is obvious. The job of AVC is to maintain an incoming carrier around an average level; here we are trying to adjust maxima and minima simultaneously. For example, how could any circuit foretell a sudden *fortissimo* transient following a two-second silent period? Possibly by scanning a musical score, and so for once the manual method beats the machine.

## Tape Response

Turning to the second reason, this is one which is much more widely appreciated: The audio response characteristic of the recording tape, which, unfortunately, depends not only upon the basic design of the tape itself, but also upon the recording head used and the speed of tape movement. In broad terms, however, the average tape for home use is very much like Fig. 1 (a), being particularly sensitive around 2.5 to 3.5 kc and dropping off extremely rapidly each side. If the recording speed is  $3\frac{3}{4}$  IPS, then top cut-off is around 6 kc, and this increases to about 9.5 kc for  $7\frac{1}{2}$  IPS; note that this is the "skirt," and not the peak of the curve.

Given expensive and elaborate commercial equipment, that sort of thing can be ironed out. A compensated recording amplifier is provided to give the appropriate tone correction, and either a separate reproducing amplifier is used or else a separately balanced part of the same amplifier is run only on reproduction. To have exactly the same amplifier chain for both recording and reproducing presents more problems than appear at first sight. Hence,

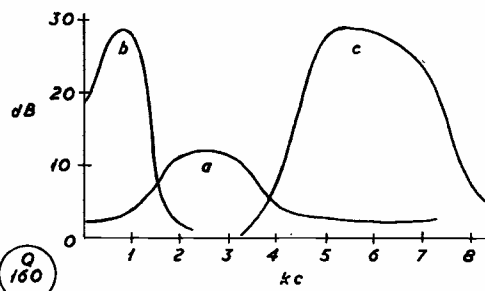


Fig. 1. Compared with the middle register, the proportion of bass (b) and top (c) required is very much greater for a balanced output — see text for discussion.

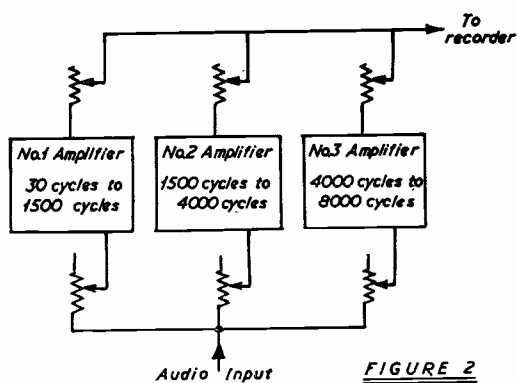


FIGURE 2

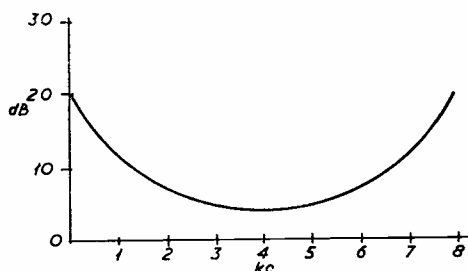


FIGURE 2A

Q 161

Fig. 2 is the amplifier feed layout, as required, and at Fig. 2A is the shape of output curve which is desirable.

most amateurs prefer to use fairly simple equipment with only partial compensation; elementary R/C correction circuits are included which accentuate bass at the expense of top, or *vice-versa*. They give a definite improvement, but more by a shift in general response balance than by adding the missing frequencies; they are more a palliative than a cure.

Let's have another look at Fig. 1. We can see the normal "natural" response curve of the tape (1a) right in the middle. To level response out, what we really need to do is to put in more bass (1b) and more top (1c). If we agree that that is the case, then we can also deduce that we are not really looking at one response curve, but three; that means one for the bass, one for the middle register, and one for the top. Ideally, then, we should use three separate amplifiers, each dealing with the appropriate register, and we should mix these in to balance-out the tape characteristics. Very expensive and complicated. But it would follow that any extra top put in would not be at the expense of the bass, and *vice-versa*, which means a lot. A block diagram of such a set-up is shown in Fig. 2.

**Circuit Development**

Could this be done more simply? That was the question which faced the author. For example, could one get away with two separate input amplifiers only—one bass, one top—shown in block form at Fig. 3, and with a response curve like Fig 3a, with bass and top boost and just about the

right proportion of middle register getting through? If so, could one do it with a single-valve unit such as a twin-triode?

Accordingly, work was started on a circuit shown in general outline in Fig. 4. The two sections of a twin-triode assembly were treated as completely independent amplifiers—one for bass and one for top—each having its own input volume controls (VL.1 and VL.2). Incidentally, at the start, similar volume controls for balancing were also inserted in the *output* circuit, but operation was so complex that they were discarded almost at the first trial, leaving just the two input controls, as mentioned. The idea was to control the amount of bass and top coming through by means of the independent input volume controls, which, in turn, would determine the amount of output available for each triode. Strangely enough, this proved incredibly difficult to handle, mainly on psychological grounds! In setting up, one triode—possibly the bass—is first brought up to give the required amount. Then the other is brought in, and invariably one tends to turn it on just that fraction too much so that its triode is over-loaded and distortion occurs in the recording. The author is the first to admit that this sounds silly, and that it ought to be perfectly simple to handle two little controls like this, coming from the same audio source, without being so ham-handed as to over-load. Yet that is the fact.

Finally, therefore, the circuit shown in Fig. 4A

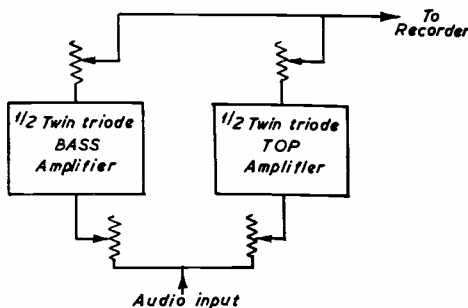


FIGURE 3

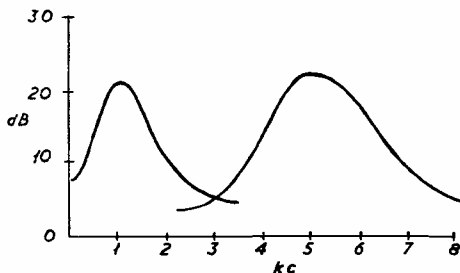


FIGURE 3A

Q 162

Fig. 3. The twin-triode bass-and-top amplifiers, showing essential circuitry, with the relative output levels obtained from the two amplifiers at Fig. 3A.

**Table of Values**

Fig. 4A. Circuit as finally evolved by G5GQ

C1, C2 = .01 $\mu$ F, 350v.	Ra = 100,000 ohms, $\frac{1}{2}$ -w.
C3, C5 = .001 $\mu$ F, 350v.	Rk = 2,000 ohms, $\frac{1}{2}$ -w.
C4 = 0.1 $\mu$ F, 350v.	V = 6SC7
Ck = 25 $\mu$ F, 12v.	Fr = 1 megohm tapped
R1, R2 = 20,000 ohms, $\frac{1}{2}$ -w.	fader
R3, R4, R5 = 50,000 ohms, $\frac{1}{2}$ -w.	Vr = 500,000-ohm volume control

was adopted. In this, one triode feeds through a fixed amount of audio (in this case, bass) whilst the other section gives a variable amount of true top boost. To grasp this, imagine it in operation, with the tone level control VR set at zero, so that one triode (the top booster) is supplying nothing. Some music, or what-have-you, is fed into the recorder via this unit, and the output noted on the monitor speaker. The result is a small amount of middle register with a colossal bass superimposed, drums and double-basses "woofing" across the room and almost moving the furniture. The volume level (FR) is set to the correct amount for full recording.

Now for the top boost. Control VR is brought up and, as this is done, in comes the top with a real wallop, getting shriller and shriller until it seems to pierce the ear-drums. Try recording a constant high note (such as a heterodyne) and switching back immediately to compare record with original, and it will be amazing just how much extra top it can take. During record periods, when the necessary boost is put on, the results from the monitor speaker are horrible and shrill, but, by the time the tape has smoothed it out, the reproduction will be wonderful.

**Construction and Setting Up**

The construction of a unit of this type is extremely simple; most of the components can be assembled on the valve-holder itself. Power is best taken from the actual recorder, by means of a plug brought out at a convenient point; the tone expander can then be plugged-in when required, and bother with hum and so on avoided.

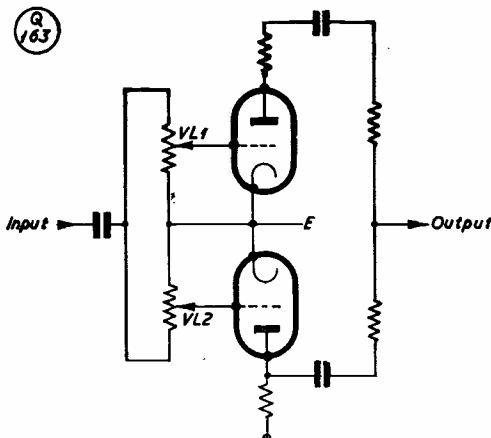


Fig. 4. The circuit for a two-input volume control arrangement, as explained in the article.

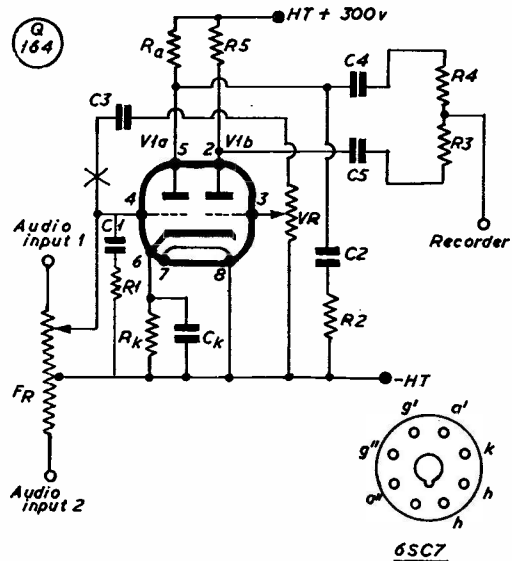


Fig. 4A is the circuit in detail as derived by G5GQ from the considerations discussed in his article. All values are given in the table.

Valve section Triode A is bass boost, through the RC compensators C1/R1 and C2/R2 in grid and anode respectively. R3 and R4 are just decouplers. Start off by disconnecting the second triode section V1B at X, and just work on the bass booster. For easy operation, the bass under these conditions should sound unpleasantly too much (repeat, unpleasantly too much). Remember that it is unbalanced, and when the top is brought in, the apparent amount of bass will drop considerably. Hence, there should be more coming through than would normally be acceptable. If there is too little, increase the values of C1 and C2, say, up to .02  $\mu$ F.

Having got the thing really to "woof," connect up the other triode at X and bring it up on volume control VR. Try the setting of this at various positions, as suggested earlier, until the right amount of top is available in the actual reproduction.

Any final balancing necessary can be done by altering the ratio of R3/R4. For example, if there is a fraction too much bass, increase R3 by about 50% and try again.

The simplicity and small size of the unit can be appreciated by reference to the audio mixing unit and volume level indicator described in the May 1957 issue of SHORT WAVE MAGAZINE. This had a 4-position switch giving various combinations of tone control. This switch has been removed, and the volume control VR inserted in its place. An extra hole has been drilled to take the 6SC7 on the top of the unit. Not only is there plenty of room for this modification, but an extra hole has also been drilled in the side to take an octal valve-holder, which in turn provides an additional outlet for a microphone head-amplifier power supply to be provided from the recorder.

The results, even with this simple equipment, are

really astounding, and the brilliance of the tremendous top, when heard with an equal amount of bass, is unbelievable; indeed, it is almost stereophonic in its effect.

It is not claimed that this unit is a polished, highly professional job. But it is a simple thing to make which will produce unbelievable results with ordinary amateur methods and equipment, ordinary loud-speakers in ordinary rooms. The various boosts employed are intended to produce the result at one's actual ears, allowing for all the normal room difficulties—and, after all, it's what you eventually hear that counts.

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## BOOK REVIEW

### "*The Exploration of Space by Radio*"

It is fascinating to see how closely pure and applied physics are interwoven; how alternately a discovery in one leads to a development in the other, and *vice versa*. Radio Astronomy stems from radio and radar and is practised by those who are craftsmen in electronics, mostly radar engineers of the last war, and their successors in Cambridge, Manchester and Sydney. As in all fundamental research, of course, a wide knowledge of physics is needed fully to appreciate all the implications of a piece of work. Nevertheless, it does happen that each new step in the field of Radio Astronomy has followed new techniques in electronics—invented or designed for the purpose maybe, but electronic application is always the tool, and so it sets the pace. The discovery of what is known as the 21 cm (1420 mc) hydrogen line is just such a case.

Hence, it is not surprising that a substantial part of this new book on Radio Astronomy should be concerned with techniques readily intelligible only to those with an electronic background. We of the amateur fraternity are fortunate in being among the few who can really appreciate the problems, their elegant solutions, and the amazing results which have been achieved since the war. The basic astronomy presents little difficulty, because for years it has been dealt with as "popular science." This, allied with a knowledge of electronics, enables one to understand and appreciate each development, application and technique. An example or two, from the book, must suffice to illustrate the point.

Radar reflections from the moon and meteor streams yield information on the moon's surface and the velocities of meteorites. The behaviour of the sun in the range 1-10 metres is quite out of keeping with its optical appearance. Study of these emissions is giving us new data relevant to the aurora and the ionosphere. Unexpected, and so far unexplained, noises emanate from the planet Jupiter. More exciting are the radiations reaching us from beyond the solar system, from our own Milky Way, and other galaxies. Originating in sources so distant, some of this radiation may have been travelling almost since time itself began—if one can grasp such a conception. Two galaxies, in violent collision, provide one of the most powerful radio sources in the heavens. It is quite to be expected that such events will be detectable

far beyond the range of the largest and most favourably situated optical telescopes. So we see that Radio Astronomy could be a means of investigating the greatest and most fascinating mystery of all—the Universe itself.

Only two or three books exist on the subject of Radio Astronomy, of another of which Professor Lovell was also co-author. Now a point has been reached which makes it particularly opportune, and important, to have a complete and up-to-the-minute account of the state of the subject from an authoritative source.

This book fulfils that need. The treatment is thorough, and to some the number of formulae may even appear disconcerting. They do not, however, by any means make the book unreadable for the non-mathematical, while enhancing its value to the more serious reader who wants to see the proofs. This happy compromise is achieved by omitting the tedious derivations and merely quoting the result. Bibliography is given at all stages for those who may wish to enquire further. The book follows a logical order as the subject falls naturally into a series of chapter headings. It is to be strongly recommended to those who wish to acquire more knowledge on this important new subject.

*The Exploration of Space by Radio*, by R. Hanbury Brown, D.I.C., A.M.I.E.E., F.R.A.S., and Professor A. C. B. Lovell, O.B.E., F.R.S., pp.207, fully illustrated in line and half-tone, indexed, price 35s., published by Chapman & Hall, Ltd., 37 Essex Street, Strand, London, W.C.2.

J.M.O.

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## "HAMS" ON THE BBC AGAIN

One cannot get away from this wretched, and ridiculously overworked, word "ham." On May 15, in the BBC's "What Do You Know?" programme on the Light, the "What Do You Want To Know?" spot was about Amateur Radio. This might be thought to be good publicity, but unfortunately the title chosen for the item was "Hams, QSO's and QSL's." The expert on the programme was F. Hennig, G8SW (Gerrards Cross, Bucks.), who, in the short time available, gave quite a competent explanation of what Amateur Radio means, with a recording of an actual DX contact. But one could wish that there had not been quite so much chat about *hams*!

From our own researches, it seems that the derivation of the word "ham" is due entirely to an unfortunate (American) accident. The first three radio amateurs in the States are said to have had names beginning with "H," "A" and "M"—so they have been immortalised (if that is the word) by all their successors being called "hams." It seems a pity, now, that their names did not begin with "X," "Y" and "Z" (or some other unpronounceable combination)—particularly as there were active amateur experimenters in this country before radio even got to the United States. And that in itself is a fact worth recording.

# NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. call signs, 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.

- EI2AE**, M. C. Hamilton (*G13KEV*, ex-*YI2DX*), QSL via Tullywigan, Cookstown, Co. Tyrone, N.I.
- EI9AD**, J. J. Dolan, 26 Shelbourne Park, Limerick, Eire.
- G3KZC**, R. F. Harknett, 25 High Street, Hanham, Nr. Bristol, Glos.
- GM3MDX**, J. Lawson, Shandwick, Bentinck Crescent, Troon, Ayrshire.
- G3MEF**, T. C. Wylie, 18 Litchdon Street (Flat 1), Barnstaple, N. Devon.
- G3MGS**, C. D. Stephens, 10 Green Lane, Chislehurst, Kent.
- G3MGW**, R. Wheeler, 9 Bateman Road, Brightlingsea, Essex.
- G3MIL**, F. J. M. Marr-Johnson, Boxley House, Boxley, nr. Maidstone, Kent. (*Tel.: Maidstone 4103.*)
- G3MJI**, R. G. Ford, Signals Section, R.A.F. Station, Hornchurch, Essex.
- G3MLR**, S. A. Faulkner, Kantara Hotel, Ramore Avenue, Portrush, Co. Antrim.
- G3MLT**, R. J. Killick, Brock Cottage, Hillbrow Road, Esher, Surrey.
- G3MMK**, M. Firth, 48 East Street, Lightcliffe, nr. Halifax, Yorkshire.
- G3MML/M**, E. G. Augood, 49 Parkstone Avenue, Hornchurch, Essex.
- G3MMQ**, J. A. Hedges, 35 Ferry-mead Avenue, Greenford, Middlesex.
- G3MMY**, B. A. M. Ross, Holmleigh, Battlebarrow, Appleby, Westmorland.
- GM3MNA**, C. G. Martin, 452 Holburn Street, Aberdeen.
- G3MND**, C. B. Wells, 56 Central Avenue, Beverley, East Yorkshire.
- G3MNL**, G. W. Lamb, 110 Boundary Road, Carlisle, Cumberland. (*Tel.: Carlisle 23203.*)
- G3MNT**, G. A. Farrall, 94 Cheadle Old Road, Edgeley Park, Stockport, Cheshire.
- G3MNV**, P. W. F. Darragh, 9 Rectory Park Avenue, Sutton Coldfield, Warks.
- G3MNY**, G. W. Tyrrell, 70 Middlefield, Ormsgill, Barrow-in-Furness, Lancs.
- G3MOE**, J. H. Moxey, 27 Fairhaven Road, Leckhampton, Cheltenham, Glos. (*Tel.: Cheltenham 4217.*)
- G3MOI**, H. Willmore, c/o Sgts' Mess, R.A.F. Station, Hornchurch, Essex.
- GW3MOP**, L. D. Watts, 110 Dunvant Road, Killay, nr. Swansea, Glam. (*Tel.: Swansea 22322.*)
- GW3MPP**, G. C. Price, Garregwen, 36 Park Crescent, Abergavenny, Mon. (*Tel.: Abergavenny 913.*)
- G3MPW**, A. S. Walker, 100 Buckingham Avenue, Scunthorpe, Lincs.
- G3MPY**, W. S. Carruthers, The Cottage, 4 Addison Road, Kensington, London, W.14. (*Tel.: Park 7117.*)
- VSIGC**, N. G. Cooper (ex-*G3LMO*), 17 Bedok Avenue, Bedok, Singapore, 16.
- CHANGE OF ADDRESS**
- G2CIP**, F. E. Moor, 6 Allerton Road, Southport, Lancs.
- GW2TY**, W. J. Edwards, 47a Commercial Street, Nantymoel, Bridgend, Glam.
- G3AED**, W. N. L. Seward, Beechcroft, 40 Church Road, Earley, Reading, Berks. (*Tel.: Reading 61416.*)
- G3AST**, J. A. Plowman, A.Br.I.R.E., 9 East Coker Road, Yeovil, Somerset.
- G3AXL**, H. A. Ballard, 50 Churchill Avenue, Hastings, Sussex. (*Tel.: Hastings 2722.*)
- G3CSC**, S. J. Roddan, 18 Muncaster Drive, Rainford, Lancs.
- G3FGY**, T. Darn, 44 Laurel Avenue, Ripley, Derbyshire.
- G3FQJ**, J. W. Barton, 433 Greystones Road, Sheffield, 11, Yorkshire.
- G3FQJ/A**, J. W. Barton, Brook Secondary School, Sheffield, 13, Yorkshire.
- G3GDI**, Mrs. Paula Sollom, The Rowans, Green Street Green, Farnborough, Kent.
- G3GNV**, H. W. Sollam, The Rowans, Green Street Green, Farnborough, Kent.
- G3GZB**, S. N. Radcliffe, M.A., 99 Friar's Avenue, Shenfield, Essex.
- G13HNM**, C. E. Davies, 29 Lucerne Parade, Stranmillis, Belfast. (*Tel.: Belfast 660754.*)
- G3HWR**, H. W. Rees, B.Sc., 3 Rosecroft Avenue, London, N.W.3.
- GM3JOI**, J. Murray, 23 Grieve Street, Methilhill, Methil, Fife.
- G3KDA**, M. G. Rimmer, 56 The Leys, Waterloo Road, Bidford-on-Avon, nr. Alcester, Warks.
- G3KLH**, D. G. Alexander, 25 Oxford Road, Woodstock, Oxon.
- G3KYT**, K. Schofield, Ashville, Tower Hill Road, Upholland, nr. Wigan, Lancs.
- G3LOQ**, R. J. Henning (ex-*VS9AH*), 12 St. John's Road, Cambridge, Cambs.
- GW5PH**, A. F. Phillips, Clifton, 32 Caemawr Road, Morrision, Swansea, Glam.
- G6AW**, W. E. F. Jennings, O.B.E., Leascroft, The Drive, Chestfield, Whitstable, Kent. (*Re-issue.*)
- G8MD**, J. A. Drinkall, 25 Garstans Road North, Wesham, nr. Kirkham, Lancs.
- CORRECTION**
- G3EMD**, M. R. Hassall, 99 Shensone Valley Road, Quinton, Birmingham, 32.

# THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for July Issue : JUNE 13)

**A**CTIVITY has largely switched to outdoor events, but it is gratifying to note that so many Clubs continue to run a full schedule of activities and to report them to us.

Several secretaries have recently commented on a feature of Club work that brings them in new members—the "local Net." Whether it runs on Top Band or on Eighty, the fact remains that many local inhabitants first become aware of the existence of the Club (or even of Amateur Radio itself) by this means.

When a local Net is on the air, references to Club meetings and activities are bound to creep in, and a judicious reference to the time and place of the next meeting (strictly in the course of conversation which is well within the terms of the licence!) will often bring along someone who is pleased to find that the voices he hears belong to real persons.

On this theme, we frequently get requests from readers to be "put in touch with any club in my locality." Often, the reader concerned need have looked no further than these pages for the information, because in the course of 3-4 months nearly all active Clubs are reported in this feature. Though some Club secretaries write in regularly each month with news of their activities, many do not report more than about four or five times a year. Hence, a check through four recent issues of *SHORT WAVE MAGAZINE* will usually reveal whether there is an active Club in any particular locality, with the address of the honorary secretary.

As regards *local* publicity, it is always a good thing to get a note of the Club's activities into the local paper from time to time. This will nearly always bring in new members. Local papers are usually interested in Amateur Radio, if it is presented as a "news story," with some emphasis on the DX angle.

**Aberdeen** meet on June 20 for a Quiz—on Tape, involving the identification of odd sounds and signals. This sounds an excellent idea for a novelty, and will doubtless be widely copied! On June 27 they have a Mullard Film Show and on July 4 a Sale. Anyone on holiday in or around Aberdeen will be heartily welcomed to any meeting: Fridays, 7.30 p.m., at 6, Blenheim Lane, Aberdeen.

**Wirral** held a very successful Annual Dinner with an attendance of 120, including visitors from many other Clubs. Two of their Mobiles went to the recent Trentham Gardens Mobile Rally. On June 6 they have a pre-NFD meeting, and on June 20 a post-NFD inquest. July 4 is the date for their Junk

Sale. Their excellent *News Letter* (now at Vol. 11, No. 5) continues to circulate all the local news and gossip.

**Acton, Brentford and Chiswick** have had lectures on the Antennamatch and TVI by G4LS, and have also been making their plans for NFD. Morse practice is now laid on every Tuesday, 7.30 p.m. in the Clubroom at 66 High Road, Chiswick, W.4.

**Bradford** have only one meeting during May, which was on the 13th. They were then considering Field Day arrangements. On June 3 they had a talk on Experimental Colour Television by Mr. H. D. Kitchin. For June 17 the subject is Radio and Television Interference.

**Bury** are holding a Junk Sale on June 10, and July 8 will be their "Natter Night." **Harlow** will be running a Mobile Rally on June 22, at Magdalen Laver Village Hall, near Harlow, Essex. Talk-in will be provided by G3ERN on 1980 kc and by G3JMA on 144.8 mc. Refreshments will be available on the spot.

**North Kent** visited the works of the Jennings Organ Co. on May 29; June 12 is booked for an

## NAMES AND ADDRESSES OF CLUB SECRETARIES REPORTING IN THIS ISSUE:

ABERDEEN: W. K. Heggie, 80 Leslie Terrace, Aberdeen.  
 ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, London, W.3.  
 BARNET: E. W. Brett, G3LUY, 28 Edward House, Edward Road, New Barnet.  
 BRADFORD: D. M. Pratt, G3KEP, 27 Woodlands Grove, Cottingley, Bingley.  
 BRIGHTON: R. Purdy, 37 Bond Street, Brighton 1.  
 BURY: L. Robinson, 56 Avondale Avenue, Bury.  
 CHELTENHAM: C. Wallis, G3CWV, 147 Hales Road, Cheltenham.  
 CORNISH: J. Brown, G3LPB, Marlborough Farm, Falmouth.  
 CRYSTAL PALACE: G. M. C. Stone, G3FZL, 10 Liphook Crescent, London, S.E.23.  
 ENFIELD: V. Croucher, G3AFY, 15 Nelson Road, London, N.15.  
 GRAFTON: A. W. H. Wennell, G2CJN, 145 Uxendon Hill, Wembley Park, Middlesex.  
 HARLOW: A. T. White, The Chestnuts, Eyefield, Ongar.  
 NEWBURY: J. A. Gale, Wild Hedges, Crookham Common, near Newbury.  
 NORTH KENT: D. W. Wooderson, G3HKX, 39 Woolwich Road, Bexleyheath.  
 PRESTON: K. Ashcroft, 36 Windermere Road, Fulwood, Preston.  
 PURLEY: E. R. Honeywood, G3GKF, 105 Whytecliffe Road, Purley.  
 RADIO AMATEUR INVALID AND BEDFAST CLUB: W. Harris, 25 Playford Lane, Rushmere, Ipswich.  
 SLADE: C. N. Smart, 110 Woolmore Road, Birmingham 23.  
 SOUTH MANCHESTER: M. Barnsley, G3HZM, 11 Cemetery Road, Benton, Lancs.  
 STOCKPORT: G. R. Phillips, G3FYE, 7 Germans Buildings, Buxton Road, Stockport.  
 WHITCHURCH: D. Earnshaw, G3LHP, Gerharden, Alkington Road, Whitchurch, Salop.  
 WIRRAL: H. V. Young, G3LCI, 9 Eastcroft Road, Wallasey.  
 WORTHING: J. R. Tootill, 113 Kings Road, Lancing.



RAE Quiz and June 26 for a Junk Sale. **Purley** held their AGM on May 16. **Preston** is a newcomer to these columns, and announces a Junk Sale on June 11, and a Taped Lecture on TVI on June 25. Any interested persons will be welcomed to these meetings, at the Fruiterers' Club, High Street, Preston.

**Slade** meet on June 6 for a talk on IGY Research by Mr. D. Ramsden, B.Sc., of the Electron Physics Dept., University of Birmingham. Then on June 20 they are holding a "Criss-Cross Quiz" arranged and presented by G3HKC and G3JZF. The Club station G3JBN is available for members' use every day, and Morse classes are held on Tuesdays and Fridays at 7.45 p.m.

**Stockport** elected new officers for the season at their recent AGM; they report improved attendances at meetings, and have prepared several outdoor events for the Summer, including the Stockport and South Manchester Mobile Rally, scheduled for July 13. See separate panel.

**Whitchurch** (Salop) is a newly-formed Club which will meet at the School Hall, Old Grammar School Buildings, Whitchurch. G3LHP is secretary (see panel), G3DUC chairman and G3LJI treasurer.

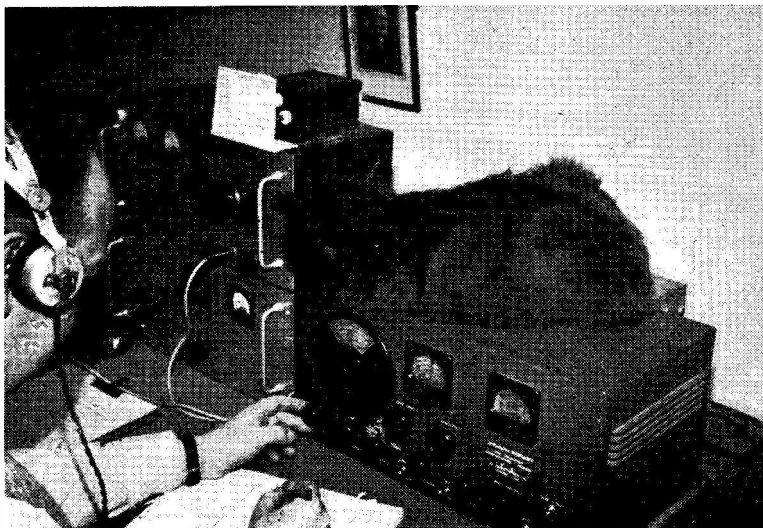
**Barnet** held their first monthly meeting on April 29, when G3DGN lectured on Transistors. They will be meeting on the last Tuesday of each month, 7.30 p.m. in the Headquarters of No. 1374 Sqdn. A.T.C., Gloucester Road, New Barnet; next meeting after publication is on June 24, when G3AAE will talk about his DX-pedition to Alderney.

**Cornish** met at Falmouth on May 7, when a good attendance of members heard G3BHC on Aerials, and also a tape made by G2FQD called "Conquest of Space." Future subjects include SSB and Licence Conditions. Summer visitors will be heartily welcomed, and are asked to consult the secretary, as meetings will not all be held in the same place—see panel.

**Crystal Palace** will be having another Junk Sale on June 21, which is expected to attract buyers and sellers from all over South London! Meetings are on the first Tuesday and third Saturday of the month at Windermere House, Westow Street, Crystal Palace.

**Enfield** forward their news letter (the *Lea Valley Reflector*), from which we gather that the two subjects of recent meetings were Communication Receivers (G2UJ) and Crystal Oscillators (John Gazeley).

**Newbury** have spent much time discussing and preparing for Field Day, for which they held a trial run on May 17. They also sent four well-



Each year during MCC, the operator on G3DOE of the Thanet Radio Society is encouraged by the presence of Thanet's aged black cat; dozing in the comfortable warmth from the receiver, she supervises the proceedings throughout the Contest. When this photograph was taken, the operator was G3FVV, who also built the G3DOE Top Band transmitter.

loaded cars to the Cheltenham Mobile Rally (including three mobile stations) and planned to go to the Bournemouth event as well.

The **Radio Amateur Invalid** and **Bedfast Club** continue to publish their very useful news sheet *Radial*, which is full of personal news of their members. Full particulars available from the hon. sec. (see panel).

**Worthing** continue to meet on the second Monday at the Adult Education Centre, Union Place, but there will be no meeting in August. Meanwhile their well-known "Bucket and Spade Party" is organised for Sunday, June 22, 11.30 a.m. until 7 p.m. The meeting place is the raised promenade south of Beach House, Worthing, and mobiles will be talked in by G3GVM/A on Top Band and Eighty between 11 a.m. and 1 p.m.

The next Mobile Meeting to be organised by **Southgate** will be on the afternoon of Sunday, June 15, at Wheathampstead Common, starting at 2 p.m., with Top-Band talk-in facilities available. This is a change of date, place and time, consequent on Field Day commitments. All details of the Mobile meeting from Southgate's /M organiser: D.E. Bootman, 18 Worcester Crescent, Mill Hill, London, N.W.7. (Tel.: MILL Hill 5156.)

**Brighton** are holding their Field Day inquest on June 10, and on June 17 they have a Junk Sale. For the remainder of the summer season they hope

#### MOBILE RALLY

Stockport and South Manchester are joining forces to organise a Mobile Rally on July 13 at Capesthorpe Hall, near Macclesfield, Cheshire. Full details available from the Hon. Sec. of either Club—see panel for QTH's.

All Clubs and local groups are invited to use this space for publicity and the reporting of their activities. We sometimes get complaints that "Our Club is never mentioned." The reason always is that no report has been sent in! Reports should be addressed to The Club Secretary, "Short Wave Magazine," 55 Victoria Street, London, S.W.1, and be posted to arrive on or before the date given every month at the head of this article. Reports received late cannot be taken into this feature. Photographs suitable for reproduction are always welcome, and a small fee is paid for those used, immediately on appearance.

to arrange impromptu lectures and demonstrations, and also to resume the Morse and Fundamentals classes.

Recent events at **Cheltenham** have included a taped lecture on Receivers, a Film Show, an Activity Field Weekend with activity on four bands, and the Mobile Rally on May 11. On June 18 the Club will visit the local telephone exchange, and there will be D-F tests on June 29 and August 31. Normal meetings are held every Wednesday, 8 p.m. in the Clubroom at St. Mark's Community Centre.

## STORIES IN THE JUNK BOX

SOME MEMORIES REVIVED

S. G. Wood (G5UJ)

**J**UNK BOXES can be interesting. Looking through his, the other day, took the writer back some years. An old crystal detector, of 1924 vintage, revived memories of school days and early experiments in radio. A pair of basket coils, complete with 2-way swinging coil mount, a 7-ohm rheostat (used in those days for getting maximum efficiency by adjusting the filament voltage) which brought to mind the early valves of the Ediswan ARDE and the famous Dutch R types—by the light of which one could *almost* read the evening paper! This recalled logging the first amateur station; it was on the 440-metre amateur band, and the receiver was a simple detector and one LF—battery, of course—and what a thrill that was!

Prices in the 1920's were pretty stiff. A reasonably sensitive pair of headphones cost about £3—quite a sum out of a schoolboy's pocket-money, had it not been possible to persuade the parent to contribute towards it! But we had fun. Plenty of excitement, too. One remembers sitting up half the night in an anxious attempt to hear the Trans-Atlantic broadcasters. The star stations were WGY, Schnecktady, the well-known voice of the General Electric Company, and next came KDKA in Pittsburg, Pa., with their associated short-wave relays 2-XAF and 2-XAD. Station WLW in Cincinnati was also much sought after. By 1926/27 we had those history-making tests on short waves initiated by Mr. Gerald Marcuse, G2NM (still active), culminating in the establishment of the BBC's Overseas Service.

The year 1928 saw the advent of the screened-grid and pentode valves, with a consequent revolution in radio circuitry. Came the hey-day of the kit manu-

**South Manchester** will be gathering on June 20 to hear a talk by G3FKO, of Bristol, on Two-Metre Work. July 13 is the date of the annual D-F contest, and a Mobile Rally will be held on the same day, in conjunction with **Stockport**. The entrance (Capesthorne Hall on the A.34 road) will also be the starting point for the D-F Contest. The Club Tx is on the air every Friday evening except for lecture nights.

**Grafton** recently heard a talk by G2AIW on VHF; they also held a Junk Sale and a discussion on the recent Top-Band Contest, with a tape recording of part of the phone section. G3KQZ and G3LBM tied for first place, being winners of the CW and phone sections respectively. G3JZX was third and G3MGV was "Best Beginner." The entry consisted of 13 members, and 63 non-members co-operated. Main activity now concerns the Grafton Field Day on Hampstead Heath, June 14-15, when G3AFT/P will work on the HF bands and G2CJN/P the LF.

facturers—everything was designed for kits.

Associated with this period were such names as John Scott-Taggart, J. H. Rayner, Percy Harris, W. James, and, of course, Capt. P. P. Eckersley of the BBC. Perhaps the most noted design of the day was Scott-Taggart's ST-100, a reflex employing two valves and a crystal detector, which was said to equal three valves in a normal circuit. Weird indeed were some of those circuits, too! Prior to the inception of the SG valve as an RF amplifier, one always had to use neutralised triodes in any HF stage of a receiver, in order to avoid instability and self-oscillation. It was then that amateurs learnt the art of neutralising.

The stage gain was pitifully low, of course, by present-day standards. One tried to make good this loss of efficiency by winding high-Q coils, often with Litz wire. Size was certainly no object, either! The writer remembers a 5-valve battery set, built in the time-honoured bread-board fashion, which measured some 44 ins. wide by 16 ins. deep, overlapping the small table on which it was operated.

By 1931, short waves were being used very extensively, and in 1935 the writer became operational into a dummy load, with the AA call-sign 2BSF; a year later the call became G5UJ. Looking back over the past, one can see that Amateur Radio has weathered many storms, and its flag is still flying. Long may it continue!

### SENDING IN SMALL ADVERTISEMENTS

We would particularly ask the increasing number of readers making use of our Small Advertisements columns to draft their notices carefully and *legibly*, with the accepted abbreviations. In the nature of things, these advertisements have to be transcribed by junior staff with little or no knowledge of the subject, and a good deal of reading and checking is called for to get them right, and into the form in which they appear in print. The rates for Small Advertisements are quoted at the head of the Reader column in each issue; coverage is now very wide, and a good response is assured for really attractive items, at the right price.

## THE HASTINGS CLUB TOUR

REPORTING THE G6HH  
SPRING EXPEDITION

J. D. Heys (G3BDQ)

AT 06.00 hours on Saturday, April 12, in a biting east wind and with a sprinkling of snow on the roof tops, five members of the Hastings and District Amateur Radio Club pulled away from the sea front on the first lap of their 900-mile journey. On the following Saturday morning the tired but happy crews of the two vehicles used on the trip ran into their home town in blazing sunshine with the temperature up to 60 degrees — such are the vagaries of the English climate!

In eight days the writer, John Taplin (G3HRI), Bob Page (G3MIY), Bill Thompson our secretary and his son Nigel, had visited 26 English and Welsh counties. The Club call sign G6HH together with its GW prefix and /A or /P suffixes had attracted a good deal of attention on all bands from 160 to 10 metres. In all, 191 different stations were worked in 15 countries, 49 of them from the car with its 4ft. whip aerial ("The Sputnik Special," as it came to be called). The rare Top Band counties of Rutland, Merioneth, Montgomery, Radnor and Brecknock were successfully put on the air, much to the delight of the keen WABC 'chasers.

### How it All Began

At one of our weekly meetings last autumn the writer happened to mention a vague plan for a Club tour. To his surprise the idea caught on and

within days, routes, equipment, and leave dates were being planned. Discussion and argument centring round the project certainly kept members interested for many Club evenings, and everyone contributed something to the cause. Indeed, an overseas member of the Club, Horst Jens (DJ3OD) was good enough to send along a gift of £5 to swell the "petrol fund."

### Selection of Gear

G3HCK loaned us his 250-watt PE generating set, but no one had a compact all-band transmitter. However, Messrs. K. W. Electronics, Ltd., generously lent us a K.W. "Vanguard." This transmitter performed so beautifully at the writer's QTH (adding JT1YL to his score) and throughout the tour that one of the Club members decided to keep it for himself! Other firms were also kind enough to contribute equipment on loan. Stratton and Co., Ltd., came up trumps and sent along a mint Eddystone 888A, complete with S-meter and speaker, which was a godsend when the pile-ups started on Top Band. Cosmocord willingly supplied three Acos crystal microphones. One of the latter, a MIC 39-1 stick type, impressed everyone with its wonderfully flat response and was also bought in at the end. A local Rootes Group distributor, Messrs. Langney Motors, Ltd., provided us with a 15-cwt. Commer van free of charge. This vehicle was, of course, invaluable and carried most of the gear and all the luggage.

### Mobile Operation

This was restricted to Top Band as the 40 and 80 metre /M aerials did not seem to like the deep narrow Welsh valleys, and anyway we were kept so busy on One-Sixty in the densely populated areas that there was hardly time for mobile work



The party started out early on the (frosty) morning of April 12, from the sea-front at Hastings. Here we see, left to right : G3MGQ, G3MIY, G3MQT jr., SWL Finch, G3MQT (hon. secretary, Hastings & District Amateur Radio Club), G3HRI (a sightless member), G3BDQ (author of the article), and G3IKE.

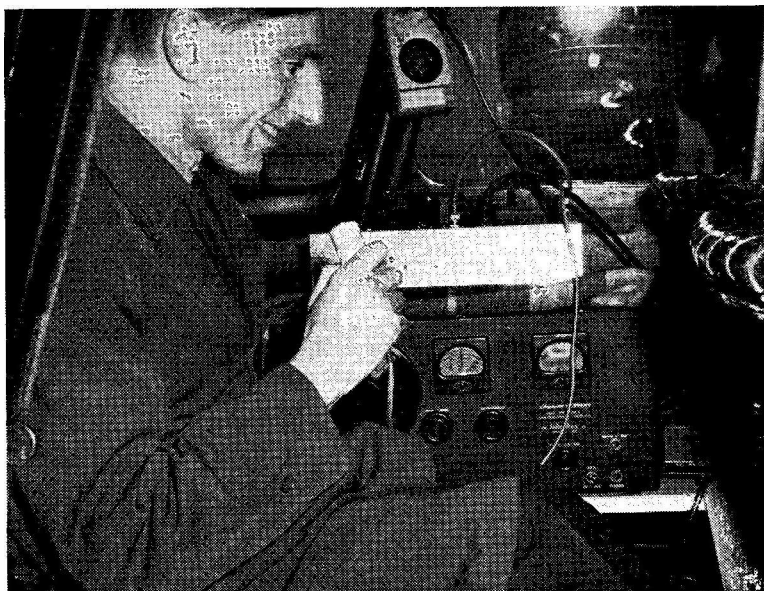
on any other band, so we decided to leave well alone.

The mobile transmitter was specially built for the journey by the writer and was "tailor made" to fit secretary Thompson's car. For simplicity it was crystal controlled on the three LF bands. It had a 1625 PA with Pi-output, a pair of 6AQ5's in AB1 for the modulator, and the usual 12AX7 pre-amp and triode driver stages.

As is so well known (or should be by now) the key to successful mobile operation is the aerial. On Top Band we used a fibre-glass fishing rod tip wound with 8 feet of enamelled wire, base loaded with a coil wound on a cyclist's polythene drinking bottle. A polythene sandwich bag weatherproofed the coil and the system was spot tuned on 1970 kc with two one foot lengths of steel piano wire. These were connected to the top of the loading coil and provided some variable tuning capacity. The aerial was mounted on top of the car and all sway was overcome by using four nylon guys made from 28lb. fishing line.

The receiver was an old SX24, and a dual power supply was also provided by the hon. sec. This power unit consisted of a vibrator pack for the receiver and a rotary generator for the 350 volts transmitter HT. Send/Receive was achieved with one switch on the receiver, and relays switched the HT voltages and the aerial. A thermo-ammeter was useful for keeping an eye on aerial current; we looked for those upward kicks which denote modulation.

Top Band mobile ranges of 30 miles were commonplace, and our best DX was G3LIL near Newbury, worked when we were passing through Sevenoaks, a distance of 80 miles. All of us were amazed at the high level of activity in the Midlands. The journey from Rutland to Sutton Park was a continuous series of QSO's so far as the duty mobile operator in the back of the car was concerned. What a contrast with Central Wales, where amateurs are very few and far between! Ten other mobiles were worked; many of these contacts eventually led to personal QSO's and mutual inspections of gear. One point worthy of mention is the still very common delusion that the "hot" end of a whip aerial is the part that does the work. Nothing could be further from the truth and the most elaborate 12-foot copper whip is a waste of effort if the loading coil is wound with fine wire on a long narrow former. Maximum radiation is from the lower half of the loading coil—so make sure the coil has a high "Q" with a diameter of



Throughout the tour, the Club callsign G6HH was used, prefixed and suffixed GW, /P or /M as appropriate. Under /M conditions, the receiver was an SX-24, with the operator (G3HRI in this photograph) in the back of the car. The transmitter is above the receiver, with the power supply units on the floor. In the week of the trip, nearly 1,000 miles were run, and many interesting and pleasurable QSO's and personal contacts were made by the Hastings group.

about half its length and is wound with at least 18 SWG wire.

#### /P From The Rare Counties

Our first experience of operating on Top Band from a sought-after county was at Ketton in Rutland. When G3FUR of Stamford learned of our intentions in his neighbouring county he offered to find us a suitable spot for /A operation. Of course we jumped at the idea, and to our delight found a brick out-house with mains supply and operating table laid on waiting for us. G3FUR had even got an aerial up for us—a 66-foot doublet between a pair of 40ft. masts; it worked like a charm from the word "go." An oil convector was also thoughtfully provided and this item saved the lives of G3HRI and G3BDQ, who spent the whole night with the gear whilst the rest of the party slept in a nearby tavern. Owing to poor conditions and a seemingly dead band, only five 160-metre stations were raised that night, the first Rutland QSO being with our Club president, G6QB, whom we worked on Top Band from every temporary or portable QTH during the tour. (These skeds with Q6QB were useful in letting the folks at home know that we were still alive and kicking!)

Putting Merioneth on the map was greatly helped through the kindness of GW3DHY and his XYL in Bala, where we literally took possession of the shack. A temporary aerial about 200 feet long was strung out down the garden and the team got down to operating in four-hour shifts. The between-times were spent in sleeping, eating, and rag-

chewing with GW3DHY, who is the only active amateur in the county and finds life without "locals" a little boring.

Montgomeryshire saw us in our oddest QTH. Operation was from the car pulled into the roadside and the aerial was 200 feet of insulated wire slung over a telephone line and dropping to ground level at the far end. Even with this unpromising set-up we were soon in business and peeling off contacts.

A hill-top location 1,000 feet above sea level far from human habitation; what more could any operator wish? That wish came true near Presteign in Radnor. Here we worked 35 Top Banders before midnight, when we had to pack up and take down the 300-footer. The story was much the same on the following evening near Brecon, but near midnight found us struggling with both vehicles which had bogged down in soft ground. After the application of great physical effort and some low cunning we eventually got on the road again and reached a pub, appropriately named "The Gremlin," in the nick of time. We would have liked to have done more phone working, but felt that our efforts should be directed more towards the CW man striving after WABC, so concentrated on the key rather than the mike. However, at Brecon G3MIY did work eleven phone stations in half-an-hour and was reduced to a croaky whisper for some time afterwards!

#### The Other Bands

The K.W. "Vanguard" was used to very good

effect on the DX bands, and a ten-metre phone opening to North America on April 12 enabled us to work a string of W stations from the Rutland site. The lure of having worked "the smallest English county" resulted in pile-ups of the kind more usually associated with exotic prefixes! Our best DX was a 569 report on 7 mc from W6DOJ, but "faithful Forty" was used mainly to keep skeds with G3LMG and to rag-chew with U.K. stations. Twenty metres gave us many European QSO's and Eighty was useful for G contacts before breakfast when the other bands seemed quiet.

#### Hospitality

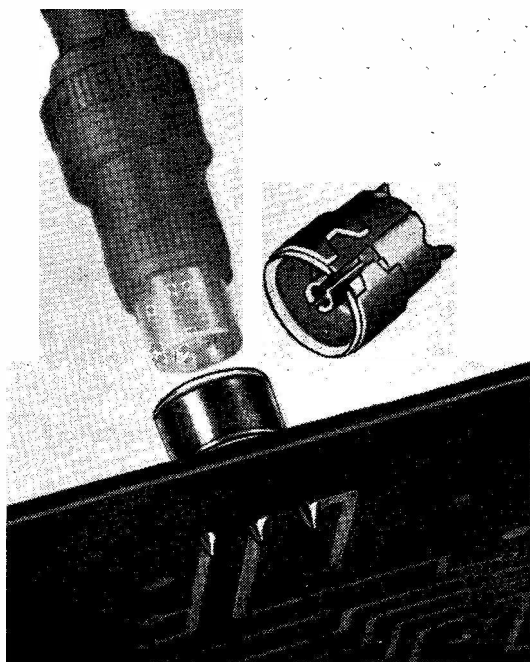
Under this heading, we can only say "Thank you" to so many who were so kind to us. Throughout the tour we were warmly received by several clubs and by many individual amateurs. The Saturday night noggin with the Stamford gang; the luxurious and well-equipped premises of the Leicester boys, the "high altitude" den of the Coventry Club; the fleet of mobiles in Sutton Park, and the meeting at the "British Volunteer" in Cardiff, will all be long remembered by all the members of our party. The wonderfully efficient talking-in provided by G3HRH/M, G3BMD/M, G3GLQ/M and GW3BAZ/M saved us many miles and enquiries in their districts. G3HRI and the writer will also be ever grateful to G3AIK of Ketton for the magnificent breakfast provided so unexpectedly when things seemed rather grey at 7.00 a.m. one frosty morning. At home, G3LMG undertook the burden of filling up over 200 QSL cards from the duplicate log sheets dispatched to him every day. This ensured that every contact we made would be promptly confirmed.

It is to be hoped that many other Clubs and Groups will follow up this venture with similar and perhaps more ambitious schemes. Should they wander Hastings way they can be assured of a grand reception from us all. As to next year? No doubt someone will come up with a bright idea!

#### THE R.E.C.M.F. EXHIBITION

Those able to visit this year's Components Show will have noticed the great strides made in transistor production, the full-scale commercialisation of printed circuits and of components specially designed for use with them, the wide range of miniature components (for which the original requirement was for the electronics of guided weapons) now generally available, and the adaptation of turn-table machinery for stereophonic reproduction. The Exhibition was visited by representatives from 29 overseas countries, including Russia (with a "delegation" of eleven), China and Japan.

The R.E.C.M.F. announces that it is organising an Exhibition of British electronic components in Sweden; this is to be held at Stockholm during September 29 - October 3 next, and will be the third of a series taking place every five years; some 30 British firms have already booked stand space.



Belling-Lee have produced a coax socket for printed-circuit mounting, made of cadmium-plated brass, with the centre contact silver plated. The socket connections have been made suitable for dip soldering.

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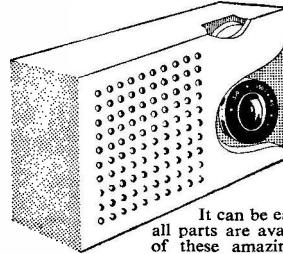
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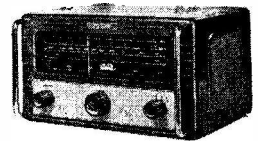
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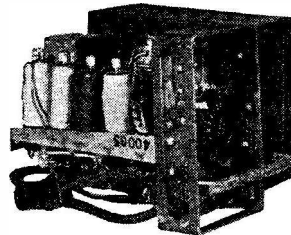
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# HENRY'S (Radio) LTD

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## QUARTZ CRYSTALS

FT243  
Fundamentals



80 Types 5706 667 kc/s to 8340 kc/s. (In steps of 33.333 kc/s). 120 Types 5675 kc/s to 8650 kc/s. (In steps of 25 kc/s).  
(Excluding Types 7000/7300 and 8000/8300).  
5/- EACH

Complete Sets of 80 Crystals ... £6 0 0  
Complete Sets of 120 Crystals ... £7 10 0

7000 kc/s. to 7300 kc/s. in steps of 25 kc/s. 7/6  
8000 kc/s. to 8300 kc/s. in steps of 25 kc/s. each

### T.C.S. CRYSTALS, 3-PIN TYPE 249, IN KILO-CYCLES

|        |        |        |      |        |
|--------|--------|--------|------|--------|
| 1572.5 | 1700   | 2070.3 | 2105 | 266.75 |
| 1665.5 | 1962.5 | 2072.5 | 2410 | 2865   |

at 7/6 each.

### FT241A 72nd HARMONIC CRYSTALS IN MEGACYCLES

|      |      |      |      |      |     |
|------|------|------|------|------|-----|
| 32.5 | 32.7 | 36.4 | 36.6 | at   | 5/- |
| 32.6 | 36.3 | 36.5 | 36.7 | each |     |

### FT241A — 54th HARMONIC

80 Types 20 Mc/s to 27.9 Mc/s. (in steps of 100 kc/s.)

(Excluding 24/25.9 Mc/s. and 27 Mc/s.).

5/- EACH Complete Set of 80 Crystals, £6

24/25.9 Mc/s. and 27 Mc/s., at 7/6.

|                                    |     |     |      |
|------------------------------------|-----|-----|------|
| 100 Kc's. Gold Plated D.T. Cut 10X | ... | ... | 15/- |
| 100 Kc's. Three Pin U.X.           | ... | ... | 15/- |
| 150 Kc's. Two Pin Round            | ... | ... | 12/6 |
| 160 Kc's. Two Pin 10X              | ... | ... | 12/6 |
| 200 Kc's. FT241A                   | ... | ... | 10/- |
| 500 Kc's. FT241A                   | ... | ... | 7/6  |
| 500 Kc's. Two Pin 10X              | ... | ... | 15/- |
| 500 Kc's. Brook's                  | ... | ... | 15/- |
| 2500 Kc's. Octal                   | ... | ... | 12/6 |
| 5000 Kc's. Piezo 2-Pin Holder      | ... | ... | 12/6 |

### P.O. TYPE 4B CERAMIC

|             |             |           |
|-------------|-------------|-----------|
| 100 Kc/s.   | 819.6 Kc/s. | 15/- EACH |
| 163.9 Kc/s. | 1000 Kc/s.  |           |

### CERAMIC 2-PIN BANANA PLUG

15,010 Kc/s.; 16,135 Kc/s.; 16,435 Kc/s.; 18,025 Kc/s.; 15,110 Kc/s.; 16,335 Kc/s.; 16,700 Kc/s.; 18,125 Kc/s.  
7/6 EACH

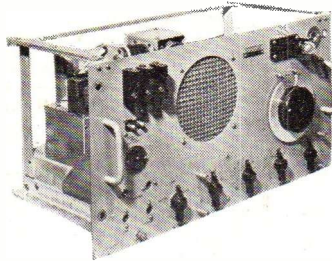
### MARCONI, S.T.C. 2 PIN 10X FUNDAMENTALS IN KILOCYCLES

|         |         |         |        |        |
|---------|---------|---------|--------|--------|
| 1183    | 1575    | 2315    | 10,233 | 10,823 |
| 1205    | 1588.68 | 1875    | 10,245 | 10,856 |
| 1324.5  | 1613.25 | 1930    | 10,300 | 10,878 |
| 1352.5  | 1650    | 1981    | 10,433 | 11,437 |
| 1384    | 1668.2  | 2055    | 10,445 | 11,501 |
| 1405    | 1674.9  | 2065.75 | 10,501 | 11,526 |
| 1408.5  | 1680    | 2067.5  | 10,511 | 11,587 |
| 1550.62 | 1680.5  | 2087.5  | 10,534 | 11,751 |
| 1554.4  | 1700    | 2089    | 10,545 | 11,788 |
| 1561.1  | 1727    | 2118.25 | 10,557 | 11,814 |
| 1565.62 | 1740    | 2196    | 10,567 | 11,851 |
| 1655.75 | 1764.5  | 2261    | 10,622 | 11,876 |
| 1570    | 1775    | 2295    | 10,166 | 10,755 |
| 1570.75 | 1780    | 2312    | 10,189 | 10,767 |
| 1572.5  | 1815    |         |        |        |

7/6 each

## SHORT-WAVE COMMUNICATION RECEIVER

10-60 Mc/s (5.30 Meters) RECEPTION SET TYPE 208  
I.F. FREQUENCY 2 MC'S.



Complete with 6 valves, 2-6K8G, 2-EF39, 6Q7G and 6V6G. Internal mains and 6v. vibrator pack. Built-in 6½" P.M. speaker. Muirhead slow motion drive. B.F.O. and R.F. stage. Provision for 'Phones and Muting and 600 ohms line combined input, 100/250v. A.C. and 6v. D.C. All sets in new condition and air tested.

£6. 19. 6

Carr. 15/6

Size: 24 x 18 x 12. Weight 80 lbs. (including Transit Case)

### WALKIE/TALKIE TYPE 38 TRANSMITTER RECEIVER

Complete with 5 Valves. In new condition. With circuit. These Sets are sold without Guarantee, but are serviceable.

22/6 p.p. 2/6

H/Phones 7/6 pair. Junction Box, 2/6. Throat Mike, 4/6. Canvas Bag, 4/-. Aerial Rod, 2/6.

### TRANSMITTER/RECEIVER, Army Type 17 Mk. II

Complete with Valves, High Resistance Headphones, Handmike and Instruction Book and circuit. Frequency Range 44.0 to 61 Mc/s. Range Approximately 3 to 8 miles. Power requirements: Standard 120v. H.T. and 2v. L.T.

Ideal for Civil Defence and communications.

BRAND NEW

Calibrated Wavemeter for same 10/- extra.

59/6

### TEST EQUIPMENT. U.S.A.

#### R.F. WATTMETER TS-87/AP

3 position 0-10/15/30 watts

Complete with photo-cell, 2 spare lamps and leads, with transit case. BRAND NEW £10/10/0. P.P. 7/6.

### WAVE-GUIDE WATTMETER

Type W8921 10 cm. Complete in transit case. BRAND NEW, £5/10/-, P.P. 7/6.

### RT10/APS-3

3 centimetre Radar Unit complete with 725A Magnetron 2-723A/B's 2-6AC7's. 724A and IN23 pulse trans, etc. BRAND NEW in carton, £10/10/-.

### PYE 45 Mc/s STRIP

Complete with 12 valves: 10 EF50, 1 EB34 and 1 EA50. Including modification data. New Condition.

### TYPE 3583

39/6

ABSOLUTE BARGAIN!

### R.F. UNITS

Tuning 20 to 30 Mc/s. Includes 3 SP61's. Carriage 2/6  
TYPE 26: Variable tuning, 50 to 65 Mc/s. Including 2 EF54's and 1 EC52. Carriage 2/6.

### TYPE 25 (switched)

10/-

25/-

### INDICATOR UNIT TYPE 247

R.F. POWER WATTMETER. Complete with large 1 MA Meter. Magic Eye indicator; 2 EF50 diodes and rectifiers. Inputs:—12v.; 80v. D.C. or 100/240v. A.C., 50 c/s. £4. 19. 6

### BC-906-D FREQUENCY METER

Range 150-235 Mc/s. New condition. Bargain ... ..

45/-

### EVERSHED WEE MEGGERS

500v. Brand New with leather case ... .. £12. 10. 0  
500v. New Condition with leather case ... .. £8. 19. 6  
100v. New Condition with case ... .. £6. 0. 0

### JUST ARRIVED! MIXER UNIT TYPE 79

Frequency Range 172 to 190 Mc/s.  
Comprising:—VCR 139A tube; 7, EF50; EF55; 4, EA50; 5U4; VUI20; EC52 and 2, EB91. Standard mains input 200-250 volts, 50 c/s. Carriage 5/-. £5. 10. 0