

The SHORT WAVE Magazine

VOL. XXI

APRIL, 1963

NUMBER 2

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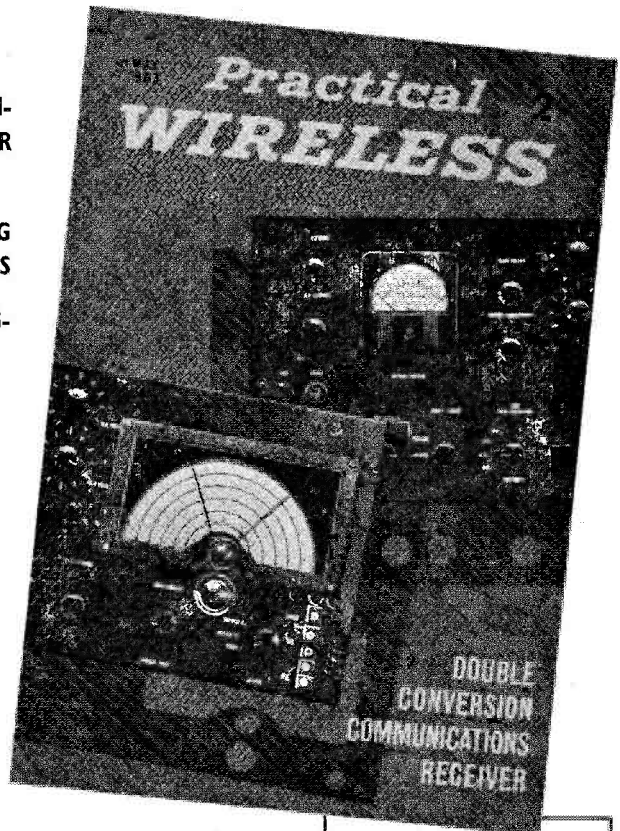
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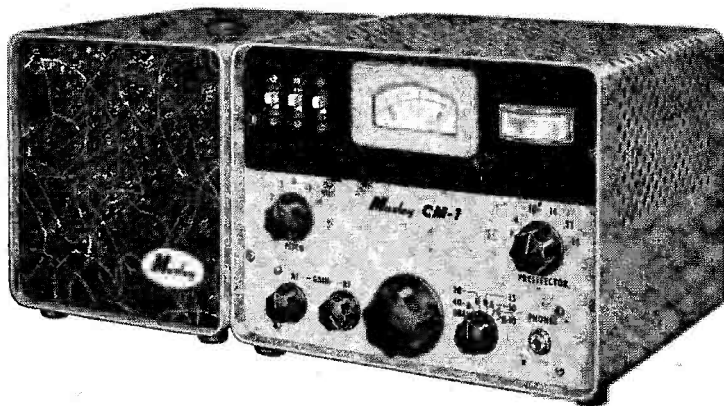
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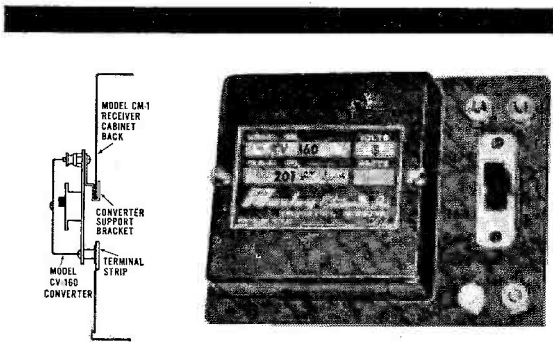
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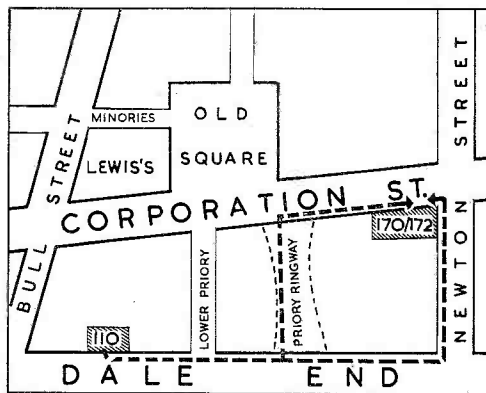
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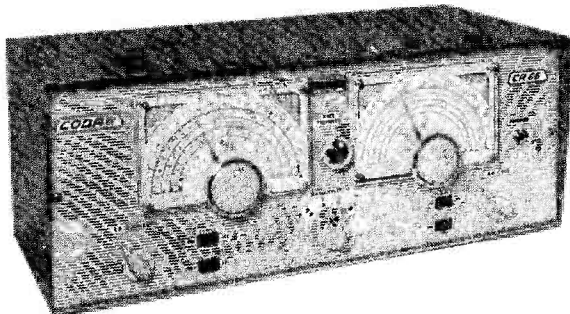
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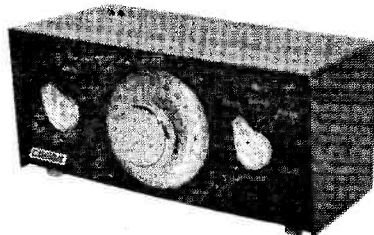
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E D I T O R I A L

Service *As has been pointed out in these pages before, there is much scope for the radio amateur's knowledge, ability and operating experience in the field of Civil Defence communications — indeed, it is obvious that a sound C.D. communication plan must rely largely on radio. It must also be closely integrated with the Regional C.D. command organisation, using C.D. frequencies and equipment, and not be dependent on some vague outside arrangement which may or may not be available for immediate action should the need arise.*

Within the regions, the Civil Defence communications network is built up on VHF channels, the bands used being 96-97 mc, 155-156 mc and 168-169 mc, for which fixed-station and portable equipment has been designed, operating mainly on crystal-controlled spot frequencies. Regular exercises are carried out, under conditions as realistic as possible, giving an authentic field-day flavour and atmosphere to the proceedings.

It is evident that licensed radio amateurs could do a great deal to help their local C.D. authority. Not only would they be contributing something really useful while enjoying practical radio work, but they would also meet other public-spirited people who understand the importance of being prepared for eventualities.

The local telephone directory, police station or town clerk's office will lead enquiries in the right direction — the Civil Defence Hq. for the region.

*Austin Fobler
G6FO.*

CHANNEL-SWITCHED MOBILE TRANSMITTER

FURTHER CONSTRUCTIONAL NOTES—TESTING OUT— ADJUSTMENT AND OPERATION

Part II

J. A. H. SPRATT, M.I.R.E. (G3KWG)

This concludes the description of the portable mobile LF-band transmitter, of which the circuit and design details were given in the March issue of SHORT WAVE MAGAZINE, as Part I of the article. This should be read with the final constructional and operating points discussed here.—Editor.

IN the original model, the transistors were mounted on a bulkhead on the top side of the chassis, this bulkhead being used to carry the rest of the power supply items. Remember to use connecting wire commensurate with the 10 amp. loading for the collector and inverter connections generally. This means something like 16g. solid wire, or the equivalent in stranded. You may find that things work, but wonder why the HT line only shows 300 volts instead of the expected 450 volts—until you find a couple of volts drop along the inverter leads, with distinct warning. It should be remembered, that with the transistor inverter, the output voltage is almost directly proportional to the input voltage. Remember, too, that the leads from the aerial switch to the aerial taps can easily carry an amp. or more of RF circulating current, and these also should be of heavy gauge, such as coax braiding.

Other construction points follow normal trends. It is probably preferable to use an alloy chassis rather than steel, since metal working is then considerably eased—whoever it was who said that a job would take a few hours using an aluminium chassis, or six months using steel, was not far wide of the mark, especially when meter cut outs have to be made! All the holes should be drilled before mounting components. It is well worth the effort involved to get the front-panel work done, assemble all the components, ensure that everything is on that has to go on, then dismantle and have the panel sprayed by the local garage. One of the "aerosols" of paint should make a nice-looking job. Metal work for cabinet and panels is always a vexed problem, which can be solved by use of a standard cabinet, or there may be a local firm who will produce a "one-off" for you at a reasonable price. The third alternative is a suitable surplus unit that can be stripped down and used. Of course, there are the more skilled among us who can produce the most marvellous

metalwork creations with apparent ease, but they tend to be in a minority. In the writer's case, the transmitter and receiver complete are housed in a box measuring 15½ ins. wide by 10 ins. high by 10 ins. deep—see p.9, March. No particular steps were taken to miniaturise, the objective being rather to use standard components to take up as little space as possible.

Alignment and Test

Before applying power, make certain that there are no obvious clangers in the wiring, the best method being a point-to-point wiring and component check. Check all lines to deck for short circuits, using an ohmmeter. Remove the fuse F2 from the HT line, and switch S3 to low power. Check that the valves are lighting up, and that the voltage across the EF91 heater is 6.3 volts \pm 5%. Press the handset switch, and if the connections are all correct, a 400 c/s whine will be heard from the power unit, and the voltage measured at the fuse will be of the order of 350 volts. The note of the power unit should be steady, and is probably best defined as a buzz, since it is caused by the transformer laminations and windings "singing." Let go of the pressel, switch S3 to high power and close the pressel. The voltage of the HT line should now be of the order of 650 volts. Let go of the pressel, and wait ten seconds or so, then insert the HT fuse, F2. It is necessary to wait this long for the HT line to discharge through resistor R25, the time-constant being 4 μ F/megohms, i.e. four seconds, and there will be less than 100 volts across the line.

Switch S3 to Test, put the channel switch, S1, to Posn. 1, ensuring that the required crystal is inserted, and close the pressel on the handset. Then adjust trimmer CT1 for 75 volts PA bias, by tuning for a peak and then detuning on the HF side, i.e. by

TABLE I

(Fig. 3 refers)

Pi-Network Constants (calculated) for 72-ohm load

	Frequency	1.8	1.9	2.0	3.5	3.6	3.7	3.8	mc
Input C	C12	315	300	285	160	158	153	150	μ F
Inductance	L3	28.0	26.5	25.0	14.5	14.0	13.6	13.2	μ H
Output C	CT7-12	1550	1460	1380	790	770	750	735	μ F

Pi-Network Constants (calculated) for 52-ohm load

	Frequency	1.8	1.9	2.0	3.5	3.6	3.7	3.8	mc
Input C	C12	315	300	285	160	158	153	150	μ F
Inductance	L3	27.0	25.6	24.5	14.0	13.5	12.3	12.8	μ H
Output C	CT7-12	1580	1500	1420	815	790	770	750	μ F

NOTES:

- (1) For CT7 to CT12 use 500 μ F or 750 μ F compression trimmers with the required capacity in parallel for the frequency in use. The shunt capacitors should be mica. A suitable range of micas and the compression trimmers are available from *Radiospares*.
- (2) The constants given above are theoretical and are design basis figures. In practice \pm 10% variation is to be expected.
- (3) For a given frequency, the loading is inversely proportional to the value of the output capacitance (CT7-12), i.e. decreasing the capacity increases the loading.
- (4) R12 is 1 megohm, 1-watt.

opening the vanes of the trimmer further (by screwing anti-clockwise). The PA grid bias can also be measured with an Avo Model 8, or similar measuring device, connected across R9; alternatively, an 0.5 milliammeter can be inserted in the earthy end of R9. Do not hold the pressel down longer than necessary whilst tuning the oscillator anode, since the PA is untuned, and this is a high-dissipation condition.

When Channel One has been correctly set up, tune each channel in turn to its respective crystal. Ensure that you are tuned to the fundamental, by commencing with the trimmer fully engaged, and by gradually unscrewing. If by any chance you cannot tune at either extremity of the bands, *e.g.* at 1.8 mc or at 3.8 mc, due either to the trimmer being fully engaged or fully open, then adjustment of L1 can be carried out as required. Alternatively, 20 μF or so can be connected across the trimmer at the lower frequencies, and L1 reduced in value, so that the trimmer can be correctly adjusted at the upper frequencies. Whilst it does not matter in which order the crystals are put in, the logical way is to have a block of Top Band crystals in order of frequency, followed by 80m. in order.

PA Adjustment and Aerial Tuning

To set up the PA, the easiest method is a dummy load consisting of a carbon resistor of the correct wattage and value, with an ammeter in series to measure the aerial current. The power output can then be computed from I^2R . Tuning into the dummy load has the further advantage that the adjustment will be somewhere near correct, so that only touching up is necessary in the car or on board the boat. For

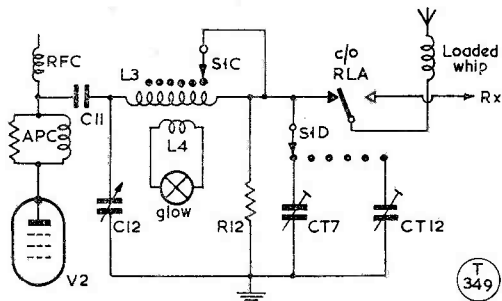
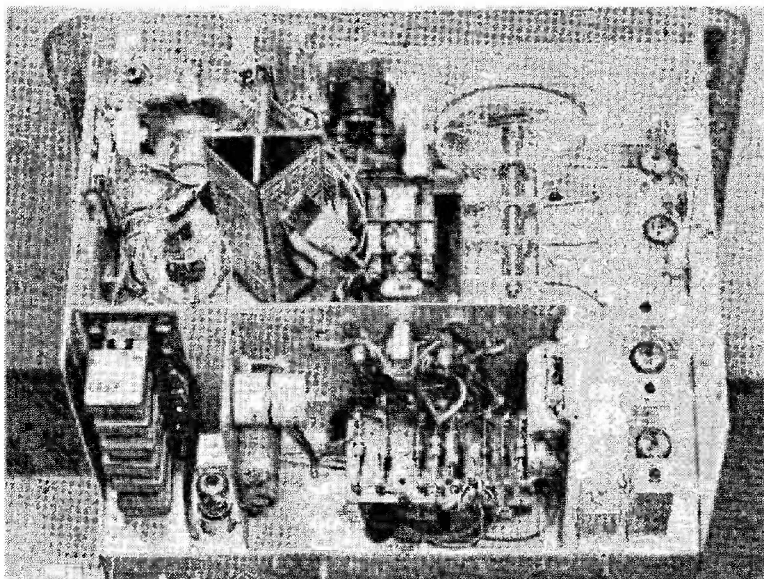


Fig. 3. If it is desired to change the tank circuit of the G3KWG 1.6-4.0 mc transmitter to the pi-network configuration, this is how it should look—and see Table I for values.



How the upper-deck layout is arranged in the G3KWG transmitter/receiver, covering 1.6-4.0 mc, as described in his article. The six crystals, with the EF91 CO, for spot frequencies on Top Band and 80 metres, are at lower left, with the 1625 (12v. 807) PA immediately behind the CO stage screen. The PA tank coil, in the cruciform shape in this case, stands upright, connections being made by specially constructed clips—though taps on the coil with heavy copperised croc. clips would do as well. The change-over relay is immediately to the right of the PA coil, and the three-gang condenser assembly is for Rx tuning; the 12v.-HT ECH83 receiver valves and associated circuitry are along the right-hand edge of the chassis. The control circuits and transistor inverter power supply for transmitter HT are in the compartment at lower centre.

end-fed aerials up to 70 ft. in length, a reasonable dummy load is a 200 μF condenser in series with a 10-ohm resistor; an 0.5 amp RF ammeter at the earthy end will indicate the power dissipated in the load. For use with coax lines or feeders, the appropriate characteristic impedance of the line should be simulated by the requisite value of resistor. In the first case, tuning is quite easy, since only two variables are involved—the tank condenser C12, and the aerial taps on L3, and this system will be described first.

Connect up the dummy load, as appropriate, switch S3 to low power and set C12 to half capacity; then alternately depress the pressel, check to see if a dip is produced in the PA current meter by swinging C12, let go the pressel, alter the position of the aerial tap, depress the pressel—and so on—until the PA is loaded to 35 mA to 40 mA dip. It will be found that increasing the inductance will decrease the loading, and *vice versa*. For the 80m. channels, tune up on low power, switch to high power and adjust if necessary for 65 mA to 75 mA PA current. To ensure that the PA is not being tuned to second harmonic, start with all the coil in circuit, and gradually move the taps up as required. It will be noted that as the PA is brought into tune, the aerial current will rise, and the aerial indicator lamp will glow. On Top Band channels, the PA current must not rise above 37 mA, otherwise the 10 watts input will be exceeded.

TABLE II

Voltage Readings

High Power	Anode	Screen	Grid	Cathode
V1	300	270	—	7.5 ⁽¹⁾
V2	455	265	—80	8.0
V3 ⁽²⁾	370	370	—	13.5
V3 ⁽³⁾	345	345	—	15.0
V4 ⁽²⁾	370	370	—	13.5
V4 ⁽³⁾	345	345	—	15.0

HT Line 460 volts

Low Power	Anode	Screen	Grid	Cathode
V1	170	160	—	3.5 ⁽¹⁾
V2	255	180	—40	3.8
V3 ⁽²⁾	210	210	—	6.0
V3 ⁽³⁾	190	190	—	7.0
V4 ⁽²⁾	210	210	—	6.0
V4 ⁽³⁾	190	190	—	7.0

HT Line 260 volts⁽¹⁾ Cathode voltage V1 measured with RFC in series with voltmeter.⁽²⁾ Measured with no audio input.⁽³⁾ Measured with full audio input.

All voltages measured using AVO Model 8.

Transmitter in oscillatory condition delivering power to artificial aerial.

Battery voltage nominal.

For working into resistive feeders, the tuning procedure is as above, except that C12 should be set to the approximate figure indicated in Table I, and by combination of aerial tap and trimmer adjustments, the PA cathode current should be brought to within 10% to 20% of the required value. Fine adjustment of the loading can be brought about by means of the trimmer and C12. Each channel is set up in the same way, so that in the end the only adjustments required in operation are to select the channel, the correct position of the power switch, and finally to touch up C12 for the dip.

Modulation checking should be done on both high and low power, preferably using an audio tone and oscilloscope. However, the usual method of whistling into the microphone, and checking that the current in the load increases by 1.25, is a reasonable indication of 100% modulation depth. With the microphone actually used on the model, the envelope is astonishingly pure on a whistle. If an oscilloscope is not available, then it will be necessary to listen on the station receiver, or on a monitor, to check for distortion and over-modulation. It will be noted that the aerial indicator PL2 on the tank will increase in brilliance on modulation, and that the PA cathode current will kick upward very slightly on peaks. If a different microphone is used, it may be necessary to adjust the ratio of R14 to R13 as required, but the sum of the two resistors must remain about 140 ohms.

Should CW be required, it is suggested that the modulator be open-circuited by removing the feed to R17, that the same switch could have a wafer to short the handset pressel, and then key oscillator and PA. If cathode keying is used, remember to

return the cathodes to earth *via* a large-value resistance, to prevent breakdown of the heater-cathode insulation in the key-up condition, when the cathodes will tend to rise to HT. It will also be necessary to switch the cathode meter out of circuit, otherwise the meter will be damaged in the key-up condition by the high cathode-to-earth voltage.

Operation

The transmitter as described and illustrated here has been used for a reasonable period, and good results have been obtained with lengths of aerial from 12 ft. to 200 ft., unloaded and end-fed. Quality reports have been excellent, despite the use of the carbon microphone. Whilst there is nothing to prevent the use of a more elaborate modulator and speech amplifier with a crystal or dynamic microphone, it is as well to keep a restricted audio bandwidth confined to speech frequencies. It may not make for BBC quality but it does make for less interference. The channel-switching facility has been found useful, and once set up for the channels required and for a given aerial, has required no further attention.

Grateful acknowledgement is made to colleague J. E. Johnson, who did a lot of hard work on the equipment, and then gave some very valuable criticism of the manuscript.

SPECIAL-ACTIVITY STATIONS

The first to be notified under this heading—*see* p.45, March issue, for qualifications—are as follows:

GB3KHE, April 16-18: Operated by Kinloss Amateur Radio Club, at R.A.F. Station Kinloss for their Hobbies and Handicrafts Exhibition, running all bands Ten to Top, but mainly 40-80 metres and seeking, in particular, QSO's with other R.A.F. stations. All contacts and SWL reports will be QSL'd, *via* D. E. Murgatroyd, GM3PGX, 25 Tedder Road, Kinloss, Forres, Moray, Scotland.

GB3RIW, April 25-27: Organised by the Burslem, Stoke-on-Trent and University of Keele Radio Societies in connection with the Festival of Leisure at the Municipal Hall, Newcastle-under-Lyne, Staffs. All bands 2-160 metres will be operated, with 100% QSL by special card, *via* V. J. Reynolds, G3COY, 90 Princes Road, Hartshill, Stoke-on-Trent, Staffs.

GB3MYA, June 28-30: Organised by the World Association of Methodist Radio Amateurs and Clubs (WAMRAC) in connection with the Methodist Exhibition at Peterborough, Northants. Details from Rev. A. W. Shepherd, G3NGF, 121 Main Street, Asfordby, Melton Mowbray, Leics.

NEW BBC HEAD OF TRAINING

The BBC announces that A. E. Robertson, B.Sc., A.M.I.E.E., who started with the Corporation in 1936 as an assistant maintenance engineer, has been appointed head of the BBC's Engineering Training Department at Evesham, Worcs. Until recently, he was chief instructor and assistant head of the department.

For The Beginner

CRYSTAL OSCILLATORS

The first piece of transmitting equipment built by the beginner should be a crystal oscillator, which can form the basis of many types of amateur-band transmitter, or can be used as it stands for low-power working. Practical experience with crystal oscillators will be invaluable at a later stage, both in transmitter and receiver design.

THE piezo-electric crystal is probably the amateur's best friend. Used with a single valve, or even a transistor, together with a few cheap and simple components, it provides him with a remarkable degree of frequency stability not only at its own fundamental, but at a variety of other frequencies in harmonic relation. The beginner's first transmitter need consist of nothing more than a straight crystal oscillator, and the beauty of this particular "start in life" is that the quality and stability of the signal generated will be excellent right from the beginning.

Some novices who open up with a home-built variable-frequency oscillator discover almost at once that it is easy to radiate a signal (of sorts) but that it is more likely to be a T7 or T8 affair than the T9 which they expected they would get. Not so with the crystal . . . just the simplest precautions, and T9x is the order of the day.

Experience in using different types of crystal oscillator is a considerable help towards the designing, at a later stage, of a good VFO. And, in any case, a versatile CO around the shack is an invaluable piece of apparatus, both for testing crystals and for using crystals of known frequency for calibrating other pieces of gear.

Basic Principles

The very simplest type of CO is shown in Fig. 1. It is simply the familiar Tuned-Plate-Tuned-Grid (TPTG) circuit, but it has a crystal instead of a

grid coil.

This crystal is the electrical equivalent of a tuned circuit of extremely high Q; it has inductance, series capacitance, series resistance and parallel capacitance, and may well have a Q of well over 20,000. Another way of saying this is that the impedance of a crystal, connected as in Fig. 1, will vary over an enormous ratio for a frequency-change of a matter of a few cycles.

Therefore the crystal oscillator valve will oscillate freely when the anode circuit is tuned to the crystal frequency; quite a small amount of de-tuning will "kill" the circuit. As it stands, this

Table of Values

Fig. 1. The simplest CO circuit

- | | |
|---|--|
| C1 = 150 μ F variable, receiving type | L2 = 2 or 3 turns link winding, at HT end of L1. |
| C2 = .005 μ F ceramic | X1 = Crystal for desired band |
| R1 = 50,000 ohms, $\frac{1}{2}$ w. | V = Any small triode (6J5, half 12AU7, etc.) |
| L1 = For 7 mc crystal, 15 turns 20g. on 1 $\frac{1}{2}$ -in. diam. former, and in proportion for other bands. | |

Fig. 2. Tetrode CO circuit

- | | |
|---|--|
| C1, C2 = As in Fig. 1 | R2 = 10,000 ohms, 5w. |
| C3 = .005 μ F, ceramic, 500v. wkng. | X1 = Crystal for desired band |
| Cx = see text | V = Almost any tetrode (6V6, 6L6, 807, etc.) |
| L1, L2 = As in Fig. 1 | |
| R1 = 50,000 ohms, 1w. | |

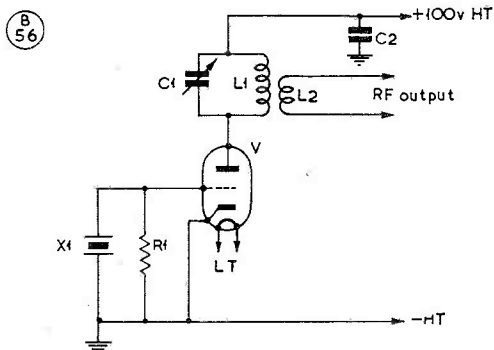


Fig. 1

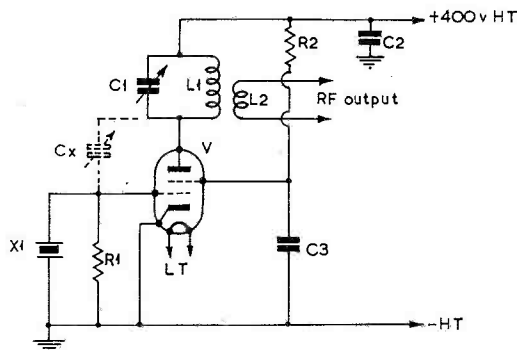


Fig. 2

Fig. 1. The simplest crystal-oscillator (CO) circuit is simply a tuned-plate tuned-grid (TPTG) arrangement with the crystal replacing the tuned grid side. The anode circuit L1, C1 is tuned to the fundamental frequency of the crystal. At Fig. 2 the same circuit is modified to use a tetrode instead of a triode, making it possible to run the oscillator at higher plate voltage without cracking the crystal due to over-excitation. The condenser Cx may not be necessary, and in any case must be kept very small — see text.

circuit is only suitable for driving a following stage, because it should be run at a low voltage (100 volts or thereabouts) and its output power will be in the region of 1 watt or less.

However, if we substitute a tetrode for the triode (Fig. 2) we can increase the HT on the anode, keeping the screen voltage relatively low, and make use of the higher gain of the valve. The limiting factor with the triode is that if the HT is increased too far, the RF current through the crystal itself will be excessive, and may cause it to crack through overheating. With the tetrode, this grid-circuit current can be kept down to a much lower figure, even with anode voltages of up to 400 volts.

Since the circuit depends for its operation on a small amount of feedback between grid and anode circuits, when a tetrode is used it may be necessary to provide this feedback with an external condenser of very low capacity (Cx), which may be as small as 3 $\mu\mu\text{F}$ or thereabouts.

The unit shown in Fig. 2 *could* be coupled directly to an ATU and put on the air as a QRP transmitter. Some of the more daring operators have often used a valve such as an 807 and pushed the input up to 20 watts or even higher—but they have probably cracked quite a few crystals in unguarded moments!

Note that these two circuits—two varieties of the very simplest type of crystal oscillator will only provide output at the actual fundamental frequency of the crystal. If you want harmonic output, at twice or three times the frequency, another stage is necessary to provide it.

So we pass to a more useful type of oscillator. Sometimes known as the Pierce, sometimes the Pierce-Colpitts, its resemblance to an ordinary Colpitts circuit can be plainly seen in Fig. 3. Two condensers, C1 and C2, are connected across the crystal, and the earthed cathode of the valve is connected to their centre-point. These two condensers and the crystal provide a complete oscillatory circuit on their own, and thus no tuned coil in the anode circuit is necessary. A unit of this type is invaluable for testing crystals, since it will oscillate over a very wide range of frequencies without needing a tuning control of any kind.

Note, too, that although the cathode is shown as earthed, the earth could equally well be connected elsewhere in the circuit. If you imagine the *anode* to be earthed, it will lead you easily to the next configuration (Fig. 4). This is basically the same Colpitts arrangement, the screen of the tetrode taking the place of the anode of the valve in Fig. 3. The oscillatory circuit is now across grid, cathode and screen; and for convenience the screen *is* now the earthy point of the circuit. It is not directly connected to earth, true, but it is "earthy" with regard to HF because of the by-pass condenser C4. The cathode is connected to the "centre-tap" as before, so it must be fed through an RF choke.

As these three electrodes now form a self-contained oscillatory circuit, we can do useful things with the anode. It can, in fact, be tuned to harmonics of the crystal frequency, at which it will give a

reasonably large output. If X1 is a 7 mc crystal, the tuned anode circuit C3, L1 will give outputs at either 14 mc or 21 mc when given the right values. It can also be used at the fundamental, without fear of cracking the crystal, provided that the values of the condensers C1 and C2 are chosen to give the required amount of feedback and no more.

In general it will be found that C1 can be about one-tenth of the value of C2; or, better still, C1 could be a variable air-dielectric trimmer whose maximum capacity is about a quarter of that of C2 (e.g. C1 might be a 3-30 $\mu\mu\text{F}$ trimmer, and C2 a 120 $\mu\mu\text{F}$ fixed condenser). Some experimenters may be mystified to learn, if indeed they have not already found out, that this circuit will probably work without these condensers being used at all. The answer is that the grid-cathode and anode-cathode capacitances of the valve supply sufficient feedback to maintain oscillation. However, for stable operation it is of course desirable to swamp them with additional capacity connected externally, and that is just what is happening in the circuit of Fig. 4.

The RF output from an arrangement such as this can be taken off, either through a condenser C5 as shown, or by means of a link-coupled winding as in Figs. 1 and 2. Choice of method really depends upon what follows; if a succeeding stage is being driven, the capacity coupling will probably be more convenient. If the stage is to be used as a QRP transmitter and coupled to an ATU, then the link coupling will be preferable.

For a complete single-stage transmitter using this basic circuit, and incorporating a few refinements, refer to Fig. 1 on p.631 of the February issue of SHORT WAVE MAGAZINE which shows G3BDQ's Single-Stage Multi-Band Transmitter. Twenty watts on four bands is obtainable with this very simple rig.



“... And what's more, Penelope, I might even give up Amateur Radio ...”

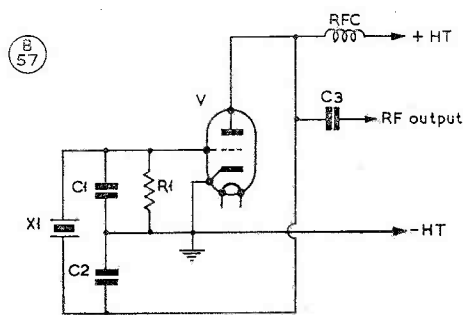


Fig. 3

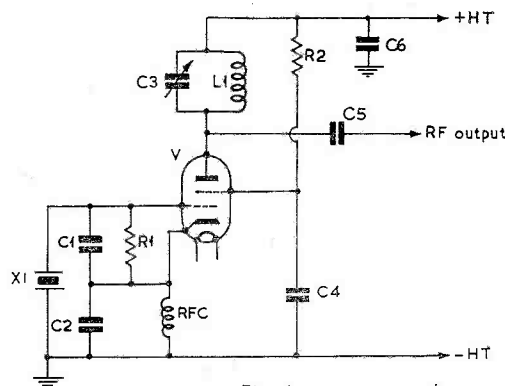


Fig. 4

Fig. 2. A CO arrangement which needs no tuned circuit, although C1 and C2 have to be chosen, within broad limits, to suit the crystal frequency. Fig. 4 is another version of the Colpitts circuit of Fig. 3, in which the oscillator electrodes are the grid, cathode and screen of the valve. The anode circuit may be tuned either to the fundamental or to harmonics of the crystal frequency.

Table of Values

Fig. 3. Colpitts Circuit with Triode

- C1 = 10 $\mu\mu\text{F}$ air trimmer (also see text)
- C2 = 100 $\mu\mu\text{F}$ silver mica
- C3 = 100 $\mu\mu\text{F}$, ceramic
- R1 = 50,000 ohms, 1w.
- RFC = Standard 2.5 mH choke
- X1 = Crystal for desired band
- V = Any small triode

Fig. 4. Colpitts circuit with Tetrode

- C1, C2 = As in Fig. 3
- C3 = 150 $\mu\mu\text{F}$ variable
- C4, C5, C6 = .002 μF ceramic, 500v, wkg.
- L1 = As in Figs. 1 and 2
- R1 = 50,000 ohms, 1w.
- R2 = 10,000 ohms, 5w.
- RFC = Standard 2.5 mH choke
- X1 = Crystal for desired band
- V = Any suitable tetrode (6V6, 6L6, 807, 1625, etc.)

There are, of course, many other crystal oscillator circuits. Years ago the Tri-Tet arrangement was probably the most popular, but it was merely another way of doing what the Colpitts circuit will do. Instead of the feedback capacitors it used a tuned circuit in series with the crystal, and a cathode tap at the junction. The triode part of a tetrode thus formed the crystal oscillator, leaving the fourth electrode (the anode) free to be tuned to a harmonic frequency. The name "Tri-Tet" derived from this, of course. But it is not recommended, nowadays, compared with the very simple and equally efficient Colpitts arrangement we have discussed.

Series or Parallel

Just as the same components (inductor coil and capacitor condenser) may be arranged to form either a series-resonant or parallel-resonant circuit, so may quartz crystals be used in either mode. A parallel-resonant circuit presents a *high* impedance at its resonant frequency and is therefore sometimes known as a rejector circuit; the series-resonant variety shows a *low* impedance at its resonant frequency and is called an acceptor circuit.

Crystals, as used in oscillator circuits, are naturally

connected in the parallel or high-impedance mode, but when they are used in filter circuits and for various other purposes outside the scope of this article, they may be encountered in the series mode. This is mentioned only to clear up any possible mystification; and we may as well add that the crystal frequency is not exactly the same in both modes—there is a small variation.

Overtone Operation

Crystals are cut from the original quartz in various ways, and it is possible, by choice of the correct axis and subsequent treatment, to produce a crystal which oscillates at a harmonic (or an approximate harmonic, hence the use of the term *overtone*) of the actual fundamental frequency for which it is cut. Crystals used for VHF work (those in the 24 mc range, for further multiplication to 144 mc, are frequently met) are usually of this type. A 24 mc crystal will have the physical dimensions associated with an 8 mc crystal, and so on. Do not be confused between these "overtone crystals" and the harmonics which can be derived, by circuitry, from a crystal oscillating at its own frequency.

Indeed, a recent innovation has been an "overtone/harmonic" crystal oscillator circuit, in which an overtone crystal is used, but a harmonic of that overtone can be derived from two valves, or even with one. Thus an overtone-type crystal with a fundamental of 8 mc may be made to give output at 72 mc in one stage. The output is very low, of course, and more applicable to receivers than transmitters.

In short, the crystal oscillator is a very fascinating device which has many uses in the amateur's shack. And a small stock of crystals with very carefully chosen frequencies can be worth its weight in gold, although it doesn't cost anything of that order! Government-surplus crystals, completely sealed or encapsuled, are very plentiful on the market and are extensively used nowadays among the amateur fraternity, particularly since SSB became so popular.

DX CRUISE IN THE PACIFIC

THE SURVEY WORK PROCEEDS—
MORE OPERATION UNDER
YJ1MA, VR1M AND VR2EA—
THEN HOMEWARD

Part II

R/S M. J. MATTHEWS, R.N. (G3JFF)

The first part of this article, covering our contributor's results and experiences up to Christmas 1961-'62, appeared in the March issue of SHORT WAVE MAGAZINE. In this concluding instalment G3JFF/MM brings his odyssey to a close, after 18 months of cruising thousands of miles in the Pacific, during which amateur stations all over the world were worked from rare locations and under DX call signs.—Editor.

AS I was due to take two weeks' leave during our stay in New Zealand I availed myself of the opportunity to get away from Auckland and see some more of the people and their lovely country. Being a great agricultural and farming country I was asked if I would like to spend my leave with a farming family. I jumped at the chance of a change from Amateur Radio and two days later I arrived at a homestead not far from Te Awamutu. Being midsummer it was also the height of the hay-making season and soon I was heaving bales of hay and driving a tractor like a seasoned farmer. Whilst I was enjoying this change my SWL loggist, Roy, was having a busman's holiday with ZL1ASJ at Kawhia. All too soon my leave was over and I was on my way back to the ship.

Whilst we were alongside in Devonport I used to operate regularly on the local net on 80 metres. For many ZL's it was their first QSO with a G, and one of the regulars was ZL1SK. One QSO with him was certainly a "first"—by signal lamp across Auckland Harbour from Devonport!

Mobile operation is very popular in New Zealand, although equipment is rather harder to come by there than in the U.K. Most of the mobiles use the ZC1 transmitter operating on 80 metres.

The day before we sailed to return to our survey work in the Pacific we gave a party in the mess to show our appreciation to all those who had been so kind to us. I invited the local boys along and thus it was that four car loads (each equipped with mobile rigs) crossed over the bridge and made their way towards the Dockyard. I was in QSO with them all the way to the gates. The Dockyard Police were rather wary about letting them in—because of their varied aerials and the fact that they seemed to be in contact with one of H.M. ships! A frantic call

from ZL1SK/M and I was up at the gate explaining to the police that they were not spies but guests of mine. The mess guest-book looked like a page out of the *Call Book* by the time they had left.

Our arrival back at Vila happened to coincide with a period of bad weather—the hurricane season was still on—which brought with it a high level of static. Conditions on 14 and 21 mc were extremely poor and they were dead from 0700z, so I was, rather reluctantly, forced to operate mainly on 7 mc. Not a single European contact was made during this our last visit to the New Hebrides! On our last night of operation a tropical storm of unexpected violence broke over the area and operating was brought to an abrupt end when, with four inches of water swirling round my ankles, the diesel generator spluttered out its final volt and YJ1MA was forced to go QRT. Altogether 655 stations had been worked under the YJ1MA call and given better conditions all round, the Europeans might have had a bigger share. It was not for want of trying from our end.

Having completed the survey of Vila harbour we headed out into the Pacific towards Fiji again. We were to complete our survey of the NE coast of Vanua Levu and also carry out minor surveys around Savu Savu and Natewa Bay. As most of this work would be done out of sight of land, and normal "trig" stations would be valueless, we had to set up our own navigational fixer system.

Setting up the Survey Stations

The ship carried a complete Decca "Lambda" fixer equipment which could be used for just this type of survey. This is a derivation of the familiar Decca navigational network, operational around the United Kingdom and Europe, and is used by ships and aircraft alike.

The complete network consists of two "slave" stations, erected 100 to 150 miles apart, and the "master" station, which was permanently installed on board. In addition to the rigging of the "slaves," I was also responsible for getting the communications system between ship and slaves operative. Here again I would be able to make the necessary arrangements for the eventual re-activation of VR2EA should circumstances allow.

One of the slave stations was to be erected on the island of Wailangalala, one of the most northerly islands of the Fiji group—and the nearest to the ideal tropical island that we had seen for a long time. It had a large, deep lagoon which made it perfect for the ship to anchor close in to facilitate the unloading of stores and equipment, and long inviting sandy beaches for our pleasure after hours. The only inhabitants of the islands were two light-house keepers (who spent 18 months at a time there) and one woman for cooking and cleaning. The sudden influx of over 40 sun-bronzed sailors with tons of equipment was not a daily occurrence and will no doubt be remembered for years to come!

Cook anchored in the lagoon and soon everyone was busy getting the slave station equipment ashore and accommodation huts (for the camp party) and

food and oil storage huts erected. The centre piece of the Lambda station was its 100-foot mast, which was loaded Marconi-fashion. Before this could be put up a suitable area had to be cleared to run out the earth radials and also to lay the mast out. After two days erecting and testing the station we left the three-man maintenance party on their own and sailed about 100 miles away to put up the second slave station at Napuka.

Napuka is a mission village and the only clear space on which we could erect the mast was the school playground. Needless to say all the activity around the mission was a great distraction to the children who were given an unofficial holiday; the shouts of glee and looks of awe as the 100-foot mast went up were a treat to behold. With both slave stations operating we were ready for the monotonous job of steaming up and down endless miles of sea with the coast line of Vanua Levu many miles away. Once again I became extremely active under the /MM call and with an improvement in conditions contacts back to Europe and the United Kingdom became commonplace. These contacts, together with the Sunday morning excursions on the 40-metre "Mosquito Net" certainly relieved the monotony of the job in hand.

Time came for us to replenish the camp parties and it just so happened that our weekend at Wailangalala coincided with the A.R.R.L. DX Contest. Roy, my SWL loggist, and I, thought it would be a good idea to take part and try to clear some of the QRM on our frequency which occurred every time VR2EA appeared.

On arrival at the Island the first thing we had to do was erect an aerial. Not being tree-climbers we took the easy way out and went up on the lighthouse to secure the end of a 400 odd foot long-wire. A quick dip in the warm blue sea, which was a few feet from the shack door, and we settled down to business. Just after 0500z on February 17, 1962, we had our first contact of the Contest, with W4GD. Altogether we made 457 QSO's from VR2EA that weekend.

Then the BERU Contest weekend came along and we found ourselves once again at Wailangalala to replenish the camp. We decided that we would try out ground-plane aerials on 21 and 14 mc for this contest, and using rods which belonged to some R.N. portable transmitters we were able to construct them with little difficulty. The long-wire came in handy for 7 and 3.5 mc.

Due to the fact that Fiji is exactly 12 hours ahead of GMT, and the ship had to sail at 1700z on the Sunday, we were to lose 12 hours operating time from VR2EA. Also, to conserve fuel, we were not allowed to operate all night over Saturday! At 0014z on March 10, 1962, we made our first QSO with ZL3US on 14 mc—followed by many ZL/VK QSO's before the Europeans started coming through. The first G contact was with G4CP, followed closely by G5RP, G3HRY and a host of others. At intervals between long spells of operating Roy and I would break off and take a dive into the warm sea and



When in Suva, Fiji, G3JFF (seated, centre) met, from left to right, VR2AS, W6AL and VR2DI. His own Fijian callsign was VR2EA.

then, after a quick swim, back into the fray.

A humorous incident that occurred during the first hours of the contest is worth relating. When VR2EA first came on the band the usual interest was shown by our friends in W6. Most of them realised what type of contest this was and very sportingly laid off. However, one persevering type kept calling us, and on getting no answer (after about an hour's calling) commenced calling "CQ BERU." It wasn't until a VK had put him in the picture that he realised that he was wasting his time and causing unnecessary QRM!

In addition to giving first-VR2 QSO's to a large number of Commonwealth amateurs (a most satisfying aspect of the contest to us) we were able to add a few new countries to our own DXCC total from VR2EA. Stations like VP8GQ (worked on 7 and 14 mc), VP3MC, 5H3HD, ZC4IP and many others were logged, and several well-known DX men were worked on all four bands.

On the Sunday morning (Saturday evening in the U.K.) there was a short but excellent opening to Europe around 1839z and our re-appearance on the band caused a lot of QRM from the crowd at home. G3LPS beat them to it first, and he was quickly followed by many others before the skip shortened. Another VR2 (VR2DK) was active for part of the contest—he was situated about 300 miles away from our location—and during the course of a QSO between our two stations he told me that a G had reported his (VR2DK) signals stronger *via* the North Pole route, whilst mine were stronger over the long path. He was using a doublet whilst I had the ground plane on 14 mc. We finished up with 230 QSO's and 2702 points.

Soon after this contest we completed the survey and with the return to ship of the slave stations we prepared for another visit to Tarawa. These last two

visits to the Gilbert and Ellice Islands were for the purpose of completing a survey of the Abaiang Atoll and also for fixing the positions of several other islands which were anything up to 30 miles out of charted position. Because of this variety of work our time at Tarawa was going to be limited to two visits of four days each.

Once again we signed VR1M from our old location and conditions seemed to be reasonably good; by this I mean that 14 mc didn't die out too early, thus allowing some of our QSO's to be with Europeans. G5WP was the first one to break through the QRM barrier, with G3AAM, G2FFO and others following close on his heels. During the second and last visit (after a refuelling trip to Suva) we were less fortunate and with the DX bands closing practically before we had got ashore and fixed up the rig, we were forced to spend a lot of time on 40 metres. During this last visit only two Europeans were audible enough to make it—G13NPP and OH1TM! Altogether, 626 contacts were made in 59 countries—and with the departure to VK of VR1B (who was to become VK3IB) and myself, the Gilberts were left with only one active amateur—VR1G on Ocean.

Before leaving Fiji for good we were to carry out a couple of minor surveys, for the British Museum and the Fiji Government. It was during these jobs that I made my last venture on to the amateur bands as a DX station (till the next time!). Operating from Savu Savu I managed a couple of days making the last QSO's for the VR2EA log. When I finally went QRT there the log showed a total of 1,282 contacts.

After having spent over a year in the Pacific the time had come for us to say goodbye to all our friends in Suva. Having been based there the ship was regarded as one of the family and we were as sorry to go as they were to see us leave. At a final meeting of the Fiji Radio Club I gave a talk on my trips around the Pacific and the sort of work we had been doing.

One of the most consistent VR2's on the DX bands is Owen, VR2DK. During the course of the year I had made over 130 QSO's with him and I was now to meet him personally for the first time. On the last weekend in Fiji, Roy and I drove to the other side of the island, to Vatakoula, to spend a few hours with him and his family.

Owen is a mining engineer at the gold-mines there and on the second day of our visit we went down to see the workings of the mine. The heat and humidity were higher than anything I had ever experienced; we saw plenty of ore containing gold. Having flown at several thousand feet and sailed over the oceans of the world, I was now experiencing being 400 ft. under the earth's surface.

As we steamed out of Suva harbour with our paying-off pennant flying and the Suva Police Band playing the farewell song "Isa Lei," there were some damp eyes and lumpy throats. That night as we steamed away from Fiji I joined the "Mosquito Net" on Forty for the last time. However, contact with

VR2 was kept up by nightly skeds with VR2DK, and before finally closing down the total stood at 142—conditions precluded us making the round 150.

Our voyage back to Singapore was via Port Moresby, where we just caught VK9RO and his XYL packing up ready for their return to VK5RG, through the Torres Straits and up through the Indonesian islands. The day we steamed past Portuguese Timor the wolf pack were after CR8AB—lucky fellow!

In between making final arrangements for the flight home, I kept on the air from G3JFF/MM. As Cook neared Singapore we made regular nightly contacts with England and fittingly enough the last entry in the log records a QSO with a U.K. station, G2FFO.

Before ending this story, I must record my thanks to all who made the Amateur Radio side of this trip so enjoyable—to those who gave SWL Roy Stanney and myself so much help and hospitality; to those thousands of amateur stations all over the world who gave us contacts; to the R.N. authorities and the Government officials who were so co-operative; and last but by no means least, the ship herself—H.M.S. *Cook*, of the Far East Station.

MORE AUDIO POWER WITH TRANSISTORS

Not only are transistors being pushed further into the VHF regions, for effective operation at higher frequencies, but their usefulness is also being extended at the LF end of the spectrum, to give much greater audio output. For instance, the new Mullard AD140 power transistor when used in push-pull pair will give 35 watts of audio. Another interesting new one is the Mullard AC107, a low-noise junction transistor particularly suitable for the input stages of audio amplifiers.

TWO OLD TIMERS PASS ON

On p.636 of the February issue we mentioned G2SU as one of the distinguished old timers. It is therefore with deep regret that we have to record the passing of Mathew Eskdale, G2SU, of 330 Manchester Road, Bradford, where he had lived ever since he was licensed, nearly 40 years ago; the first amateur on the air in Bradford, he started in radio in 1911; during the Kaiser's War, he was with Rolls-Royce, Ltd. and trained 1,100 students in aeronautical engineering; he did much flying in the early days of aviation, and at one time was a member of the crew of the ill-fated airship R.100. He was 73 when he died.

Another old timer to leave the scene, early in March, was George Wigglesworth, G2BH, of Barnsley, Yorks., who was 78 at his death. He was a founder-member of the Barnsley & District Amateur Radio Club (which came into being in 1913 and is probably one of the oldest Amateur Radio organisations in the world with a record of continuous existence) and was its president for many years up to the time of his death. G2BH, a fine old gentleman whose radio experience went back to 1910, leaves a widow, three sons and a daughter, eleven grandchildren and four great-grand-children.

IMPROVING THE KEYED SIGNAL

CATHODE CONTROL CIRCUIT, FULLY ADJUSTABLE

TO transmit intelligible Morse the requirement from any keying system is that the power output from the transmitter should reach full normal value and then break down to zero quickly and cleanly. Unfortunately, a very sudden change of conditions in any electrical circuit encounters opposition which in the case of a keyed transmitter results eventually in key clicks at the receiver. In designing a keyed stage it is therefore necessary first to select a keying system which gives rapid rise and fall of output and then to slow the process down until the key clicks are minimised or eliminated.

Bias Keying

By applying a high bias to the grid of the keyed valve in the key-up position, with the bias removed (shorted) when the key is down, effective control can be obtained. By the incorporation of suitable values of resistance and capacity in the keyed grid circuit it is possible to slow up the keying action and obtain virtually clickless keying. Bias keying applies to any variation of potential on control electrodes in the valve (grid, screen or suppressor).

The objection to bias keying is that relatively high voltages must be used to obtain cut-off, and also that careful filtering is necessary to keep RF from the actual key circuit.

Cathode Keying

When the cathode circuit of a keyed stage is broken the grid automatically acquires a high negative potential. Valve action is therefore cut off very rapidly. Similarly, when the key is made the grid very rapidly becomes less negative with respect to cathode and the valve conducts, quickly building to normal peak value.

This method of keying is probably the most effective, but unfortunately, in the raw state, it is very prone to give clicks.

The keying action can be slowed up by the use of an LCR filter, but the filter once correctly adjusted is effective only for one set of input con-

ditions. When checked on an oscilloscope it is surprising how few amateurs using this type of filter do succeed in achieving correct adjustment.

Valve Keyer

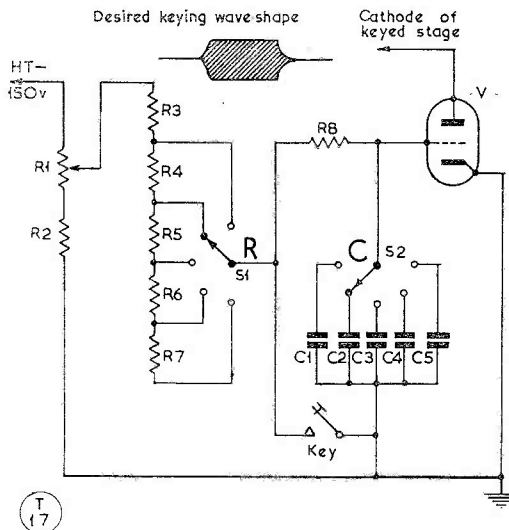
Undoubtedly the optimum keying system is one which combines the advantages of the two systems referred to above but obviates the disadvantages. The valve keyer shown in the circuit here will do all this.

The cathode is the best circuit to key, and the adjustment of C and R in a bias circuit is the easiest way to correct the rate of signal build up and decay. By using a low impedance valve or valves as a keyer the bias to be keyed is kept to a low value. Additionally, the value of cathode current in the keyed stage will not materially affect its time constant. Here then is a keyer unit which can be plugged into the cathode circuit of any low power stage and will give clean well-formed keying.

The circuit is self-explanatory, but the following additional notes may be helpful.

The keyer valves may be any low impedance triodes, or pentodes with screens and plates strapped. All that is necessary is that they should pass the cathode current of the keyed stage. Valves can be paralleled in order to provide sufficient current capacity. Allowance must be made for voltage drop across the keyer valve which will result in some loss of plate voltage at the keyed stage.

It is convenient to have a variable control of the



Circuit of the keyer unit, which can be adjusted, by selection on the variables C and R, to produce the desirable keying wave-shape, as shown inset (for CRO presentation). The keying valve is controlled by biasing, set on R1, and is in the cathode of the stage being keyed. This valve needs to be capable of passing the total cathode current of the keyed stage; for most amateur-band transmitters, a triode-connected 6L6 would do well.

Table of Values

Practical Valve Keyer circuit

C1 = .002 μ F	R2 = 50,000 ohms, 2w.
C2 = .003 μ F	R3 = 50,000 ohms, 1w.
C3 = .004 μ F	R4, R5 = 2 megohm, $\frac{1}{2}$ w.
C4 = .006 μ F	R6, R7 = 5 megohm, $\frac{1}{2}$ w.
C5 = .008 μ F	R8 = 470,000 ohms, $\frac{1}{2}$ w.
R1 = 50,000 ohms, variable, 2w.	V = See text

bias available to cut off the keyer valve. A value should be chosen just in excess of that necessary to give cut-off. In this way maximum control is available from C and R.

The "live" lead to the key must have a high order of insulation. A relay can be used for keying but it is not at all necessary.

Adjustment of the Keyer

Switch on the transmitter only as far as the keyed stage. Adjust R1 (the keyer valve bias control) until it is at a value just in excess of that necessary to cut off the keyer. Sending continuous dots, adjust C and R until the keyed signal is clean and resembles the desired wave-shape. There is of course only one satisfactory way of determining shape and that is by the use of an oscilloscope. A coil and condenser resonated to the operating

frequency and connected directly to the Y-plates of the oscilloscope will give adequate deflection if a short length of pick-up wire is also coupled to the coil. The X-base should be set to a slow running speed in step with the keying. Correct adjustment of C and R in the keyer is then simple.

The later stages of the transmitter should next be switched on and the shape of the keyed signal rechecked. Owing to the characteristics of the later stages, the signal shape may have changed slightly. This can be rectified by over or under doing the adjustment of C and R in the keyer. However, this is a fine point as also is a similar check when changing bands. In general, if the keyer is adjusted once for correct shape the radiated signal will be free from adverse keying criticism when used on other frequencies, or under different operating conditions.

TRANSISTORISED BROAD-BAND AMPLIFIER

INTERESTING CIRCUIT FOR MORE RECEIVER FRONT END GAIN

N. F. WILSHIRE (G3CEU)

THE transistor amplifier unit shown at Fig. 1 should find plenty of use in the amateur station—a glance at its response curve (Fig. 2) will suggest these at once. Its intended application is as a broad-band RF pre-amplifier ahead of any communications receiver, for increasing sensitivity either where the aerial system is a poor one or the Rx itself lacks sensitivity. Another possible use is as a harmonic amplifier for a frequency-meter.

Essentially, the circuit comprises a one-stage amplifier, TR1, giving a gain of about 20 dB. This is followed by two emitter-followers, TR2, TR3, to

bring the impedance back to 75 ohms. The matching and emitter-follower losses reduce the gain by something over 6 dB, so that the final average gain figure is about 10 dB over the major portion of the response curve—see Fig. 2. This is worth about two S-points increase, on the amateur scale, and alone makes the pre-amplifier very much a worthwhile proposition. As can be seen from Fig. 2, gain increases above 15 mc to a maximum of 20 dB at 30 mc—it is over this part of their tuning range that most receivers require an extra lift.

It should be remembered that all receivers are not of 75-ohm input impedance; the HRO, for instance, is 400 ohms. For these other impedances, the output of the amplifier should be modified accordingly. Feed-back to keep the gain linear is applied *via* the 820-ohm resistor R6 and the .05 μ F condenser C3.

Table of Values

Fig. 1. Circuit of the Transistor Pre-Amplifier

C1, C3,	R6 = 820 ohms
C4, C5 = .05 μ F	R8 = 2,200 ohms
C2, C6 = .01 μ F	R9 = 470 ohms
R1 = 75 ohms	R10 = 68 ohms
R2 = 10,000 ohms	TR1,
R3, R7 = 5,600 ohms	TR2,
R4, R5 = 4,700 ohms	TR3 = OC170

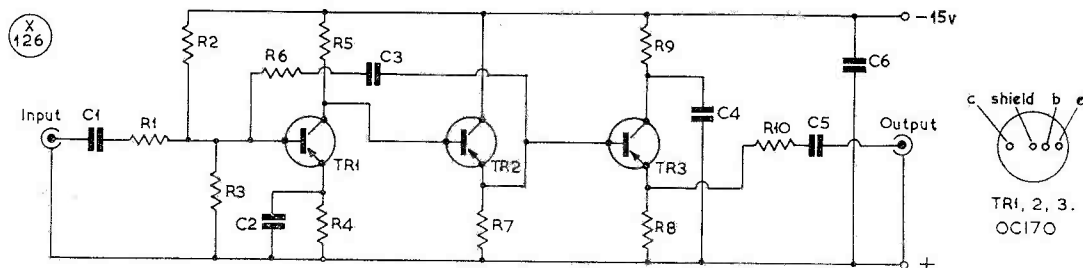


Fig. 1. Circuit of the broad-band RF amplifier, suitable for use as a pre-amplifier ahead of almost any communications receiver, and giving a gain of 10 dB (nearly, two S-pts.) up to about 15 mc, with a rising gain characteristic towards 30 mc. There are more sophisticated broad-band amplifier circuits, giving far higher gain (up to 60 dB or more) over a narrowed band-width of 12-15 mc, but the circuit shown here is a good general-purpose arrangement, involving no complications. It would be well worth trying in front of any receiver which is insensitive at the HF end of its tuning range. Another useful application would be as a harmonic amplifier for a heterodyne frequency meter.

Total power consumption is about 7 mA at 15v., but the unit can be run at lower voltages.

Construction

No difficulty should be experienced, as the layout is in no way critical—see Fig. 3, which is very nearly actual size. Two models of the amplifier have been constructed in this fashion, using tag strips bolted in a rectangular shape, one to 1 3/4 ins. by 4 ins. and the other 2 1/4 ins. by 5 ins. The only difference in performance is that on the larger one the gain peak is about 2 mc lower in frequency. The layout sketch at Fig. 3 shows the method of construction and component positioning in the smaller of the two models.

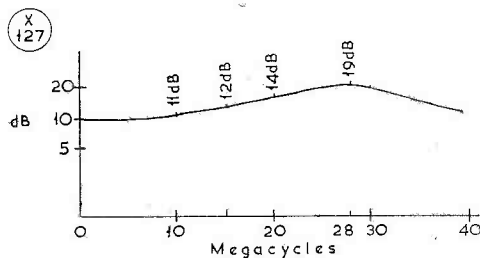


Fig. 2. A plot of the gain curve as measured for the circuit of Fig. 1, showing the rising characteristic between 15 and 30 mc. The 19 dB at 28 mc would be worth more than three S-points on any receiver.

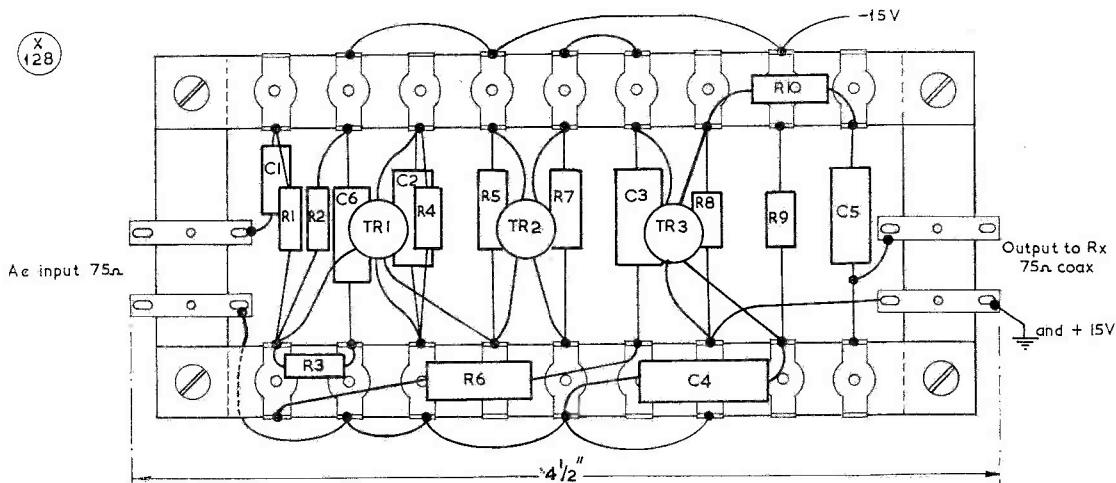


Fig. 3. Sketch to show the physical layout, as used by G3CEU, for two versions of the broad-band pre-amplifier built by him to the circuit of Fig. 1. The overall dimension is a little over 4 1/2 inches, so that this drawing is very nearly actual-size. The construction is across tag-strips, fixed about 2 1/4 ins. apart, the result being a compact unit capable of giving a gain of two S-points on the HF bands.

SEND IN YOUR CALLSIGN/ADDRESS

As we are the U.K. and European agents for the *Radio Amateur Call Book*—which, for some 40 years now, has been published from Chicago, U.S.A., and is the only directory of its kind, with a world-wide circulation—all new call signs and changes of address should be notified to us as early as possible. Not only will they appear in the “New QTH” page, which has been a regular feature of the *Magazine* for many years, but they are also passed on by us to the *Call Book* publishers. If, as a U.K. AT station operator, you are in the Foreign Section of the *Radio Amateur Call Book*, you are not only identified, but you can use *QTHR* to let your contact know where he can find your full address. The “Foreign Section” includes the world of Amateur Radio outside the United States, and lists the call sign/addresses of approximately 120,000 amateur stations. The U.K. section takes up 33 pages of the Spring Edition.

RESULTS WITH “MAGAZINE” DESIGNS

In a report on his experiences with some constructional designs and circuits described in *SHORT WAVE MAGAZINE*, G3NLM of Heysham, Lancs., says that he has had “FB results” with the S-meter arrangement discussed in the March '63 issue; the Multi-Band Radiating System, January '63; the Cathode Modulator given in the April, 1957 issue; and the Amateur-Band Frequency Meter detailed in November 1955. All these items have worked very well, and just as described. However, he did have a little difficulty with the QQV06-40A two-metre PA design using the coiled Lecher line tank circuit (April 1962), but this was overcome by changing to the parallel-line arrangement shown as a basic two-metre PA on p.68 of the same issue. G3NLM adds that he is now building up the Natterbox (SSB Transmitter) from the June 1961 issue of *SHORT WAVE MAGAZINE*.

More than 80% of all licensed U.K. amateurs are regular readers of “Short Wave Magazine”

Miscellany

INCIDENTAL INFORMATION, AND ITEMS OF TOPICAL INTEREST

(The heading under which almost anything may appear)

The total number of amateur stations on January 1, 1963, was approximately 252,000 in the U.S.A. and 120,000 in the rest of the world. From the average annual rate of growth during the years 1957-1962 (about 8 per cent per annum) it is estimated that by 1972 the figures will be roughly 500,000 in the U.S.A. and 240,000 in the rest of the world. Other significant figures (estimated) for 1963 were as follows: U.K., 10,500; U.S.S.R., 10,500; U.S. 2nd District, 34,500; U.S. 4th District, 32,800; U.S. 6th District, 31,600. After the U.K. and the U.S.S.R., the highest amateur populations (outside the U.S.A., of course) were those of Canada, Brazil, Germany, Japan, Argentina, Australia, France and South Africa, in that order. A final interesting point: The amateur population of the Northern Hemisphere is 339,000, whereas that of the Southern Hemisphere is only 33,000.

(Summarised from "QST," February 1963)

If all the amateurs operating in the recent ARRL Contest were laid end to end, the bands would be quiet enough for some of the QRP stations to work DX.

W stations with two-letter calls are likely to be Very Old Timers; their numbers are infinitesimal compared with the proliferation of three-letter

stations. Recent researches on the air provided the following answers to the query "What vintage?":—W3WV, 1905; W1QM, 1910; W5AU, 1912; W1SE, 1914; W1BA, 1915; W6JR, 1916; W1KC, 1921. Certain early three-letter calls can also go back a long way; for instance, W8BKM was licensed in 1919.

"What is all this fuss about the word 'we'? I might point out that we do it all the time, and surely everyone in the radio world knows that 'we' is the recognised amateur abbreviation for 'I'. We are going to introduce it on CW. . ." (Letter from ZB1BX)

"It was voted to re-establish a former club practice—that of having a 'grab-box' from which teen-age amateurs may obtain free radio parts donated by club members."

("Collector & Emitter," Oklahoma)

G3IDG suggests that the following "Q" signals, although intended for use in nets, might be useful for everyday CW operators:

QNJ? Can you copy me?
QNP Unable to copy you.
QNZ Zero beat your signal with mine.
QNH Your net frequency is high.
QNL Your net frequency is low.

"No, DX working is *not* a racket . . . it is *fun*. May there be more DX contests, DX-peditions, more pile-ups, and roll in the QSL cards and awards. For every rogue there are a hundred gentlemen. *Vive le DX!*"

(Letter from VE3BWY)

"G3KFN, an SWL and myself put up a 600-ft. aerial, and when we were just admiring it about a hundred birds landed on the 450-ft. run across the field. Suddenly down came the aerial with all the birds; it's one of the funniest things I've seen, all the birds flopping down to the ground in a huddle. Their additive weight plus take-off power did the trick."

(Letter from G5ZT)

Last month G3NWT regretted that our public have no sense of the romance of Amateur Radio. According to D. Gray of Easington, the American public appear to have too much! From their musical publication *Disc* he encloses a list of the Top Twenty, which includes groups calling themselves The Drifters, The Crystals, The Cascades and The Exciters (to say nothing of Johnny Thunder and



"... Have you quite finished? ..."

Bobby Vee). The prize effort is a record made by The Exciters, entitled "He's Got the Power."

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In the other direction—The BBC and its almost invariable depiction of "hams" as phoneys or pirates (see p.32, March issue), about which they seem quite unrepentant. A letter protesting about the last manifestation has merely elicited a reply to the effect that "it was only a play, not a documentary," and suggesting that people *never* believe what they hear in plays!

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Amateur Radio seems to be full of strange coincidences. An American amateur visited PAØFB, and they went on the air and put out an ordinary CQ. The first reply was from the W's home town (quite a small one) and the second was from a station very near to it. One could instance scores of such happenings; recently a well-known DX-chaser misread the call of a weak station and called him, using the wrong combination, naturally. Replying to him were both stations . . . the one he had heard and the one whose call sign he had mistakenly used! Incidentally we should be very interested to hear of more such phenomena.

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Heard on the Air (1):—"I am using a Wickeroy without boots on." (OH station on 14 mc SSB)

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"Miniaturised" components and circuits are now Old Hat. Microcircuits are the thing, and *New Scientist* (February 7, 1963) shows an illustration which gives a good idea of the present state of the art. A box which appears to measure 6 cm. square

by about 4 cm. deep contains 389 transistors, 1,660 resistors, 832 diodes and 587 capacitors. (It is part of a computer, not a communications receiver!). Passing on from this we arrive at Solid Circuits, with components integrated in a single wafer of material; one of these, a very complex circuit from the look of it, fits into a transistor case roughly $\frac{1}{4}$ -in. diameter by $\frac{1}{4}$ -in. deep.

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The cover illustration of *DX Magazine*, published by W4KVV, for March 9, 1963, is an X-ray photograph of the head of a dog. Apparently W8WC, who supplied it, did not find this picture at all easy to come by, but it was finally pinned down and reproduced for the benefit of "all those characters who keep calling CQ Dog X-ray."

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"For sale: Wooden UM3 modulation transformer, £2 10s." This small adv. in the *I.R.T.S. News* for February, hints at another major break-through, news of which has not yet reached us. We await details of a plastic modulator, or possibly a flannel PA.

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Heard on the Air (2):—"No, I do not have a beam, I just spray the stuff around."

(W2, on 14 mc SSB)

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Contest Troubles: (1) "Lost a 45-ft. mast in the gale, and was feeding 100 watts into the Atlantic Ocean for an hour. Boy, those pi-tanks will load anything!". . . (2) "Had all the usual QRM—full ashtray, hard chair and mother-in-law arrived."

(Wolverhampton "Newsletter")

COURSE ON BASIC RADIO THEORY AND PRACTICE

Arising from a comment in the March issue of *SHORT WAVE MAGAZINE* — about the difficulty experienced by absolute beginners in obtaining instruction in basic radio theory and the construction of simple circuits—we are informed that just such a course has been running very successfully since September last at the Evening Institute associated with the Kennington Secondary Boys' School, London, S.E.5. No previous knowledge of radio is expected, and the only qualification required is enthusiasm, with regular attendance. The schedule is Tuesday and Thursday evenings, 7.0-9.0 p.m., with half the time devoted to theory and half to practical work; students are encouraged to build their own gear and their problems constitute the lesson material. Present age range is 14-18 years, but applications from older students would be considered for a few of the vacancies. Apply in the first instance to: B. R. Meredith, G2CYV, Cormont Annexe, Kennington County Secondary Boys' School, Cormont Road, Myatts Fields, London, S.E.5.

We would be interested to hear of any other centres where the same sort of instruction

(elementary theory and construction for absolute beginners, as distinct from R.A.E. preparation) is being offered. There is no doubt that there is a widespread need for it, from the point at which the enthusiastic youngster is taught to relate circuit symbols with the parts they represent; how to read a simple circuit diagram; how to use a soldering iron; and how to put the circuit together to get a result. This sort of thing can only be done properly and made really interesting by a competent instructor who remembers his own beginnings as a radio enthusiast.

ANOTHER ADAPTED DESIGN

In sending in his slip for the "New QTH" page, G3RQR of Sunderland mentions that he has started with the Minitopper circuit, described on pp.292-294 of the August, 1962, issue of *SHORT WAVE MAGAZINE*. This has been built up on a BC-610 tuner unit chassis, which provided many of the parts (and only cost 6s. 6d.!). It has been wired for 12v. mobile operation eventually, and has made up into a very compact Top Band transmitter, only 9 x 4 x $\frac{1}{2}$ ins. Good reports are being obtained on 160 metres over local distances.

NOTES ON SILICON DIODES

AND A PRACTICAL CIRCUIT TO AVOID PUNCH-THROUGH FAILURE

J. R. MOORE

SILICON diodes do not seem to be as popular as they should be in amateur equipment, perhaps because, while not being very expensive, they have a nasty habit of breaking down when first switching on—they can be a bit temperamental if not properly handled. The following tale-of-woe is the writer's experience.

Having obtained what was said to be a 350-0-350v. transformer, two 1,000 p.i.v. silicon diodes were purchased and everything put together on a small chassis. When switched on, no volts appeared at the right end, and the transformer was humming violently. The diodes had lowered their back-resistance to about half-an-ohm! Measurement showed the transformer to be actually 450-0-450v., p.i.v. 1300, so it was really no wonder the diodes went.

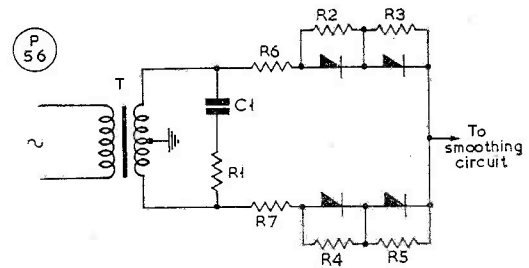
So a new start was made with four 800 p.i.v. silicon diodes, connected two in series, with inverse-voltage equalising resistors of 470K across them. This time everything worked, and the HT output was still there every time the mains plug was re-inserted. But then the fatal mistake was made of turning the PSU off by a switch in the transformer primary, instead of pulling out the mains plug, so that when switching on again, there was a loud overload hum, as before—and four more diodes down the drain!

Obviously, the requirement was to prevent high transient voltages, induced in the transformer by the switching action, causing punch-through at the collector junction. Pulling the *mains plug* out produced a spark at its terminals, thus allowing the current to decay slowly without any spike voltage on the transformer. On the other hand, when using the switch, the current decay was far quicker, resulting in a high transient voltage across the transformer secondary, which exceeded the diode p.i.v.

The Right Answer

For the third attempt, therefore, four 1,000 p.i.v. silicon diodes and a string of condensers and resistances were put together to the circuit shown here. It worked, and has continued to work ever since, without any more trouble.

The network R1, C1 forms a simple transient filter in that C1, with the inductance of the transformer secondary, comprise a resonant circuit damped by R1. The voltage-surge on switching off causes momentary oscillation, the energy being dissipated in R1. The resistors R2-R5 are to share the inverse voltage equally across the diodes. The



The power supply circuit, using silicon diodes, eventually arrived at to give trouble-free operation; the C1, R1 network is to keep down transients and so prevent puncturing of the diodes — see text. All values are given in the table.

back-resistance of silicon diodes is normally about 20 megohms; that of surplus types is likely to be a variable factor, with the result that there could be uneven voltage loading, again liable to cause punch-through due to the p.i.v. across one being exceeded.

Resistors R6, R7 are to prevent heavy current-surges when switching on; they are not necessary if the transformer secondary has a fairly high resistance, or the rectifiers are followed by a choke-input filter. The filter R1, C1 is itself not essential if other transformers, with their windings loaded, happen to be connected across the same mains plug after the switch (as in a multi-output power pack). But if the diodes are being run near their full ratings, it is just as well to include the filter—its cost is negligible compared with that of (yet another!) new set of silicon diodes, to say nothing of the inconvenience of having to re-wire the power pack and being without it in the meantime.

For different transformer voltages and load currents the ratings of C1, R1, R6, R7 can be adjusted as required. The important point to note is that the p.i.v. rating of the diode string in each arm should be equal to, or preferably greater than, three times the voltage input to the diodes, e.g. 1,350v. with a 450v. transformer.

Values for the circuit shown are: C1, made up of three .01 μ F 500v. working condensers in series, with 100K $\frac{1}{2}$ w. voltage equalising resistors across each; R1, 1,000 ohms, 1w.; R2-R5, 470K, $\frac{1}{2}$ w.; R6, R7, 10 ohms 5-watt; Diodes, silicon 450 mA, 1,000 p.i.v.; and transformer, 450-0-450v. at 450-500 mA. Widely differing transformer secondary voltages would call for changes as appropriate in the rating of C1 and the values of R1, R6 and R7, as well as in the p.i.v. rating of the diodes.

R.E.C.M.F. EXHIBITION, 1963

This important Exhibition, covering the activities of the British Radio and Electronic Component industry, will be held at Olympia, London, during May 21-24. One of the major exhibitors will be the Ministry of Aviation, now responsible for nearly half the research work in the electronics industry.

CALIBRATION OSCILLATORS

TWO CIRCUITS USING TRANSISTORS

J. ROBERTS

ONE of the most useful and easily constructed items of test gear is a crystal controlled band-edge marker, and two simple transistor versions are described in this article. Whatever the circuitry involved, these devices usually take a 3.5 mc or 1.75 mc crystal; they accordingly produce band-edge marking signals at 3.5, 7.0, 14.0, 21.0, and 28.0 mc. Since these frequencies correspond to the lower frequency limit of all the amateur bands from 80 to 10 metres they are very useful for receiver calibration purposes.

The circuits are simple enough and the components used are standard, so the units should prove to be quite inexpensive to construct even if everything has to be purchased. An OC44 has been tried by the writer but it is probable that the cheaper surplus RF transistors would be equally suitable. The crystal used in both versions was a surplus type which was found to be reasonably accurate, and active. The accuracy of the crystal is most important in a unit of this sort and it is therefore wise to check surplus crystals against a reliable frequency standard—such as a certified crystal—if one is available.

In Fig. 1, the tuned circuit must be adjustable to a frequency slightly lower than the crystal fundamental frequency to enable oscillation to commence. Any available coil-condenser combination to meet this condition will prove satisfactory, and the adjustment is not critical. The circuit of Fig. 1 will go off with any voltage between 1.5 and 9v. and operates well with crystals of fairly low activity.

No-Coil Oscillator

At Fig. 2 is a rather similar oscillator but it does not require a tuned circuit and for this reason may be preferred to the Fig. 1 arrangement. It does, however, call for a crystal of higher activity and a

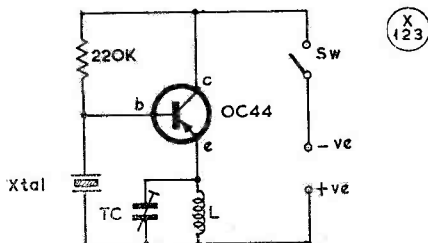


Fig. 1. In this circuit, the values of L and Tc depend on the crystal used. For a frequency in the 3.5 mc band, L can be of 50 turns of 30g., close-wound on a 3/8-in. dia. former, with Tc a 250 μ F trimmer.

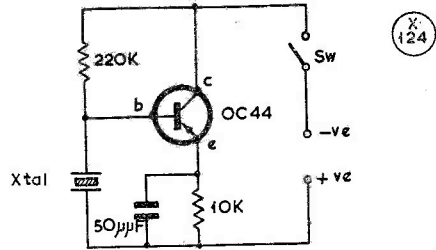


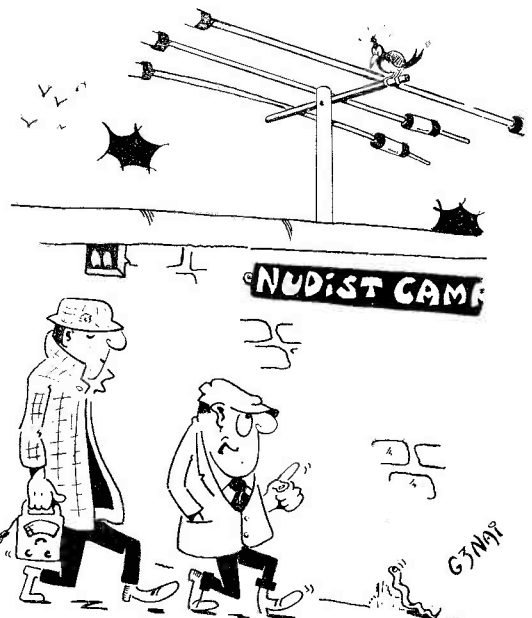
Fig. 2. Circuit requiring no tuning inductance—but the crystal must be an active one to ensure satisfactory operation.

supply voltage between 6 and 9 volts. The values of the resistor and condenser in the emitter may need some adjustment to obtain the maximum amplitude of oscillation.

Power Supply

Either version may be operated from the voltage developed across a bias resistor if the unit is built into a receiver, as long as the voltage developed does not exceed 9 volts. It may be necessary to by-pass the resistor with a .001 μ F ceramic condenser if it is not already by-passed to radio frequencies.

Harmonics were quite strong on the writer's receiver, even at 28 mc, without any direct coupling between the receiver and the units. If it is difficult to find the beat at the higher frequencies a length of wire can be connected to the emitter and taken to a point near the aerial terminal of the receiver.



“... I'm looking forward to inspecting this one, mate ...”

DX COMMENTARY

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

THE most interesting thing about the past month has been the fact that conditions have been very much better than the predictions indicated. A daily check on the WWV propagation forecast has been possible, and apart from a "4" on February 11, and "5" on February 12 and 13, the figure has never been below a "6," right up to mid-March. In fact we had a U7 on February 20 and a W7 on the 21st.

Now these figures in themselves are not all that significant, but the forecast in *CQ*, usually pretty reliable, indicated that there would only be one day in February (the 26th) when WWV would go as high as a 6; and that he would be sending only a 3 on February 5, 12, 13, 19 and 20. When WWV sends a 3, conditions are pretty poor . . . but with a whole month of 6's and 7's they have been as good as they were two years back.

For most of the period the 21 mc band was wide open to the U.S.A. in the afternoons—even to the West Coast on a good many days. And 14 mc was doing a roaring trade at almost any time of day. The U.S. stations fell off noticeably by March 10 and the few days following, but scrutiny of what sounded like a dead band (on the afternoon of March 12) revealed reasonable signals from VK, 4S7, 9M2, VU, CR7, FG7, PY, KV4 and KP4—all in the space of half an hour.

This is a matter of vital interest to all of us. Has something happened, in the way of artificial livening-up of the ionosphere? Some scientists have already hinted at it, but very guardedly. Certainly the sunspot count is



DL2BD/GW3NUO

CALLS HEARD, WORKED and QSL'd

extremely low, but conditions don't seem to match up with it at all. In other words, propagation is much better than it should be theoretically. And what with megaton bombs, exhaust from rockets, and all the satellites charging about, the ionosphere has certainly had something to put up with of late. (What *did* happen to all those needles, anyway?) It is only with great trepidation that we write this, knowing that by the time it is published, the bands may be flat on their faces.

ZL Again on One-Sixty!

Big news first, and this is it . . . ZL3RB has been working and hearing G stations on Top Band once more. But whereas the G/ZL work of some years back was done in the autumn, this time some careful planning and patient sked-keeping has proved it possible in early spring. The story, in short, is this: On February 23, at 0726, ZL3RB heard G3IGW at RST 329. On March 3 he heard G3OIT, and on March 4, G3OQT.

The latter station heard the ZL on March 5; and on March 8 their first QSO took place. This was at 0650, with 449 both ways, although at 0653 the ZL peaked at 569. G3ERN called ZL3RB immediately after this, and made a QSO just before he faded out at 0700.

Terrific work, this, and hearty congratulations to all concerned. The skeds are continuing, and there may be some more to report . . . if so, you will find it in the "Late Flashes" paragraph. As on the earlier ZL/G affairs, considerable perseverance was proved to pay off. G3OQT says that it took a lot of will-power to get up every morning at 0600 and go out to his garden-shed shack! By the way, the G's were on 1980 kc and the ZL on 1880.

Trans-Atlantic DX

While on the ZL sked, G3OQT worked KP4AXU (1902 kc) twice, which reminds us that most of the States and the Caribbean islands where Top Band operation has not

been allowed are now in the clear. So KP4 and the like are back in the running.

After the rather sensational report on the month of January which we published last month, the February doings fell rather flat. That wonderful peak of January 26-27 was not repeated.

However, here is the news to date, and once again it has to be drastically summarised to fit the space available. On *February 3 (Fifth Test)* conditions were not good. However, HC1DC and DL1FF put up a new "first"; G's who got across were G3PU, 3PQA to the W's, and the same two plus G6BQ to HC1DC. On *February 4 and 5*, G3RJI reported W6KIP at RST 579, 0720-0730.

February 10 was very poor and some G's heard nothing; others several weak W's. *February 17 (Sixth Test)* was a little better, but still not much good, though HC1DC worked a load of W's.

February 24 was a relatively good morning. G5ZT raised six W's on his 600-ft. wire; CT1CO gave lots of people a new country; other G's across were G3PQA, 3OQT, 3IGW, 3ERN and 6BQ. On *March 3*, W1BB reported G3PU putting in a consistent signal for two hours, but there was not much activity.

Some interesting "Firsts": VR3O and W2IU (February 20); W6KIP and KH6EGL/KM6; WØVXO and G16TK (first WØ to G); and CT1CO and W3GQF (February 24).

Other DX news in brief: W6KIP has had good openings to ZL, VR3 and VP2 . . . G3PGN worked W, VE, VP8GQ, OY7ML and heard KP4AXU peaking 589 ! . . . G3OIT has written to ZE3JO for skeds . . . ZS2FM and ZS2OQ are active, and received signals from W6YY on February 17.

VP5CZ, during the test on February 3, heard G3PQA, G3PU and DL1FF. He also logged HC1DC calling LU3EX. And he passes the news that the VP5 allocation is 1800-1825, 1875-1900, 1900-1925 and 1975-2000 kc, A1 and A3, 150 watts by day and 50 watts by night.

With the W4's and W5's now in the clear for Top Band, W1BB

points out that a WAS on One-Sixty will be possible. (We would not be surprised if he is the first to claim it!)

Other Top-Band News

HE9RAP (an SWL in Lausanne) sends a long list of G's heard there on A3. They have doubtless had his QSL . . . G3PQB (Peterborough) reports for the first time and has already worked 5A3CJ, OH3NY, HA, PA, DL and OK. "Where are the GC's?" he asks. GW3PPF heard "ZD8AN" on the band, but thinks he was an obvious phoney. The most consistent Trans-Atlantic signal was W1BU.

GM3PBA (Dumfries) notes that he has had 83 QSO's with 49 different OK stations, and he is now all-out for his daylight WABC, with 45 already on the list. He adds that much is said about Lids, Clots, Nits and so on, but not enough about the real first-class types, some of whom he mentions as having helped him with advice and guidance in a nice way when he himself was perhaps a little clueless and almost giving up the DX as a bad job.

G3PLQ, away at sea, wishes there was a /MM licence for Top Band—he is an enforced SWL these days! However, he has a listening sked from his ship with quite a big group of stations and is getting some interesting results. He sends his complete log, from Liverpool down to Bathurst, Gambia, where, on March 2-3, he was receiving both the W's and the G's calling them.

G3REA (Warrington) has worked HB9EO, OH3NY and 5A3CJ; and on March 10 he heard KP4AXU and 4AQY, both around 1995 kc. He would like a "novice Sunday," when only those who

have never worked across the Pond would come on. (Good idea, too, but it would only happen in Utopia!)

Eighty Metres

Whereas vast stretches of the spectrum carry "No Parking" notices, as far as amateurs are concerned, *Eighty* has "Free Car Park" boards up, but is cram full of heavy lorries. Only by day, when few people use the band anyway, is there room to squeeze in between the commercials.

"A grim struggle," says G2DC, who managed to work VP8GQ, several VE's, all W districts except 6 and 7, KV4AA, VP2VL and ZL3GS (all CW). G3KMQ (same mode) raised VP5XG, W5HCZ/VO2, 3A2CL and TF5TP. Interesting gotaway—JA6AK, 449 at 2235 GMT.

ZB1BX says he did work a JA, on CW—also VE3FFW/SU on SSB. G3FXB put his band total over the century, and says that W's could be worked very fast (including a bunch of WØ's) during the ARRL Contest. His best on SSB were EP3RO, HB1GJ/FL, HR3HH, PJ2AA, VP2AB and 5BL, ZS5JY and ZL's. On CW he collected KV4CI, MP4BBE, ST2AR, VP5XG, VP8GQ, VS1LP, ZL's and 9Q5AB.

G3NOF worked SSB with KP4OWH, W1BU, VE2WM, VO1DN, ZL3BF and 3A2CL. He says that ZL's were heard as late as 0900 on occasions, G3HZL had CW contacts with VP5XG, VP8GQ and ZB1CR.

As always, we have some interesting gen. on this band from some of the SWL's. Barry Cushing (Whyteleafe) heard SSB from one or two unusual ones, such as HB1GJ/FL, YV5AMS (0700),

TEN-METRE ACTIVITY SUNDAY

To investigate the suitability of the 10-metre band for general working under present conditions, a special test-period has been arranged for Sunday, April 21, 0900-1900 GMT, during which as many operators as possible are asked to use the 28,000-28,500 kc portion of the band, on CW and/or phone. If you do not hear anything, call CQ. No conditions or restrictions—just come on and see what you can work, local or DX, in any mode. SWL's are invited to co-operate. To enable the test to be fully reported, please notify your results as soon as possible after April 21. If you have 10-metre gear, be on the air for April 21, 0900-1900 GMT.

KZ5OX (0706), TI2PI, VP7CW (0735), KZ5GI (0710), as well as plenty of ZL, KP4 and the like.

The best heard by Barry Cur- now (Plymouth) were FG7XT (2240), YV5ANS (0435), ZS1JA (2015), VE5FN and VE6SF (0700) and W6VBY (0741)—all SSB. David Hayes (London, N.3) logged HI8XAG, FG7XT, HC1DC, OY7ML, VE7ZM, TI2PI, W6 and 7, ZK1BS, XE1WN, VR3O and many ZL's —again, all SSB. He says conditions for W6 were excellent on February 27.

Forty Metres

Conditions have been excellent nearly all the time, but through the usual hazards this band suffers from. G3NOF reports hearing many VK's on SSB around 0800, with VK2AVA outstanding. And

one SWL—J. W. Bluff (Harrow) really penetrated into the SSB DX with JA1INJ (several times, 1655-1950), VK2AVA (2020 and mornings), YV4BV (midnight), ZS3E (1010) and many 4X4's, all below 7100 kc. Above 7100 he logged HC1DC, HH2PW (2320), HL9KH (1535), VP7NS (0900), YV5AGD (0815) and K6AHV (0840). Even on AM he winkled out HP3FL (0485) and 9G1DM and 1DV (2210).

The rest of the 7 mc DX is all on CW, and starts with G3KMQ, who worked F2CC/FC, HB1GJ/FL, KV4AA, CT2BO and VP8GQ. ZB1CR's bag was VS9AAA, TF3GF, VE8GJ, MP4BBE, VP9BO, VP8GQ and VU2GG. XU2ABA was discarded as a phoney or else a YU with a flabby fist!

G3LPS had a nice little bag which included VS1FJ, VP8GQ, ZB1BX, VU2GG, VP5XG, VP9BO, VK5NO and VK7SM. G3FXB collected ST2AR, VP5XG, VP9BO, VP8GQ, VQ4IN, VS9AAA and 9AAE, VU2GG, ZE6JE and 5N2RSB.

G3PEK raised 5B4IP, ZB1CR, 3V8CA, VE3KE, YV5ANT, VP5XG, VP8GO and UL7GP. G3LHJ worked CT2BO, VE3KE, VP5XG, VP8GQ, VS1LP, ZB1BX and 1CR, 4S7WP and 5B4's. G3HZL lists VU2GG, VP9BO, VP5XG and VP8GQ.

G2DC, though he thought conditions disappointing, found 1900-2100 and 0700-0800 quite interesting, and worked LA2NG/P, MP4BBE, VU2GG and 2MD, VK3RJ, VP5XG, VP8GQ, VQ2W, VQ4IN, ZE6JE, 9K2AD, W's, VE's and ZL's. Note that the call VP8GQ appears in every list! G2DC nominates him for the "DX Palm," as he has been workable on five bands—1.8 to 21 mc. Certainly Peter, who is G3LET, has been doing his stuff, especially on the LF bands; and the same applies to the other Peter—VP5XG, who is G3HVG. He, too, has been worked by someone or other on all five bands. When some of these keen G operators get posted abroad they certainly stir things up.

No one seems to mention XE1OK, who has been worked by G6QB with some regularity,

around 0810 GMT. He has been very consistent, and, considering how many people seem to want Mexico, in surprisingly little demand.

Twenty Metres

For the whole of February and the first week in March, the 14 mc band was in wonderful shape. Then things dropped off a little, but by the time of writing they seemed to be coming back nicely. Most of the DX recorded is on CW, but the SSB types didn't go short, by any means. G3PEK worked CW with KP4BEA, KV4CI, YV5AXA, VE6UM, UM8KAA, VP8GQ and 8HD, VS1GZ, VS4RS and SV0WY. G3LHJ made it with FB8ZZ, UH8, VS1FJ and 1GZ, VP5XG, VP8GQ and 5N2RSB.

G3HZL's list includes FY7YF, KG4AM, VP8GQ and FM7WP; G3KMQ reached his 200 mark with FR7ZC/J, CR9AH, ZD6OL, VS9MB, PJ2CK, VP8HF/MM, HP1IE, 6O1ND, VP9FK and HK's.

G3LPS came up with VS1GZ, VS9AAA, VS9MB, 5N2's, 5H3, 9M2UF, VK7SM, VE8DX, UA0AU, VQ2's, ZL's and the like. G3FXB raised VP8GQ, VS9MB, ZD6OL and 9M2UF on CW; SSB fetched in CR8AA, ET3MEN and FR7ZC/J. G3NFV (SSB) worked KC6BK, XE1IL, HL9KH and KG6AJB.

G8VG also worked both modes; SSB brought him PY4AS, VP3RS, VS9ASS and EP2AM, while CW netted JA's, KR6ML, VK7ZW, VS6EC, VP8GQ, 9 M 2 U F, YN1AA, 4S7EC, 9L1GM, KP4, KV4, HP1IE and, of course, VP5XG on regular skeds. (G8VG is Peter's dad.)

G3NOF stuck to SSB and came out with FG7XT, FR7ZC/J, HH2PW, PJ2AA, TF2WHB, PZ1AX, VP6KL, 7CW, 7NS, YV1EQ, YA1AA, ZD8DW, ZS's, 6O1WF and a host of /MM's, in which he seems to specialise.

From a colossal SSB list from GW3AHN we skim the cream, which is roughly as follows: CR8AA, FG7XT, FR7ZC/J, HI8XAG, HL9KH, KC6BK, KG6IJ, W9WNV/KG6 (Rota), KH6PD/KG6 (Marcus), PJ2AA, VK8NE, YA1AW, YN7GJ,

FIVE BAND TABLE

Station	7 mc	3.5 mc	1.8 mc	14 mc	21 mc	Countries Worked
G3FXB	163	104	9	277	270	307
G2DC	147	102	14	287	269	308
G3FPQ	139	113	26	269	256	296
G3IGW	102	53	28	132	127	184
G2YS	96	75	21	181	129	205
G3HZL	90	51	9	155	125	182
G8VG	85	38	12	154	80	176
G2BLA	77	39	9	96	98	150
G3JVJ	72	41	4	89	77	129
G3KMQ	65	47	12	182	77	202
G3DO	62	71	10	286	223	303
W6AM	59	30	8	316	87	321
G3PEK	56	30	12	73	34	87
G3LHJ	54	24	12	139	174	206
GW3CBY	54	36	19	80	32	100
G3NFV	44	55	17	93	122	170
GW3PSM	36	9	1	14	7	43
G3BHJ	29	14	1	65	165	180
G3IDG	27	17	9	53	63	92
G3NOF	22	33	2	190	184	239
G3PEU	22	26	4	134	72	154
G3PMR	19	5	7	35	19	44

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

ZD8DW, ZL1ABZ (Kermadec). And, on CW, FR7ZC/J, VP5XG, VP8GQ, VQ2 and VS9.

GM3JDR sends an equally long list for SSB, from which we select CR8AA, HL9KH, KC6BK, KG6AKR, W9WNV / KG6, KH6PD / KG6, KX6AE, LA9RG/P, VK9LA, YV1EQ, 5U7AH and 9Q5RCS. His CW raised FR7ZC/J, W9WNV/KG6, LU2ZX, VK9LA, 9Q5AB and many others.

G2DC, on CW only, worked FR7ZC/J, FK8AT, VU2MD and 2GG, VS1FJ and others, VP2VL, VP5XG, VP8GQ, W—all States except KH6, ZL4JF (Campbell), 6W8DE and 9M2UF.

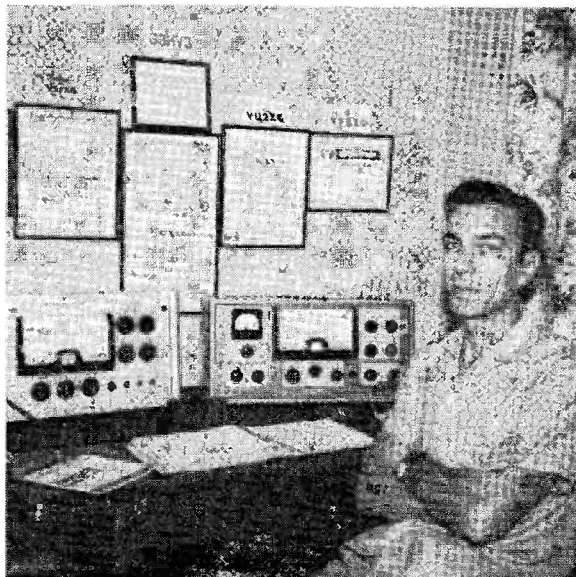
Lastly, that solitary voice on AM phone G3GDC, with quite a list, which includes EP2's, FG7XS, HH's, FM7WQ, VP2AR, VP4, 5, 6, 7, 9, PZ1BO, ZE8JZ, ZS's, VS1's 9M2's 5N2SMW, 9G1EC, YA1AG and AL3ZH (the latter being the new prefix for Algeria).

Fifteen Metres

Very good at times, especially for North America, and sometimes Africa and Asia—but neglected! G2DC's bag included FR7ZC/J, VU2GG, VS1FJ, VS9MB, VQ2JG and 2W, VQ8AB, VP5XG and 8GQ, XE1AX, ZE3JO and 6JE, ZD6OL, 5H3HZ, W1-Ø, VE1-7, VK2-6.

G3PEK found six new countries—UA9, VS9, EP2AM, SVØWZ, 5B4 and VP8GQ... G3LHJ raised FR7ZC/J, VQ2W, VP8GQ, VU2GG, VS1, VS9, ZL, and 5H3HZ... G3LPS, on CW (as were the previous three) worked VQ4, VP8GQ, VS9, 5N2RSB, VQ2W, 5H3HZ and ZE2KL; then AM phone (quite new to him) accounted for 9G1EE and 1EC, VQ2, PY's, ZS's, VP7CX, CR7BF, CR6ES, 5R8AK and 5B4's.

G3FXB also worked AM, on which he raised MP4TAM, ZD6RM, 5H3HZ, 5R8AK and 6O2GM; CW brought in FR7ZC/J, VP5XG and 8GQ, VS4RS and 4S7LB... G8VG, with CW, raised CR6, FR7ZC/J, 9Q5BZ, VQ2, 4, 5, 8, ZD6OL, ZE3JO, ZS's and 5R8BX... GW3AHN (still CW) netted FR7ZC/J, HC1DC, VP8GQ, VS9, VQ2 and 4, ZD6OL, 5N2RSB, 5R8BX and



G3HVG is ex-VS7/4S7XG, VU2XG, and is now VP5XG at Kingston, Jamaica, where he is in charge of the passport office for the British High Commission. His father is G8VG, and wherever Peter has been on his travels, they have been able to keep a schedule. VP5XG is already well-known as a DX operator on Top Band, and made the G/VP5 "first" with G3IGW. Active on all bands 10-160 metres, VP5XG runs a K.W. Vanguard transmitter and a Geloso G.209 receiver. He says that on his next overseas tour the Tx will be a K.W. Viceroy. He is a member of the F.O.C., and also holds our FBA and WBC awards.

9G1EE. Gus (FR7ZC/J) was also worked on SSB... G3NWT, on AM phone, raised CR6, CR7, VQ2, 5N2, 9G1, 5R8AK, ZS3R and ZS9G. He heard, also, VS4RS and VU2BK.

Ten Metres

You will doubtless have noticed, by now, the schedule on p.81 for the Ten-Metre Activity Sunday, on April 21, and we hope that it will induce a number of stations to show a little interest in the band. For the moment ZE2JA (Borrowdale) seems to be the most stalwart supporter of Ten; during the last half of February he worked G2PX, 3JON, 3PZO, EA7, CN8, II, CT1 and DL, nearly all around midday. He has been heard by many G's, and is a very consistent signal. Meanwhile there does seem to be quite a lot of local activity on the band on Sunday mornings, and more than one local net, to our knowledge, has moved off Top Band on to Ten Metres. If the ease of operation and absence of QRM were more widely appreciated, others would

follow. Ground-wave range seems to be around 40 miles, but for those with good QTH's considerably more. Don't forget April 21, then; if you can't hear anything, call CQ. And the more CW the better—it will have an even better chance of making itself heard at extreme ranges.

G3IDG reminds us that the last Ten-Metre Activity Sundays were June 28, 1953, with 21 countries reported active, and July 25, 1954, when many people reported nil, but he heard 38 G's and 11 Europeans, and worked about 10 stations with 10 watts of CW and two indoor dipoles.

Shorts

Twice during the month a "dead" band has suddenly come to life. G3KMQ was just going to close down at 2030, with 14 mc sounding about dead, when from out of nowhere appeared one W, then another, and within seconds "the most crashing, noisy rabble—fun-fair, dodgems, jungle ride, big dipper and the lot" all rolled in. He sat back and roared with

laughter. The reason—ZD8SW had called CQ! We heard a similar manifestation when Gus unexpectedly showed up from the Comoros as FH8CE . . . but at least it does show you that someone is *listening* all the time.

VP4VP (*ex*-GW3JGN) is looking for GW contacts around 1930; and 9M2GF is keen on G contacts in the London area. G3GDC, who passes on this news, says it's odd to hear the latter call CQ G about six times and then end up working Europeans, around 1630. Both stations are on Twenty, AM Phone. This goes to show that on this side of the Atlantic people *don't* listen enough—they are so busy calling CQ DX that the actual DX goes unnoticed.

DXCC and All That

Last month G2DC and your conductor were both a little sarcastic about the ARRL's ruling concerning the Channel Islands; and these were, of course, by no means the first such comments about this country-fixing business. We have since been reminded, by G2HFD and others, that the ARRL regard DXCC as a domestic matter of their own, and do not feel it incumbent to refer country-status problems for comment to any other body. There is therefore little point in criticising their decisions—one either accepts DXCC as some sort of yardstick, or one doesn't. Fair enough, and we agree.

But we have always felt that the ideal basis for a competitive award of this kind should be based on physical facts and should be independent of governments or politics. For this reason we welcome the news that a small group is working to establish a brand new standard—the DXMC (DX Millenary Club). The DXCC was first introduced when it was quite an achievement to work 100 countries, and now its ceiling is roughly 325 (until some more new ones are introduced).

The suggestion for a DXMC is that "units" (we can no longer call them countries) should consist of (a) any agreed DXCC unit, as at present laid down, plus (b) any island not included in the foregoing. This makes a score of 1,000

perfectly possible, if not immediately. There are, of course, many thousands of inhabited islands, though just how many of them have ever been put on the air we would not pretend to know. *But they all count*, unless they are already accepted as a DXCC unit.

This little hint should send the DX-chasers scurrying to their atlases, logs and QSL collections to see how many islands have been passed over as of no interest hitherto! Take a look, for a start, at the Western Isles, the Orkneys and Shetlands, the Isle of Wight, those of the Channel Islands which are not already available for DXCC; and then pass on to the Caribbean, where any good atlas will show you at least 200 islands. As for the Pacific—well, *you* count them!

DX News from Readers

The following items are all by direct contact or correspondence, as distinct from the "gossip" items which are culled from the various DX publications, and appear in another section.

From G2DC: Danny Weil has at last decided to "retire." He will sell *Yasme III* in the U.S.A., and it is possible that a syndicate will buy her for future DX-peditionary work. After leaving VR2EO, where he is at present, Danny will return *via* ZM6, VR4, FO8 and HC8 . . . W0MLY's trip to Navassa is cancelled (politics in the Caribbean) . . . ZL4JF (Campbell) is "very sound" on 14020 kc CW, around 0830 . . . W9JFF has left CR8 and may visit some of the rarer VK9 islands . . . HL9KH, said to have a helicopter at his disposal, hopes to visit a rare one soon.

From W6YY: JA1EEB/KG6 should be on Marcus Is. until June 30, working on 7008, 7010 and 14040 kc. He is a member of a Japanese meteorological team.

From GW3AHN: KG6SZ was due to operate from Saipan, March 21-24 inclusive, 14340 and 21440 kc—QSL to VE7ZM . . . W4BPD's operation from Chagos last year will *not* count for DXCC . . . W9JFF/CR8AA (*see* preceding note) may possibly operate from PK6 . . . Others due on between date of writing and date of publication were W8NWO and

his gang, from FY7-land; and Gus, W4BPD, from Tromelin. He was due to start on March 21, but it is just possible that his stay would be longer than the projected 4-5 days.

From SWL D. Gray (Co. Durham): W5JDX/VP9 puts in good 14 mc SSB around 1900 . . . VP7LG and VP7CW are U.S. missile-tracking men on Eleuthera Island, also to be heard on 14 mc SSB, and all these three use the low end (14100-14125 kc). Favouring 14265 kc SSB is VP4TI (1100) . . . HC1DC, famous for his Top Band signals, is Director of the NASA Satellite-tracking station on Mt. Cotopaxi . . . 5A3BC, who had hopes of becoming a rare one on leaving Libya, picks up the call GD3NMQ in April.

DX Gossip from Everywhere

W1TYQ and W8GCN promise operation from the Neutral Zone of Kuwait (9K3 . . . NZ) shortly . . . Certain VS9's may be working from Yemen (4WI) before long . . . CE0XA, the promised trip to San Felix Is., is *off* (too expensive) . . . VK0DM is on Macquarie (VK3AHO skeds him on Mondays, 14 mc SSB at 1030), and VK0NL is on Heard (or *was*)—he may have left by now.

UA0EK is on the northern half of Sakhalin Island, which makes him Zone 19—a rarity for SSB . . . VP5BP is on the Cayman Is., VE3CJ, operating until perhaps

TOP BAND LADDER

(G3P-- and G3R-- stations only)

(Starting date, July 1st, 1962)

Station	Counties	Countries
G3PLQ	80	14
GM3PBA	75	18
G3RBP	75	18
G3REA	65	13
G3RRU	53	11
GW3PPF	53	10
G13RCB	53	9
G3RJI	45	5
G3RDQ	42	8
G3RJH	39	8
G3PMR	36	7

(NOTE: This ladder will continue until the end of 1963. Entries will be accepted up to July 1st.)

mid-April . . . CE3AG reports that a new and more active operator will be taking over from CEØAD (Easter Island) shortly.

9M2GV promises activity from VS4, VS5 and ZC5 for about two months, starting March 15 . . . VK3AHO's projected expedition to Nauru Island is still on, with perhaps a stop-off at Ocean Island as well; mostly SSB, this one . . . Norfolk Island is a "rare one" again, the cable station there having been closed down . . . VS1FJ plans a sortie to Christmas Is., VK9. It will be handled by an R.A.F. group, who are fully equipped and only awaiting licence and visiting permits; a two-week stay is hoped for.

KC6AQ (Western Carolines) is active Wednesdays at 0900 . . . ZD8DW (operators W5SWX and W7AAY) uses 14337 kc SSB at 1900, 14134 kc at 2200; they should still be there, but not for long . . . Andorra coming up—PX7AOC will be F7AOC, operating thence, May 25-June 5 . . . VU4A appears to be another phoney — same category as previous one.

General Chat

Grafton Radio Society issued their second WALT (Worked All London Town) certificate to

G3MNR; overseas stations seem to have great difficulty in collecting the necessary QSL's for this award.

The QUA Club (Channel Is.) have initiated a WAGC Certificate in three grades. Full details from the secretary, Mrs. Jill Banks, 23 Marett Court, Marett Road, Jersey.

GW3FVC/A will be operating from Capel Dewi, Cardiganshire, on Top Band CW only, April 12-28; there will be some daylight operation. QSL's to G3FVC (QTHR).

G3OTR and G3OTS will be on Top Band from Westmorland, during the nights of April 5, 6 and 7; Phone if possible, CW if conditions are rough.

CW operators will be interested in G3IDG's researches into the matter of the Bug, as follows:— "The bug which you would fright me with I seek" (*Winter's Tale*); "Tush, tush! Fear boys with bugs" (*Taming of the Shrew*); "The bug-destroyer seizes on his bug with delight" (*Sydney Smith, 1771-1845*); "Bug: An object of terror" (*Chambers' Dictionary*).

Late Flashes

A DX-pedition sponsored by the Hammarlund Co. and using Hammarlund equipment through-

out will be roving over the Pacific during May 1-June 30, signing VR1N, VK9BH and VR4CB, on 15-80m., CW and SSB, with some operation on 160m. from time to time. QSL's to: Hammarlund DX-pedition, General Post Office P.O. Box 7388, New York 1, N.Y. More details later.

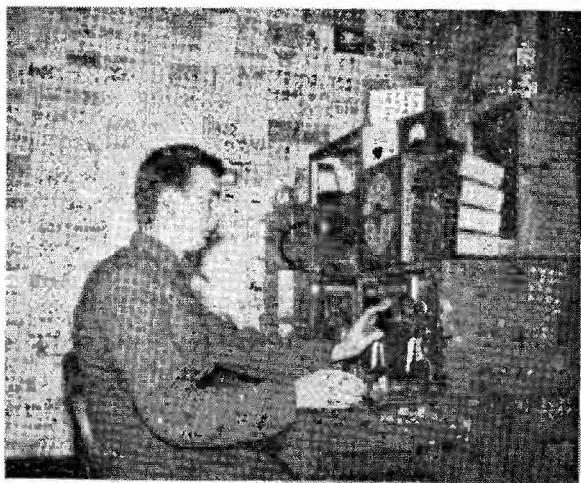
Gus (W4BPD) after a magnificent spell of operation from FR7ZC/J, showed up unexpectedly from the Comoros, signing FH8CE, on March 14-15. This was a very short one, and his next appearance was from 5R8CM on March 18. His own version of Tromelin operation was that it will open on March 29, not the 21st as previously stated. We hope he's still there when you read this . . .

G3DO reports SSB contacts with TI2PI on 3.8 mc; and with CR8AA, FR7ZC/J, KC6BK, W9WNV/Rota, KH6PD/Marcus, LA5FI/P, VK9AT (Papua) and ZD8DW on 14 mc. VK9AT is on 14290 kc, Sundays around 1130 GMT.

The Yasme Foundation is considering financing ZS6LM on a DX-pedition to VK9 (Christmas Island) and VK4 (Willis Island) . . . EP2RC, in Iran, is ex-ET2US and will be active around 1830-2100 . . . VS1LP is ex-EP2BK, who worked Top Band from Iran with such effect. He can now be found on Forty and Eighty.

From the most northerly island in the U.K. (Unst, Shetlands) G3RFR reports working 21 mc AM with 5A2CJ, VQ2, ZE, ZS, 9G1EE and a W6 . . . G3PEU (Linby) has been given the call ZD7BW and will be on SSB from St. Helena in August . . . G3RFS (Barnet) worked 4S7EC, VP8GQ, YK2SK, VQ2 and 5N2JWB on 14 mc CW.

And that brings us to the sign-off, with due acknowledgments to the WGDXC *Bulletins*, W4KVX's *DX Magazine*, W1BB's *bulletins* and all our correspondents. Next month's deadline, because of the Easter holiday, will be **first post on Tuesday, April 16**—and not one minute later! No one will be able to creep under the wire this time. Address letters to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Good Hunting, and 73.



E18AJ, now a sea-going radio operator with the Marconi Co. and serving on the s.s. "Rajula," used to be one of the operators on EI2V, Baldonnel Airport, Dublin, an ideal site for the installation of aeri-als and the working of DX (to say nothing of the advantage of an attractive call sign!). For EI2V, they even had a 40-metre ground plane up. While at sea, E18AJ keeps a regular watch on the amateur bands, to while away his after-duty hours. Writing from Madras, he says that U.K. stations can occasionally be heard on the LF bands when there is a break in the barrage of QRN.

WORKING IN TIN

CONSTRUCTIONAL IDEAS FOR THE AMATEUR

H. COLE (G3OHK)

ALTHOUGH the writer is far from being an expert tinsmith, it has been found that many small items of equipment can be improved by being housed in or mounted on shapes made of thin tin-plate—in other words, the sort of “tin” used for canning. This is often available in sheets or as off-cuts from garages and small local concerns who undertake general metal work.

You will require a soldering-iron—not the pencil-bit type, but one giving more heat into a wide bit—cored solder, such as Multicore “Savbit,” a file, a pair of tinsnips and plenty of bright tin sheet. A scribe and a short steel rule are useful for marking out the tin accurately. The tools are obtainable from any good ironmonger, or at the tool-counter in most Woolworths shops.

One of the difficulties of working with metal is getting a clean, sharp edge. This is not easy, and the best way is not to bend the tin but to cut out every piece separately (using the tinsnips) and solder them together. All sorts of odd shapes can be assembled in this way.

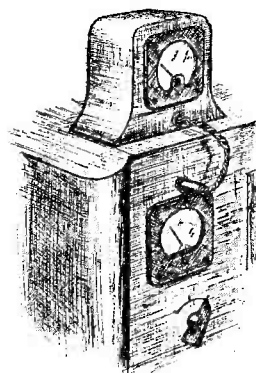
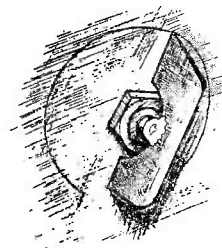
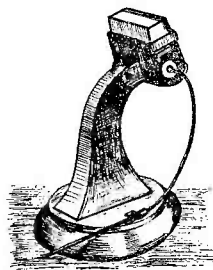
If one has a particular shape with which it is not possible to get the soldering iron inside, then the procedure is first to tin the two inside edges liberally with solder, and assemble the pieces simply by running the hot iron along the outside edge, holding the shape in such a way that the solder runs into the joint.

For straightforward work, involving right-angle bends, a couple of pieces of wood a few inches long, cut and fixed to make a 90° block end, will be handy to hold the tin pieces at right angles while a spot of solder is dropped at various points to hold the edges together prior to final soldering. With just a touch of solder here and there one can check whether the edges are correctly butted up. Then, after seeing that the edges are straight and true, drop some pieces of solder along the joint; run the hot iron slowly and steadily over it, an inch or two at a time; allow each length to set before going on further. If the iron is good and hot, and is moved along carefully, a neat, strong joint will result.

The illustrations show some examples of amateur constructional work in light tin-plate, produced by the methods explained here. There are all sorts of small pieces of equipment that can be improved in the same way. For finish, black crackle paint is good, or one can use a hard enamel, in instrument grey or some other colour. A few transfers, to identify controls, can give a real professional appearance.

No originality is claimed by the writer for all this,

X
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Drawings of some items made by G3OHK using the methods he explains in his article. With practice and a little care, good work can be turned out. The central piece is a knob fitted to one of those surplus potentiometers having a very short shaft.

because it is no more than regular tinsmith's work—but how many have tackled it in a purely amateur way? If you are handy with a soldering-iron, it's easier than you might think—and the result can be extremely satisfying.

RE-EQUIPMENT OF LEAFIELD RADIO, GBL

One of the oldest of the G.P.O. stations for long-range point-to-point working is Leafield Radio, Oxford. GBL is now one of the HF transmitting points for the overseas radio-telegraph service in the Post Office external communications organisation. To provide a greater traffic-handling capacity, the older Leafield equipment is being entirely replaced by 18 modern HF transmitters, with a new layout and control system.

RTTY Topics

THE FSR.1.1X (AP.66862) FREQUENCY SHIFT CONVERTER —DESCRIPTION AND OPERATING NOTES

W. M. BRENNAN (G3CQE)

This feature, appearing every other month, caters for those interested in radio-teleprinter operation on the amateur bands. The February contribution dealt with Frequency Shift Keying, showing some circuits suitable for home construction, and in December last the space was devoted to general operating notes and on-the-air activities.—Editor.

ACTIVITY continues to increase, particularly on eighty and twenty metres, and most weekday lunchtime sees QSO's taking place on both bands. There are more G station newcomers on 20-80m., and two new countries to be added to the active list are Libya and Crete, with 5A2TC and SVØWT. EP2AD is also said to be sorting out some RTTY gear. PAØYZ reports an increasing interest in Holland where he has been invited to give RTTY lectures to several radio clubs. However, as usual, the lack of suitable equipment is still a great obstacle to the newcomer in Holland.

Hunting down T/P gear has always been a favourite pastime for the RTTY enthusiast and its scarcity perhaps contributes something to the pleasure of using it when it is finally acquired. Certainly, the fact that one cannot just go into a shop and buy a T/P has resulted in a spirit of co-operation and mutual help among the RTTY fraternity that is in the best traditions of the amateur movement; whenever two or three RTTY operators gather the yarns about how old G2-- discovered two 7B 'printers in a cowshed take up as much time as more controversial topics, such as "Which is the best type of TU?"!

Commercial RTTY Converter

One of the two types of Terminal Unit (TU) or RTTY converter to come on to the surplus market during the last three years or so is the ex-Service item known as the "AP.66862, Adaptor, Receiver, Frequency Shift," or, to give it its civilian title, the "A.T.M. Frequency Shift Converter Model FSR.1.1X." This is an excellent piece of gear that might almost have been made for the RTTY operator and, indeed, a commercial TU produced recently for the amateur market in the U.S.A. has several similar features. Small wonder, then, that a number of U.K. amateurs are using these units with excellent

results. As it is quite possible that more of them will appear from time to time, it is thought worth presenting a little information about them, and the adjustment procedure.

The Complete Equipment

The FSR.1.1X is part of the complete F.S. Receiving Terminal FSR.2X. This was designed to take either all, or some of, four different units, depending upon the user's requirements. The individual units are:

- (1) Converter Model FSR.1.1X;
- (2) AFC and BFO Unit Model FRS.4.1;
- (3) Cathode Ray Monitor, CRM.1;
- (4) Power Unit, Model FRS.1.2X.

All of these units are compactly constructed on grey 19in. standard rack-mounting panels $3\frac{1}{2}$ ins. high. All controls are mounted on the front panels, pre-set potentiometers being concealed behind masking covers. External connections to the units are on the back-drop through miniature Jones-type plugs and sockets.

Few (if any) of the AFC/BFO units or the Cathode Ray Monitor units have as yet become available and therefore this article deals mainly with the actual Converter Unit.

Converter FSR.1.1X

This is the usual audio type of TU requiring an input of two tones from a receiver. The centre freq. of the unit is 2550 c/s and so for a carrier shift of 850 c/s, the two tones will be the usual 2125 and 2975 c/s. The input to the unit is designed for a 600-ohm unbalanced connection, and the input level should be 0 dB (1 milliwatt in 600 ohms) or above. Where the station receiver does not have a 600-ohm output, a matching transformer with a ratio of 15:1 will be required to couple the usual 3-ohm speaker output from the receiver to the unit.

Fig. 1 overleaf gives the converter circuit and Fig. 2 is a sketch of the front-panel layout. As the diagram shows, the input connection is by plug PL1 which is colour coded brown. The three resistors R1, R3 and R4 form a T-network designed to improve the matching of the line to the filter over a wide band of frequencies; this network introduces a loss of 5 dB. The band-pass filter of the unit is probably its greatest asset. The filter passband is 1.7 to 3.5 kc, while the attenuation at all frequencies below 1.5 kc and above 3.6 kc is greater than 40 dB. A headphone jack permits the filtered signal to be monitored; listening at this point can be something of a revelation as (for example) when a 1 kc heterodyne at the receiver output appears to be completely swamping the RTTY signal and yet is totally absent at the filter output. The mid-band insertion loss of the filter is about 2 dB. RV1 is an input gain control and M1 an AC voltmeter, both being used to achieve the required input level. V1, V2 and V3 are EF50's strapped as triodes, the three forming a high-gain direct coupled limiter-amplifier which is capable of handling selective or flat amplitude variations up to 60 dB.

The following discriminator stage is of the linear

type, the actual discriminating network being L1 and CX, the values of which are chosen to have an equal impedance at the centre frequency of 2550 c/s. At any other frequency passed by the input filter, the circuit becomes unbalanced and the output from the discriminator valve V4 (6H6 or EB34) will be positive for higher frequencies and negative for lower ones. The DC output from this stage is fed to a low-pass filter which removes any remaining AF component. This filter was also designed to remove the 200 c/s phase modulation sometimes employed in commercial FSK to combat selective fading. This accounts for the maximum rejection point of the filter being at 200 c/s, although the cut-off freq. is 150 c/s and at least 38 dB of attenuation is offered to all frequencies above 200 c/s.

Fig. 3 shows the discriminator response in relation to that of the band-pass filter. The discriminator output is indicated on a centre-zero microammeter M2. V5 is an amplifier and driver stage for the two keying valves V6 and V7. The circuit is arranged to introduce still more limiting. The driver stage operates with a very small range of mark/space amplitude to its grid, and as the input signal far exceeds this range, the result is that quite large discrepancies in the relative amplitudes of the "mark" and "space" pulses produce negligible telegraph distortion. The manufacturers claim that a drift of the centre frequency of the incoming signal of up to 350 c/s will produce distortion within only $\pm 2\%$ for a carrier shift of 850 c/s. V6 and V7 drive a Carpenter polar relay Type 3N1, plugged into the unit through an aperture in the front panel. The contacts of this relay can of course be wired to a suitable supply for either single or double-current keying of the T/P. Spark suppression circuits for the relay contacts are included, as shown to the right of RL in the circuit opposite.

The four positions of the function switch on the front panel are marked "Test," "+," "Off" and "-." In the "Test" position the keyer amplifier stage is disconnected from the discriminator and an adjustable AC voltage (derived from the heater supply) is applied to the grid of the keyer amplifier V5 for the purpose of adjusting the keyer stages for correct operation. The "+" and "-" positions of the switch are the usual reverse-and-normal keying switch facility found on most TU's. The "Off" position disconnects the relay contacts from the T/P keying loop and applies a "mark" (or holding) voltage to the loop circuit which maintains the T/P in an idling condition.

Diversity Operation

The 3N1 polar relay has two identical sets of windings and the second set can be used in this case for diversity operation. For this form of reception two converter units are each fed from separate receivers. The polar relay is removed from one of them and the second set of relay windings of the remaining relay are connected to the keying stages of the second unit *via* the sockets provided. At the same time the grids of V5 in both units are interconnected through resistors. In this way, the relay is

Table of Values

Fig. 1. Circuit values, FS Converter FSR.1.1X

C1, C2	
C4, C5	
C10, C11	= 0.5 μ F
C12, C13	= 2-2 μ F
C3, C6	= 0.5 μ F
C8, C9	= 0.05 μ F
C14	= 250 μ F
C15	= 250 μ F
R1, R2	= 1,200 ohms
R2A	
R24	= 1,000 ohms
R2B	
R15	
R16, R20	= 100,000 ohms
R3, R4	= 100-68 ohms
R5, R19	= 47 ohms
R7	= 4,700 ohms
R8, R14	
R30	= 2,200 ohms
R9	= 22,000 ohms
R11, R27	= 2/220,000 ohms
R12, R13	
R28, R29	= 10,000 ohms
R25	= 180,000 ohms
R17	= 100 ohms
R21	= 100 ohms
R23	= 24,700 ohms
R26	= 470,000 ohms
R31, R32	= 470 ohms
RV1	
RV2	= 1,000 ohm poten-
RV6	tiometer
RV7	= 100 ohms poten-
RV4	tiometer
RV5	= 50,000 ohms,
	potentiometer
SI-55	= 1-pole, 4-way,
	relay
M1	= Voltmeter
M2	= Microammeter
BPF	= Type A-2-1/2
LPF	= Type A-3-2 filter
KL	= Carpenter polar
	relay
L1	= Coil type AS-45
L2, L3,	
L4	= As fitted
V1, V2,	
V3	= EF50
V4	= 6H6
V5, V6,	
V7	= EF50

driven by the converter which is receiving the strongest signal, whilst at the same time a bias is applied to V5 on the weaker channel and this prevents erratic operation of the relay.

Power Supplies

The power supplies required by the FRS.1.1X are quite modest, being 6.3v. AC at 2.1 amp and 300v. DC HT at about 25 mA. The companion power supply unit, the FSR.1.2X, is double-smoothed and has meters to read HT supply voltage and current. A pilot lamp indicates when LT is available at the PSU output sockets. The HT can be switched off from this unit and a further pilot lamp indicates this on/off condition. One power pack will run two converters.

The Services reference number for this PSU is "AP.66863."

The Converter In Amateur Use

Most of the converters that have come into amateur hands have been found to be in good order and have worked quite well as soon as the appropriate supplies were connected. In some cases, however, two modifications had been made to these units by previous users; both detract from the performance of the equipment, at least as far as amateur operation is concerned. Both modifications should be removed. The first is the shunting of the discriminator inductance L1 by a resistor, usually of 47K. L1 can be quickly identified at the rear of the unit when the back plate is removed. It is housed in a square can

Notes: All components are as fitted, and values are given for information only. P11 (brown), P12 (red), P13 (orange) and P14 (blue) are all Jones type 4-way plugs; SK1 (green) and SK2 (yellow) are Jones 4-way sockets. In the circuit notation C7, R6, R10 are not used. Certain resistor values are made up by resistances in parallel, e.g. R11, and others by resistors in series, as for R3, R4, C3, C6 are each two 2 μ F condensers in series.

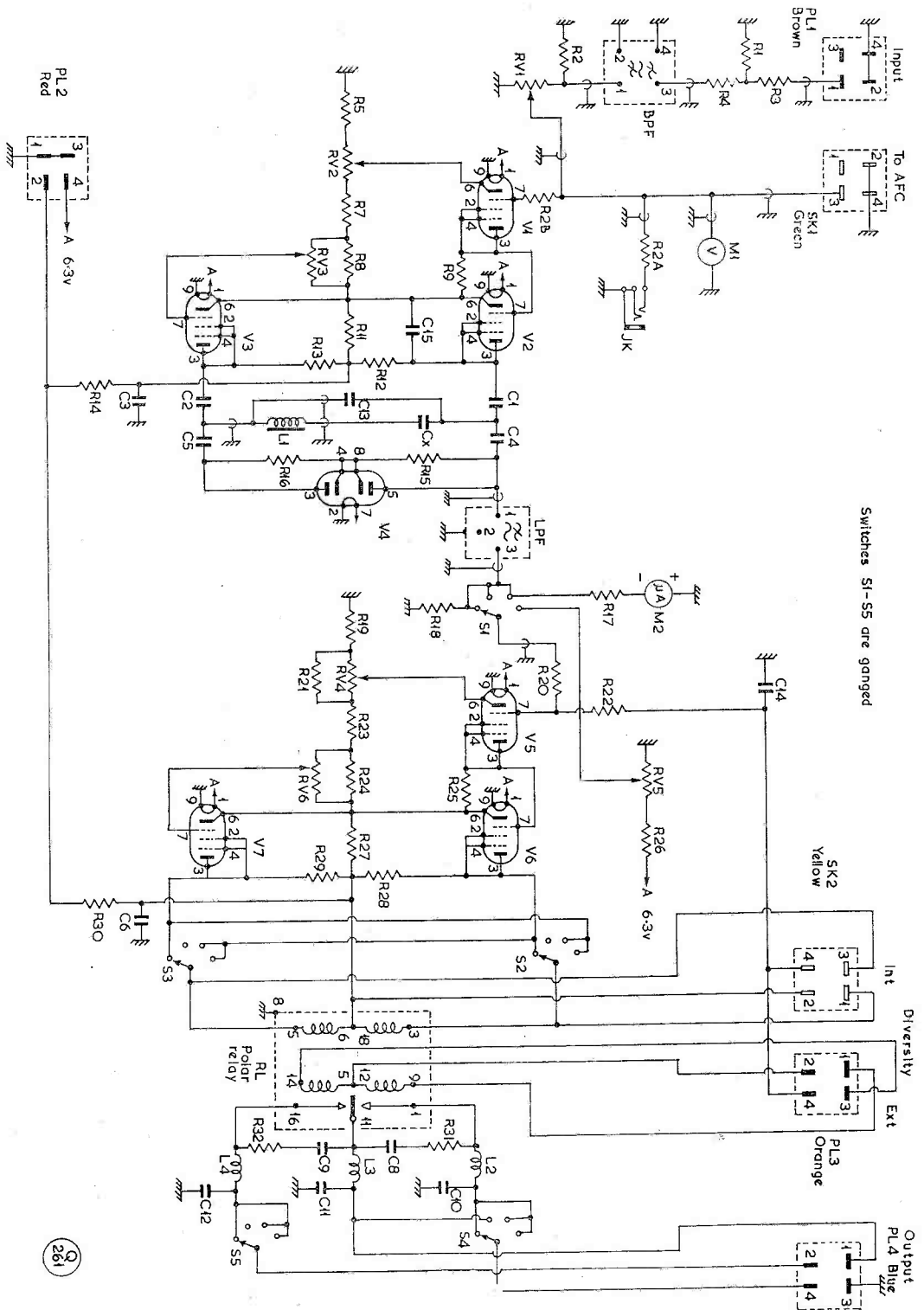


Fig. 1. General circuit arrangement of the F5 Converter Type FSR.1.1X, the Service designation of which is AP.66862. With the exception of V4, which is an EB34, all the other valves are EF50's. The text gives a full explanation of the working and adjustment of the unit, of which quite a number are now in use.

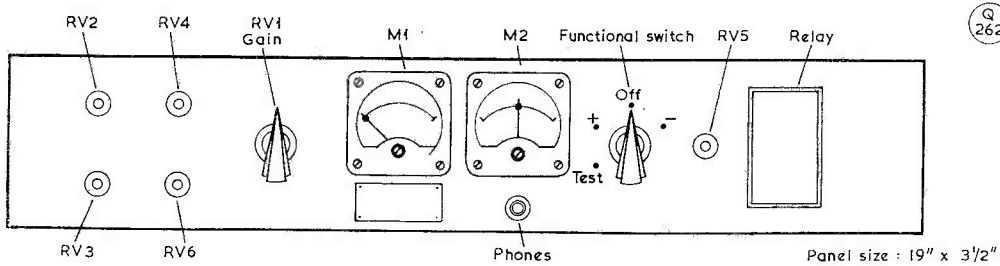


Fig. 2. The sketch is a panel view of the FSR.1.IX, and will serve to identify it for those who may be searching for, or in possession of, one without quite knowing quite what it is. The panel size is 19 ins. wide by 3 1/2 ins. deep. Those found on the surplus market would probably have the legend AP.66862 on the name-plate.

labelled "A5-45," at the extreme right of the chassis when viewed from the rear. There are two terminals projecting from the top of the can and the offending resistor is usually strapped across them. It should be snipped out. The other modification is the inclusion of a 10K resistor in series with terminal 1 of the low-pass filter. This filter will be found under the L-shaped cover at the top of the converter. The resistor should be unsoldered and the loose blue wire re-connected to terminal 1. These matters having been attended to, the following adjustments can be carried out to produce optimum performance for the converter.

Carrier Amplifier-Limiter Sensitivity

Remove covers masking the pre-set potentiometers RV2, RV3, RV4 and RV5. With power on, turn the function switch to the "Off" position and the gain control (RV1) to maximum (clockwise). Apply a steady tone input to the unit, either by tuning the

receiver to a steady carrier with the BFO switched on or (if available) from an audio oscillator. The frequency of the tone should be adjusted to give maximum deflection to the right on the meter M2; it will be found to be approx. 2,000 c/s. Reduce the setting of gain control RV1 until the meter M2 indicates about 5 μ A. Using a screwdriver, adjust RV2 and RV3 to give maximum meter deflection. Again reduce RV1 to give 5 μ A deflection and repeat the treatment on RV2 and RV3 until further adjustment of RV2 and RV3 no longer increases the meter deflection. At this point V1, V2 and V3 stages are correctly set up for maximum sensitivity.

Keying Amplifier-Limiter Sensitivity

With power switched on, and function switch at "Test," turn RV5 clockwise with a screwdriver to the point at which the relay can be heard operating on the 50 c/s test voltage; about one-third of the travel of RV5 is usually sufficient. Adjusting RV4 and RV6 in turn, it will be found in each case that for a large portion of the travel the relay comes in and at either side of this position the relay ceases to operate. Set RV4 and RV6 at the mid-position of the arc over which the relay operates. Turn RV5 slightly anti-clockwise and again RV4 and RV6 to the mid-point of the arc over which the relay operates. It will be found that this arc is now reduced in length. Repeat this process until the arc through which RV4 and RV6 can be turned without stopping the operation of the relay is as short as possible. The keying amplifier-limiter is then in its most sensitive condition.

If the required setting of RV5 is found to exceed 90% clockwise, the driver valve V5 should be replaced. If the best operating point of the keying amplifier-limiter lies outside the range of RV4, suspect either the relay being badly out of adjustment or a considerable discrepancy in the characteristics of V6 and V7. One of these valves will probably be low in emission and should be changed. Again, whenever a valve or the polar relay is changed, these adjustments should be gone through again.

Minor Circuit Variations

There are just a few variations in the values of some of the components in earlier versions of this equipment. R17 may be found to be 220K; the

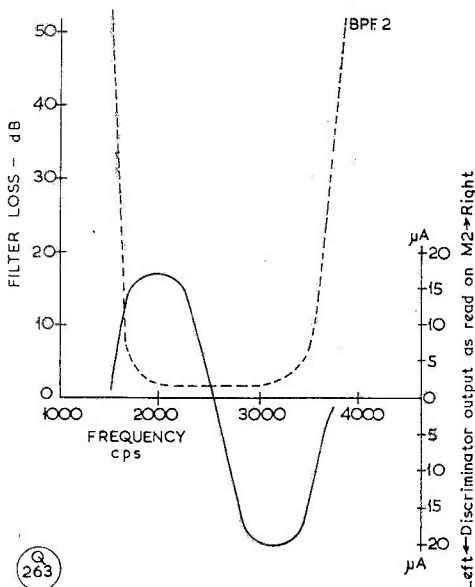


Fig. 3. The characteristics of the band-pass filter BFP2 and the demodulator output in the FS Converter FSR.1.IX discussed in the text.

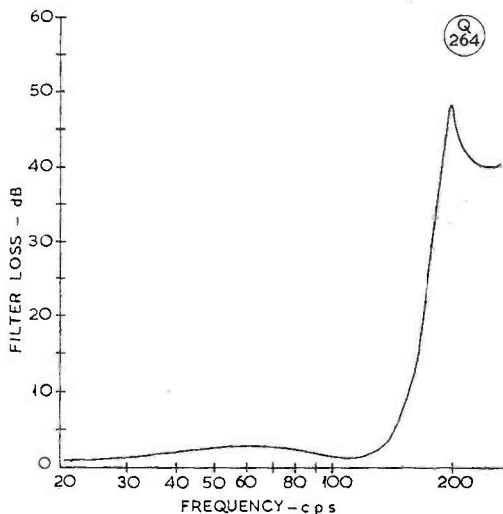


Fig. 4. The low-pass filter characteristic in the FSR.1.1X; this filter is the type A3-32 unit and is shown in the circuit of Fig. 1 between V4 and V5.

resistors R8 and R14 may be 1K instead of 2.2K; and R21 may be 47 ohms instead of 100 ohms. The 250 μ F condenser between anode and cathode of V2 is not included in the earlier versions.

The Ancillary Units

As mentioned earlier, neither the AFC and BFO nor the Cathode Ray Monitor units are by any means readily available but a few notes on them may be of interest. The input to the AFC/BFO unit is taken from one (or two) of the converters after the band-pass filter *via* the AFC socket provided. The signal is then amplified and passed through a switchable filter which selects the desired reference frequency, either "mark" or "space." Following this is a three-stage amplifier-limiter similar to that in the converter (V1, V2 and V3, Fig. 1) and then a discriminator stage which is switchable to be centred on either 2975 or 2125 c/s. This switch is ganged with that of the input filter. The discriminator DC output is filtered to produce a steady DC voltage which is indicated on a centre-zero microammeter. This voltage is then used to control a reactance valve which in turn controls the frequency of a BFO adjustable over the range 450 to 500 kc. The oscillator output is amplified by two separate buffer stages which provide BFO injection for two receivers.

The Cathode Ray Monitor Unit is intended to facilitate receiver tuning of a RTTY signal. It can also be used to give a display of the AF signal input to the converter. In addition the CRM can be used as a normal oscilloscope and a sawtooth timebase is provided, with input terminals to the amplifier on the front panel. The whole unit is self contained, having its own power supply.

Although both these units certainly help in the reception of FSK signals, they are not essential for

amateur operation. The ability of the converter to tolerate quite a large amount of drift usually means there is no need to retune the receiver during the relatively short period of an amateur transmission. Moreover, a little practice soon enables the RTTY operator to tune in a signal by observing the deflection of the centre-zero meter, or alternatively a normal oscilloscope with X and Y amplifiers can be used quite effectively with this converter.

In comparison with much other commercial terminal equipment the FSR.1.1X is a simple but very effective piece of apparatus. Of course, there are some modifications that can be made in order to increase its usefulness in the shack and perhaps these can be covered at a later date. But modified or otherwise, this particular TU is used by many amateurs as a "Standard Of Comparison" against which to evaluate the performance of other home made TU's. If you are interested in RTTY it is worth while memorising the Service title and number. Good hunting! 73 de G3CQE.

MORE ABOUT THE EARLY DAYS

Those items on the old-timer theme in recent issues of the *Magazine* have inspired some further correspondence and information of great interest. For one thing, G3CED (Broadstairs), himself an ex-R.N. W/T rating of vintage early-1920's, has sent in a U.K. call book entitled *The Wireless Directory*—this lists ships, land stations and the amateurs of the time, and was probably the first attempt at a comprehensive call book ever made.

According to *The Wireless Directory*, there were about 240 U.K. amateur stations licensed in the 1922/23 period, all in the call sign sequence 2AA-5CU only, the prefix figure 6 not then having been reached. Some 45 of these 240 stations were in the London area, Hampstead and Highgate being particularly well represented. Most licences were for 150-200 and 440 metres, the permitted modes being spark, CW, telephony and a species of signal known as tonic-train; in effect, TT was a better form of spark, the note being more musical; its special advantage was that, like spark, it could be received using a crystal detector.

A feature of the amateur licensing pattern of the period is the number of local groups shown to have held transmitting permits, *viz.*, 2CD, Burton-on-Trent Wireless Club, using 440m.; 2DT, Barrow & District Wireless Association, running spark, CW and telephony on 180 and 440 metres; 2FZ, Manchester Wireless Society, with its Hq. at the Albion Hotel, Piccadilly, M'cr; 2GN, Halifax Wireless Club; 2OT, Ilford Radio Society; 2QV, Altrincham Wireless Society, Hale, Cheshire; 2US, Wireless Society of Highgate, with Hq. at the Literary & Scientific Institute, 11 South Grove, N.6; 2XJ/2XK, Sheffield District Wireless Society; and 2YR, Hounslow Wireless Society (at Council House, Hounslow).

And that old *Wireless Directory* of 1923 also lists at least six amateurs known to us as still active and contending with the QRM as it is today; G2GG of Newbury, who keeps to a battery power supply, as

he has done for all of 40 years; G2HQ, who in those days was of Bristol and is now in Sheffield; G2KF, who from Merton, S.W.19, achieved the first-ever (amateur) Trans-Atlantic QSO, on 200 metres, and who now lives at Totnes in Devon; GW2OP (Freshwater East, Pembs.) who as 2OP experimented with spark, tonic-train, CW and telephony from 8 Lansdown Terrace, Cheltenham; G2RY, mentioned on p.23 of the March issue; and G2UV, now of Wembley, Middx., who as 2UV in London, N.W.10, gave out CW, TT and telephony on 200/440 metres—he it was who also gave us that blessed innovation, the QSL card (and you can interpret the word “blessed” in whichever way you like).

YOU COULD GET A GOOD PRICE FOR IT

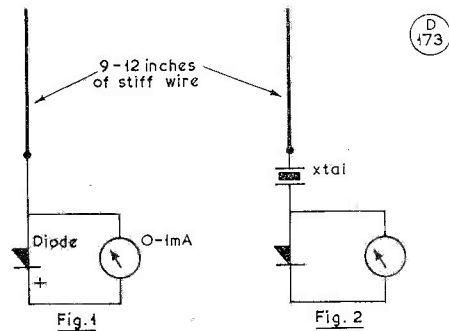
The small advertisement columns of SHORT WAVE MAGAZINE constitute a reader service which is as useful as it is interesting and comprehensive. Each month, all manner of items of amateur-band equipment are offered for sale or exchange, and it is also true to say that almost anything in the “wanted” category can be obtained through the same medium. It is likewise true that there is always a run on the attractive items, and much business is done over the week-end immediately following publication. As an instance of the volume of this business, the total value of all offerings-for-sale under the Reader heading on pp.50-56 of the March issue of SHORT WAVE MAGAZINE was in the region of £2,800; the first-cost value of this equipment could not have been much less than £4,000. Yet few of the advertisements came to more than 7s. 6d. to put in! The cost to readers is actually 3d. a word only, with a minimum charge of 5s. Draft your notice clearly and concisely and send it, with remittance at the 3d.-a-word rate, to: Advertisement Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1, as soon as you have made up your mind. Every effort is made to include all small advertisements received up to closing for press.

AN AMERICAN PROFIT FIGURE

The Zenith Radio Corporation of Chicago, U.S.A., announces nett profits for 1962 of over \$19 million (about £7m. sterling), this figure being arrived at after providing more than 21 million dollars for taxation. Since nett sales totalled about \$312m., these figures show an average gross profit ratio in the region of 13%. Zenith are one of the oldest firms in the American radio industry, having started as resistor manufacturers in the early days. They now cover a very wide field in the design, manufacture and marketing of radio apparatus of all types.

AMERICAN MAGAZINES BY SUBSCRIPTION

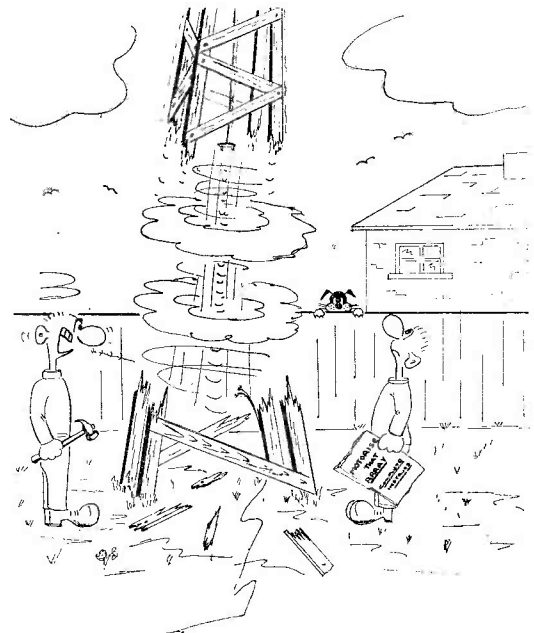
We are able to accept subscription orders, and renewals of subscription, for all American radio magazines, including *CQ*, the independent Cowan monthly on Amateur Radio; *QST*, published by the American Radio Relay League, the U.S. radio amateur organisation; and *73 Magazine*, another independent monthly, specialising in general articles



Neat little RF test-meter device. An 0-1 mA meter with a crystal diode (Fig. 1) will be found to show RF when there is sufficient pick-up from aerial or Tx. If nothing happens first time, or the meter needle goes the wrong way, reverse either the diode or the meter connection, or try the pick-up wire on the other side of the diode. In Fig. 2, the thing is made frequency-conscious by adding a crystal, enabling a VFO to be set within cycles of the crystal frequency by watching the meter. (After ZS2NP, in “Radio ZS,” January 1963).

to the total exclusion of operating and activity features. The post-free prices for delivery by surface mail direct from the American publishers are: *CQ*, 44s.; *QST*, 48s.; and *73 Magazine*, 30s. Orders, with remittance, to: Publications Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1. If a renewal, please enclose renewal notice.

For Mobile Rally Programme, see
pp.97-98



“... And what mechanical genius put the reduction-box in the wrong way round? ...”

VHF BANDS

A. J. DEVON

THOUGH conditions looked like improving just as this was going down, generally speaking the period has been rather flat and disappointing, with activity on the low side and, except on one or two odd occasions, nothing much doing outside the local area. About the only excitement was the European VHF Contest over the week-end March 2-3, when the glass stood high but conditions were not particularly good.

Indeed, the barometer trace had been steady-at-high, around 30.5in., all the preceding week, and it was on the Sunday of the contest that the pressure began to fall. Your A.J.D. was not able to be among those-present on the Saturday evening, March 2, when the contest started, but it was followed through on the Sunday. G2JF was again the high scorer, with 187 stations worked by finishing time, quite a number of these being from the nearer EU countries. Others knocking them off well were G3GHI, with 165S; G3IAS, who had 162 contacts in 27 counties; and G3EUV, with 151S worked by 1845. At about 1800, G4DC was asking for his "No. 100 QSO," and at 1730 G3CO was a nice signal when making his 73rd contact. These figures and times will give some idea of how things went for those who were really working to make a score.

VHF Convention

This is by way of being advance notice for the annual VHF/UHF convention organised by the London group. It is to be on Saturday, May 18, at the Kingsley Hotel, Bloomsbury Way, London, W.C.1, starting in the morning with a small exhibition of commercial and home-constructed VHF gear, followed by lectures on various VHF subjects in the afternoon, and winding up with the dinner in the evening. One of the guests is likely to be Ed. Tilton, WIHDQ, of QST. For the whole meeting, 11.0 a.m. to 10.30 p.m. and including the dinner, the cost is 27s. 6d. For the morning and afternoon sessions only, without dinner, it is 3s. 6d. Bookings should be made immediately through: F. E. Green, G3GMY, 48 Borough Way, Potters Bar, Middlesex. This convention, which is open to any and all VHF enthusiasts irrespective of affiliations, is always a good show, supported by people from all over the country. Out-of-town visitors usually start the day by investigating the state of the surplus market, most of the *emporium* being within easy reach of the Kingsley.

Space Project

We are informed that a new VHF group is being organised to do some practical work in connection with E-M-E operation from the U.K.; to give serious co-operation in the *Oscar III* experiment; to investigate the possibility of putting up a balloon-borne transistorised two-metre transmitter; and to see what can be done about making use of the new *Echo II* passive-reflector balloon which is to go into orbit later in the year.

These are interesting and worthwhile projects for the keen experimenter, and one can envisage the whole undertaking growing into something really useful from the point of view of the U.K. VHF operator. The co-ordinator for the Space Communication Group (the activities of which will be reported in this piece from time to time) is W. Browning, G2AOX, 47 Brampton Grove, Hendon, London, N.W.4, and the joining subscription is 10s.

This leads us on to discuss the reported first amateur VHF trans-Atlantic contact, which took place on the two-metre band over January 7/8 last, between OH1NL and W6DNG, by earth-moon-earth working. Present information is that there was no actual QSO, what happened being that OH1NL received some W6DNG signals on the 7th, and the latter caught a few characters from OH1NL the next day. High power and elaborate gear, with large aerial systems, is in use at both ends—as, indeed, it would need to be to get any result at all. There are several W6's working for E-M-E contact with Europe, and likewise there are a few EU installations in being or planned for E-M-E experiments—so trans-Atlantic amateur VHF working is within reach and is certain to be possible quite soon. But at this stage it will only be for those who can run kilowatt PA's, design and construct circularly-polarised beam arrays giving enormous gain, and have highly sensitive receiving equipment. For instance, W6DNG has an aerial consisting of three 22-ele Yagis, fed to give the necessary circular-polarisation. The foremost worker in this field in the U.K. is, of course, G2HCG, who has already had some E-M-E results (as reported in "VHF Bands" in our issues for Jan./Feb., 1962).

The "Oscar III" Possibilities

For the generality of VHF operators, the *Oscar III* project is more realistic and holds greater promise than these E-M-E schemes—for *Oscar III* is to be a translator satellite, operating in the two-metre band. That is to say, it will accept amateur signals in one part of the band, and re-transmit them in another.

To make use of *Oscar III*, you will need to be able to transmit in the area 144.075-144.125 mc, and to receive over 145.875-145.925 mc. Any signal caught by the satellite at sufficient level will be automatically re-transmitted. To work a DX station *via* the satellite, you would operate exactly as on the HF bands, but listening only in the specified Rx band area. Of course, *Oscar III* could not be available

to everybody, everywhere, all the time. Like any other orbiting satellite, it would be within range for the desired part of the world, e.g. mid-way over the Atlantic, for U.K./U.S. contacts, at certain times only, and these would, of course, depend upon the orbit achieved. Similarly, the ranges to be obtained will depend on the height, or "shape," of the orbit into which the satellite is finally settled.

It can be said that bench-tests with the prototype *Oscar III* equipment—which is being produced by the Project Oscar group of W6's—have given entirely satisfactory results and, provided a good launch can be achieved, there is every reason to expect that the whole system will work as intended. Naturally, it will be a low-power solar-cell job but that is no great disadvantage, because as experience last year with the previous Oscars showed, even a milliwatt-transmitter will give a good strong signal when the pass is favourable.

The possibilities for communication using *Oscar III* are indeed fascinating. There will be watch-keeping schedules to be worked out, all the problems of QRM on the HF-band scale to be overcome, and the thrill of hearing "CQ DX de W6 - -" to be experienced. The *Oscar III* equipment is being made to repeat on all modes CW, AM and SSB—and your A.J.D. can safely prophesy that the first-named will be found by far the most effective! The probability is that—again, from previous Oscar experience—most stations will be able to use *Oscar III* with their existing equipment.

Those, then, are the prospects. What we cannot tell you is exactly when *Oscar III* is going to appear. Even the Project Oscar people themselves do not know that. It is planned for "later this summer," and will not be announced until it is in orbit, because the launch will be as a passenger on a U.S. Army rocket being used for other experiments, and therefore subject to security control. But as soon as you get the buzz, from anywhere, that *Oscar III* is up, get the Rx going on 145-875-145-925 mc. and the Tx ready for 144-075-144-125 mc.

News and Views

The bulk of the correspondence this time is to make claims for the tables, with nothing much to report in the way of operating news. With the passing of the severe weather, and the unsticking of beams, for many people it is a matter of making good winter damage—which, for some, means putting up something new while they are about it. The only people who have no worries of this sort are those who run an indoor beam, like G8VN (Leicester); he has worked 216 stations in 28C with his, using only 16w.; he would be interested to know what others have done on an indoor array, and so would we.

G2BHN (Yeovil) claims for the tables, and G2CIW (Birmingham) reports making a start on a 23 cm. converter, in which band several other Midlands stations are interested. G5ZT (Plymouth) finds two metres quiet but works G3IEA (Torquay) daily, and has odd contacts with G2DOT, G3EGV, G3LMG, G3OCB and G3OJY, his actives within range; G5ZT now has a Tx on 430 mc and would appreciate cross-band tests, 144/430 mc, with anyone able to co-operate (*QTHR*).

G5QA (Exeter) has found the occasional good openings on the 70 cm. band and, besides keeping his schedules going with GW3ATM and G3OYM in the Chepstow district, has opened a new one with G3KFD (Brierley Hill, Staffs.) on a thrice-weekly basis; Herbert says that the path appears to be a good one, even though the distance is all of 150 miles; and G5QA is another who is looking into 23 cm. possibilities.

G3OHC reports further progress on two metres for the club station G3OXD/A (nr. Birmingham), and G3DVQ (Purley, Sy.) also moves up. G3RMB (nr. Coventry) says he has found something or somebody on the band to interest him all the winter, and now has a new converter, using a 6CW4 RF stage into a 12AT7 mixer; this has been constructed and adjusted on the principle of optimum signal-noise ratio at the front end and no-gain through the rest of the circuit; the result is a quiet converter with all the gain in the

novistor stage, which is where it should be.

Also an equipment note from G3NPF (Southend-on-Sea) who now has a much more sophisticated Tx, taking a pair of 4X150A's in the PA, with optional CO or VFO

TWO METRES COUNTIES WORKED SINCE SEPTEMBER 1, 1962

Starting Figure, 14

From Home QTH Only

Worked	Station
64	G3BA
54	G3BOC
53	G3EDD
51	EI2W
50	G3CO
49	EI2A
48	G3BNL, G3OXD/A
45	G4LU
43	G3HRH
40	G3JYP, G3PBV
39	G3JXN
37	G2AXI
36	G3NUE
35	G2BHN, G3FIJ
34	G3OJY, G3PSL
33	G3JWQ
32	G3DVQ
29	G5QA
27	G2DHV/P
26	G3NOH, G5UM
25	G3CKQ, G3GSO
24	G8VN
22	G3LQR, G3PTO
20	G3CCA, G3GWL, G3JHM/A, G3NPF, G3PKT
18	G3GVV, GI3ONF
14	G2CDX, GW3ATM

This annual Counties Worked Table will close on August 31, 1963. All operators who work 14 or more Counties on Two Metres are eligible for entry in the Table. QSL cards or other proofs are not required when making claims. The first claim should be a list of counties with the stations worked for them. Thereafter, counties may be claimed as they accrue. Note: While new claims can be made at any time in the period from now to end-June 1963, all operators are asked to send in amended scores as often as possible, in order to keep the Table running up-to-date. After June 30, 1963, only amended scores from those already standing in the Table at that date will be accepted.

control, using an SEO-Xtal mixer arrangement for the VFO; the PA is modulated by a pair of TZ40's and is driven by a QQV03-20A. The next step would be NBFM via the VFO.

G3PSL (Loughborough) pushes on in the tables, and G3CO (Hartley, Kent) reports conditions rather flat through the period; though he was able to work 80 stations during the March contest, only a very few of them were at distances over 150 miles; G3CO will be getting the gear together for four metres, making a start over Easter.

On the four-metre front, G3OWA (Kingston, Sy.) reports active, with contacts in 10 counties; he and his brother G3PRQ operate the rig, which consists of an S.440C Tx

running 9w. on 70-29 mc, an RF-27 into an AR88D as Rx, and a dipole aerial. They find plenty of activity on Sunday mornings and Wednesday evenings, and G3OWA remarks that "quite often the QRM is very bad"—well, in some ways it's good to know that! Another keen 4-metre man is G3PMJ (Gorton, M'cr.) who runs an 832 at 35w. in the Tx, CW and phone, with a 4-ele beam, and a xtal converter into an R.107 as main receiver; in his first three days with this rig G3PMJ worked 27 4-metre stations in 5 counties. (He asks "Does G9BF know anything about 4m.?" The short answer to this is, of course, "Yes, G9BF knows about everything"! He is believed to be working on some terrible new VHF project at this very moment.)

Louis of G3EHY (Banwell, Som.) well known for his consistent and very successful 4-metre activity, reports conditions during the winter as having been, on average, rather better than last summer's; at any rate, Lancs. and Cheshire stations have been regularly heard every Sunday morning at G3EHY, who has also had many contacts with G6XX (Hull), this distance being about 200 miles, be it noted! On the two-metre band, the nightly schedule with EI2A has continued, with only three failures since the beginning of January. It is interesting that GW3LJP (Llandrindod Wells, Rads.), who is on the path between the two stations and regularly monitors the sked QSO, has found that when G3EHY's signal is strong in EI it is weak with him, and vice versa; this peculiar phenomenon is quite consistent and has been checked many times, as G3EHY and GW3LJP always have a QSO after the sked-contact has been cleared.

G4LU (Oswestry), remarking that he had been locked out of the shack to get on with some decorating, managed to get in a /A session as GW4LU in Montgomeryshire for the contest week-end, when in a total of 14 hours' operating, 54 stations were worked; the site turned out to be rather a poor one, but the contacts included G13GXP, while G3EDD (Cambridge) was heard and called,

FOUR METRES
ALL-TIME COUNTIES WORKED LIST

Starting Figure, 8
From Home QTH Only

Worked	Station
27	G3EHY
26	G3JHM/A
22	G5FK
19	G3BNL, G3OHH, G3PKJ
18	G5JU
17	G3LZN, G3NUE
14	G3OKJ
12	G3LQR, G5DS
10	G3OWA
9	EI2W, G3IUD
8	G3AYT, G3HXV

This Table records Counties Worked on Four Metres, on an all-time basis. Claims can be made as for the other Tables, e.g. a list of counties with the stations worked for them, added to from time to time as more counties accrue. QSL cards or other confirmations are not required.

without QSO. G4LU has some comments to make about the beacon which for him, and many another northern station, has become unreliable as a conditions-indicator, and not nearly as useful as the old Wrotham set-up (presumably, this is to be restored in due course). The present GB3VHF signal comes from temporary gear lent by the Cambridge group.

Thoughts on Sideband

In a very interesting letter, G3BA (Sutton Coldfield), now well out in front in Annual Counties, discusses equipment possibilities for going SSB on two metres; his own layout consists essentially of a QQV03-10 as a mixer, with 131 mc fed to the cathode and an SSB signal on 14 mc (from the K.W. Viceroy) to the grids in push-pull; the 145 mc "mixture" is taken off the QQV03-10 anodes in push-pull and drives a QQV06-40A in Class-AB1 to full output, with good linearity; this is achieved with no more than 10 volts r.m.s. of SSB drive on the grids of the '3/10. On another tack, Tom suggests that the SCR-522 Tx

TWO METRES
COUNTRIES WORKED

Starting Figure, 8

- 20 G3HBW, G3LTF (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, LX, OE, OH, OK, ON, OZ, PA, SM, SP)
- 19 G5YV (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, LX, OE, OK, ON, OZ, PA, SM, SP)
- 19 G3CCH (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, OE, OH, OK, ON, OZ, PA, SM, SP)
- 18 G6NB (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, LX, OK, ON, OZ, PA, SM, SP), ON4BZ
- 17 OK2WCG
- 16 G3GHO, G3KEQ, G5MA, G6RH, G6XM, PA0FB
- 15 G2XV, G3AYC, G3BLP, G3FZL, G4MW, GM3EGW
- 14 G2CIW, G2FJR, G2HDZ, G3CO, G3FAN, G3HAZ, G3IOO, G3JWQ, G3KPT, G3WS, G5BD, G6LI, G8OU
- 13 G2HIF, G2HOP, G3BA, G3DKF, G3DMU, G3DVK, G3EHY, G3GPT, G3NNG, G3PBV, G5DS, G6XX, G8VZ
- 12 EI2A, EI2W, F8MX, G3AOS, G3GFD, G3GHI, G3JAM, G3NUE, G3OBD, G3WW, G5CP, G5ML, G8DR, GW2HIY
- 11 G2AJ, G2CZS, G3ABA, G3BDO, G3BOC, G3GSO, G3HRH, G3IUD, G3JYP, G3JZN, G3KUH, G3LHA, G3OHD, G4RO, G4SA, G5UD, G6XA, OK1VR
- 10 G2AHP, G2AXI, G2FQP, G3BK, G3BNC, G3DLU, G3GSE, G3JHM/A, G3KQF, G3LAR, G3LTN, G3MED, G3OSA, G3RMB, G5MR, G5TN, G8IC, G2FZC, GW3ATM, GWSMQ
- 9 G2BHN, G2DHV, G2DVD, G2FCL, G3BOC, G3BYV, G3FLI, G3FUR, G3JLA, G3OXD/A, G4LX, G5UM, G8GP, G3EBK, G3ONP, GM3DIQ, GW3MFY
- 8 G2DDD, G2XC, G3AEP, G3AGS, G3EKX, G3GBO, G3HCU, G3HWJ, G3JXN, G3KHA, G3PKT, G3MPS, G3OJY, G3PSL, G3VM, G5BM, G5BY, G8SB

should be a "natural" for going Sideband on two metres, using the same sort of technique (we will discuss this in greater detail on a future occasion). With other transverter design and constructional work in hand, for 70 cm. and 70 mc, he has had a busy winter—and one new aerial at G3BA is a J-Beam omni-directional slot assembly, which gives good all-round coverage over local distances without having to turn or swing anything. Of course, it is not so good for DX, as might be expected in view of the

SEVENTY CENTIMETRES

ALL-TIME COUNTIES WORKED

Starting Figure, 4

Worked	Station
40	G2XV
35	G2CIW, G3KPT, G6NF
34	G3JMA
33	G3JHM/A
32	GW3ATM
31	G3JWQ, G5YV
30	G3KEQ, G3LHA
29	G3LQR
28	G3HAZ, G3HBW, G3NNG
26	GW2ADZ
24	G3LTF
23	G3BKQ, G6NB
21	G3AYC, G3IOO
18	G5UM
17	G3BA, G3MPS
16	G2DDD, G3MED
15	G2OI, G4RO
14	G2HDZ, G3FAN, G5QA
13	EI2W, G2BDX, G6XA
12	G3NJO/T, G5BD
11	G3BYY
10	G3HWR, G3IRW, G5DS
9	G3BNL
7	G2HDY, G3JHM, G3OBD/P
6	G3FIJ, G3KHA, G3WW
5	G3FUL, G3IRA, G3IUD, G3LTN, G5ML
4	G3EKP, G3JGY

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

relatively small gain—but Tom remarks that it would be a very attractive proposition for anyone with a really good VHF location.

G3CCA (Oadby, Leics.) who is doing a lot of original work on advanced amateur VHF receiver design (on which we shall be publishing details in due course) is also in the constructional field on the transmitter side—he is applying the G3BA transverter idea using a modified Heathkit SB-10U unit as the SSB exciter to give a p.e.p. of around 200 watts from a QV06-40A as a linear PA, with the choice of upper or lower sideband. G3CCA says that the SB-10U makes an ideal self-contained SSB exciter for two metres when incorporated with a stabilised oscillator on 14 mc—he uses a 5763 in a CO circuit. This also we hope to enlarge on in future issues.

If you must use phone on VHF, then SSB (or NBFM) is the right way to achieve it. High-powered AM, though it may sound impressive on straight communications receivers calling for a lot of adjustment to take sideband phone, is in fact no more than a QRM factor when the 144-146 mc band is wide open for DX—because most converter front-ends are not tunable, cross-modulation by the big AM boys becomes quite intolerable. The real answer, if communication is what you want, is CW, with its narrowed band-width and general "sharpness" on any good Rx set-up enabling you to tighten up on the selectivity.

G3BHT (Surbiton, Sy.) writes in to report himself as a newcomer to the VHF bands who is making his start on 4 metres; he is in a flat, so the 3-ele Yagi has to be indoors; the Tx takes 25w. in the 5B254M PA, and on the Rx side he has a TW converter into an 888A. G3BHT remarks that he is finding 4m. an ideal band for semi-local working.

Also a newcomer is G2CDX (Cambridge), who got going on two metres towards the end of February and in one week worked his first 14C to get into the Annual; his PA is a QV03-20A running 25w. and modulated by a pair of 6V6's, the Rx is an ECC84 cascade into a BC-348 (with a

70 CENTIMETRES

COUNTIES WORKED SINCE SEPTEMBER 1, 1962

Starting Figure 4
From Home QTH Only

Worked	Station
29	G2CIW, G3KPT
25	G3LQR
20	G3AYC, G3EDD
17	G3LHA
14	G3BNL
12	G5QA
9	G3NOH, G5UM
6	G3BIK

This Annual Counties Worked Table is reckoned from September 1st, 1962 and will close on August 31st, 1963. All operators who work four or more Counties on the 70-centimetre (430 mc) band are eligible for entry. Counties should be claimed as they accrue, and otherwise the rules are as for the Two-Metre Annual Table.

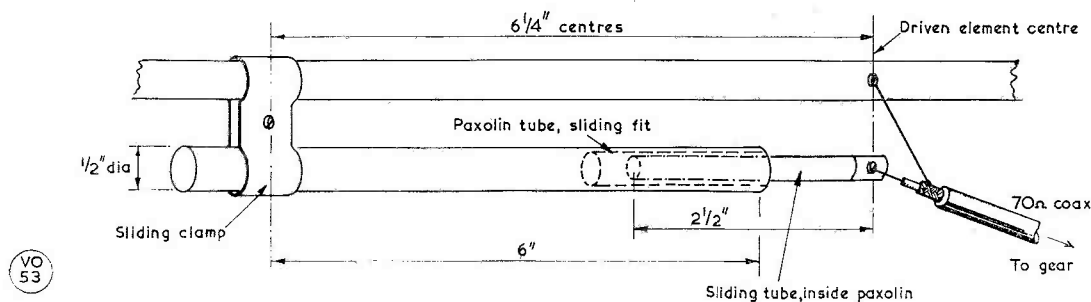
better converter involving a 6CW4 in hand) and his beam is a 4-over-4.

And to Conclude

That brings us to the end for this time. With the promise of improving conditions, we look forward to hearing of more activity on all VHF bands, and in particular on 4 metres. One cannot forecast openings (more than about 48 hours in advance, anyway) but it a fair bet that, as in past seasons, we shall find EDX/GDX conditions developing from time to time, with all the interest and excitement that they bring. To get into the next issue, please let us have your news and views, notes, claims and comments by **Friday, April 19**, at the very latest. Address it all to: A. J. Devon, "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. With you again on May 3, all being well—and go carefully over Easter.

Stop Press!

The GB3CUW expedition duly got going from Snaefell, I.O.M., on March 26, and worked a number of stations on two and four metres, making several GD "firsts" on the latter band—details next month.



Sketch to illustrate the method of gamma-match construction advocated by GW3DFF, seen here as applied to a two-metre assembly. The capacity variation is obtained by the sliding-tube adjustment, and the matching itself can be adjusted by the sliding clamp. As explained in the text, the correct settings (which will react on one another to some extent) are found by having an SWR meter in the feed-line. After fixing the adjustment, the whole assembly should be weather-proofed with insulating varnish and p.v.c. tape. The result is a sound and tidy job, mechanically and electrically.

IMPROVING THE GAMMA MATCH

BETTER MECHANICAL ARRANGEMENT

R. J. BARRETT (GW3DFF)

THE feed-line connection known as the "gamma-match" is an excellent way of matching coax to a variety of impedances where a multi-element aerial system is involved—the theory of the gamma-match (with which we are not here concerned) is explained in all recent issues of the *ARRL Handbook*. But the gamma-match does have one serious mechanical disadvantage on the constructional side. Because of the inherent inductive reactance of the matching network, it is necessary to have a series variable capacity somewhere in the circuit; as usually proposed, this takes the form of a small receiving-type variable condenser, which has to hang from the driven element and be "protected" (if that is the word) from the weather by being contained in a

plastic bag or a suitably-constructed box-to-fit. The result is a job which is as unsightly as it is mechanically unsound.

A better approach is shown in the sketch herewith. It is a simple form of construction that looks good, works well and entirely satisfies the theoretical requirement. The matching section is of $\frac{1}{2}$ -in. diameter aluminium, with a length of paxolin fitted inside; this can be secured in position by smearing the tube with any plastic-to-metal adhesive, before insertion. A secondary tube or rod, having a diameter slightly smaller than the paxolin insert, should now slide within the paxolin piece and be regarded as forming the moving side of a variable condenser—this is the pith and essence of the whole idea.

The correct way to get optimum matching is to have an SWR bridge in the coax line, and then to fidget the sliding element and the tapping point on the matching arm (along the driven element) until the best SWR reading is obtained, aiming for the desired minimum of 1:1 (which in practice can rarely be achieved, and should be treated with the utmost suspicion if it is found).

Using the mechanical arrangement shown in the sketch, the writer has had most satisfactory results for a number of years—it is applied to a 10-ele Yagi on two metres.

THE MOBILE RALLY PROGRAMME

We are now getting into the Rally season, with some 17 events already scheduled, well spaced either in time or by distance. We hope to cover as many as possible of these meetings by story and in picture, as in previous years—and it is worth a thought that the first mobile rally report ever to be published in this country (or any other, as far as we know) appeared in the November 1955 issue of *SHORT WAVE MAGAZINE*. Since then, about 100 major rallies have been held, all over England, practically all of them fully reported in the *Magazine* with, in most cases, photographs as well. During that period of nearly eight years, U.K. amateurs licensed /M

have increased from a mere handful to about 1,300 spread over all G-prefix countries. Though the great majority naturally locate in the maximum-population areas, obviously by reason of their mobility they can get around almost anywhere in the U.K. This is why it seems odd to us that, so far, all mobile rallies intended to attract outside-local support have been laid on at an English centre. Surely, the GM's could put on a show on their side of the Border which would be attractive not only in the radio-mobile sense, but also of interest to mobileers as motorists. You still don't need documents to get into Scotland—though we do know of one keen

politically-minded type who threatened to write to his M.P. because he wasn't asked for his passport at Carter Bar on the A.68!

Following is the Mobile Rally programme, as known to us at the time of going to press:

April 21: North Midlands Mobile Rally, Trentham Gardens, Stoke-on-Trent, Staffs. This has always been one of the events of the Mobile Season, held in ideal surroundings for a family outing—and with ample covered accommodation should it turn out wet. The organisers have booked much more space than in previous years (a large part of the ball-room will be devoted to exhibition stands of Amateur Radio interest) and there is plenty of room for car-parking; as before, this will be divided in such a way that the VHF types will be together, with other-band /M's in a separate enclosure; the idea is that those with like interests will find themselves alongside one another. The talk-in stations will be G3GBU/A on Top Band and G3MAR/A on two metres, with out-stations on both bands to help ease the traffic problem, both on the road and over the air. As all who have ever been to Trentham will know, there are ample catering facilities on site. To find it, you get on to the A.34, Stone to Newcastle-under-Lyme, and look out for the sign-posting. There is a small per-head admission charge, and for any further information the contact-man is: T. P. Douglas, G3BA, 141 Russell Bank Road, Four Oaks, Sutton Coldfield, Warwickshire.

April 28: International Mobile Rally, Verviers, Belgium—for details see p.643 February and p.42 March issues of SHORT WAVE MAGAZINE.

May 5: Thanet Mobile Rally, cliff-top site at Cliffsend, Ramsgate, Kent, with talk-in by

G3DOE/P on 160m. and G3BAC/P on two metres. Further details from: R. A. Bastow, G3BAC, 31 Canterbury Road East, Ramsgate, Kent.

May 12: Hamfest organised by the Grimsby Amateur Radio Society, Birds' Nest Café, Boating Lake, Cleethorpes, Lincs., to which visiting mobiles are invited. Assembly is at 2.0 p.m., and tickets at 10s. each are obtainable from: B. Walster, 47 Richard Street, Grimsby. Cleethorpes is a seaside town with all the expected by-the-sea attractions.

May 26: Peterborough Amateur Radio Society bucket-and-spade party at Hunstanton, Norfolk, another by-the-sea venue and right on The Wash.

May 26: Cheltenham Mobile Rally, to be preceded by a Mobile Dinner on the evening of Saturday, May 25.

May 26: Rally at Harewood Park, near Leeds, organised by the Northern Amateur Radio Mobile Society.

June 2: Reading Amateur Radio Club mobile rally at the Childe Beal Memorial Trust, Pangbourne, Berks.

June 16: Amateur Radio Mobile Society Rally at Barford St. John, near Deddington, Oxon.

June 23: Bridlington Amateur Radio Society Mobile Rally at Bridlington, Yorks.

June 30: West of England Mobile Rally at Longleat House, near Warminster, Wilts.

July 7: The South Shields Mobile Rally.

July 14: Chiltern Mobile Rally, West Wycombe, Bucks.

August 11: Mobile Rally at the Royal Naval College, Dartmouth, South Devon, where for the last 40 years officers of the Royal Navy have received their early indoctrination. Organised jointly by

the Torbay Amateur Radio Society and the R.N.C. Amateur Radio Club. Rally details will appear in later issues.

August 18: Derby Amateur Radio Society annual Mobile Rally.

August 25: Reading A.R.C. Rally at Pangbourne, Berks. (as for June 2).

September 15: Lincoln Short Wave Club Rally and Hamfest.

Organisers of the events listed after April are asked to let us have their final details—programme, catering arrangements, call-signs of talk-in stations, and other relevant information—in good time for appearance in the appropriate issue. The firm closing dates are: For May, April 16; for June, May 21; for July, June 18; for August, July 16; and for September, August 20. These dates apply only in respect of the Mobile feature, and are not to be taken as being effective for any other Magazine feature for which a specific closing date is given.



The /M equipment fitted in his Vauxhall "Cresta" by G3PHS (Sutton, Sy.) consists of two main units: A transistor power supply, 4 ins. square on the panel and 7 ins. deep; and a Top Band transceiver, 4 ins. by 12 ins. wide and 7 ins. deep. The transmitter is exactly as the Minitopper described in the August, 1962, issue of *Short Wave Magazine*. For receiver, G3PHS has a home-built superhet. All heaters are in balance together for the 12v. supply, the transistor PSU consists of OC35 oscillators with OA210 rectifiers, and the aerial is an 8 ft. centre-loaded whip. G3PHS says that it all performs very well, and installation is such that the whole of the gear, including the aerial, can be got into or out of the car in about two minutes.

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 U.K. section of the "RADIO AMATEUR CALL BOOK" in preparation. QTH's are inserted as they are received, up to the limit of the space allowance each month. Please write clearly and address on a separate slip to QTH Section.

E14AN, J. V. Love, The Stone-wall, Bailieborough, Co. Cavan.

G3FLS, D. R. Doughty, 36 Spinney Hill Drive, Loughborough, Leics.

G3PVM, V. L. C. Young, 19 Chilton Road, Ipswich, Suffolk.

G3ROJ, J. R. Garrood, M.A., Bryanston School, Blandford, Dorset.

G3ROW, S. W. G. C. Wheaton-Smith, 2 Ross Court, Putney, London, S.W.15.

G3RPG, R. J. Lewitter, 9 Maltravers Drive, Littlehampton, Sussex.

G3RPQ, C. Halling, 151 Clyde Crescent, Cheltenham, Glos.

G3RPW, K. W. Taunton, 170 Bradford Road, Stanningley, Pudsey, Yorkshire.

G3RQA, B. J. Quarrington, 2 Hilltop Road, Frindsbury, Rochester, Kent. (Tel.: *Strood 78677*.)

G3RQC, H. J. Luxton, 72 Beverley Street, Manchester, Lancs.

G3RQE, Dr. C. Maloof (*VK2AMA*), The Manchester Royal Infirmary, Manchester, Lancs. (Tel.: *ARD 3300*.)

G3RQR, N. L. Kirtley, 23 Meadow Lane, East Herrington, Sunderland, Co. Durham. (Tel.: *East Herrington 3345*.)

G3RQY, K. D. Brickham, 15 Tiercel Avenue, Sprowston, Norwich, Norfolk. NOR.76.R.

G3RSD, J. R. Reynolds, 91 Davenport Drive, Cleethorpes, Lincs.

G3RSL, Amateur Radio Club, 332 (City of London), Sig. Sqdn. T.A., T.A. Centre, 20 Atkins Road, Balham, London, S.W.12.

G3RSR, The Midland Radio Contest Club, c/o R. H. Jennings, 12 Dark Lane, Hollywood, Birmingham, Warks.

G3RSU, D. P. A. Bindon, Alford, Curland, Taunton, Somerset.

G3RTK, G. H. Hurst, 111 North Road, St. Helens, Lancs. (Tel.: *St. Helens 23329*.)

G3RTN, L. D. North, 205 Cherry Orchard Road, Handsworth Wood, Birmingham, 20.

G3RTO, N. W. F. Pratt, 3 Grey Street, Newthorpe, Nottinghamshire.

G3RTP, J. Pennington, 9 Coningsby Road, Woodthorpe, Nottingham.

G3RTS, D. V. McCaughan, 69 Galwally Park, Belfast, 8.

G3RTU, K. Kahn, 12 Cliffdale Drive, Higher Crumpsall, Manchester, 8.

G3RTW, D. Wheeler, Little Meadow, Brickhouse Lane, Stoke Prior, Bromsgrove, Wores. (Tel.: *Bromsgrove 3313*.)

G3RUB, S. O. Hine, 7 Castleton Avenue, Riddings, Derbyshire.

GW3RUE, E. R. Edwards, 20 Abbey Road, Denbigh, Denbighshire.

G3RUG, G. E. Twiss, 12 Combermere Close, Cheadle Hulme, Cheadle, Cheshire.

G3RUG/A, G. E. Twiss, Avondale School, St. Lesmo Road, Stockport, Cheshire.

G3RUK, R. M. Davies, 17 Silver Street, Wythall, Birmingham.

G3RUO, W. Williamson, 60 Queens Road, Eastwood, Notts.

G3RUS, L. S. Beaumont (*ex-5A5TZ*), 51 Strensall Park, York. (Tel.: *Strensall 477*.)

G3RUV, A. T. James, 18 Lonsdale Road, Heavitree, Exeter, Devon.

G3RUX, B. V. Marshall, 39 Park Lane, Pinhoe, Exeter, Devon.

G3RUZ, D. H. Martin, 1 Western Hill, Durham City, Co. Durham. (Tel.: *Durham 3766*.)

G3RVA, R. H. Crowe, 25 Buttons Farm Road, Penn, Wolverhampton, Staffs. (Tel.: *Wolverhampton 38447*.)

GM3RVK, G. Thomson, Douglas Terrace, Windygates, Fife.

G3RVM, C. I. B. Trusson, 7 St. Oswald's Drive, Durham City, Co. Durham.

G3RVP, A. A. Mothersdale, 40 Ashbourne Avenue, Bolton Road, Bradford 2, Yorkshire.

G3RVX, J. Colegate, 3 Pump Lane, Bathford, Bath, Somerset.

G3RVY, P. Colegate, 22 Bathford Hill, Bathford, Bath, Somerset.

CHANGE OF ADDRESS

DL2GZ, W. J. Wallace (*G3KGZ*), Hq. (Unit) R.A.F., Germany, B.F.P.O. 40.

G2FFT, J. Weaver, 15 Longfield Road, Thorpe St. Andrew, Norwich, Norfolk. NOR.74.T.

G3BXY, T. Murnane, 40 Regnum Drive, Shaw, Newbury, Berkshire.

G3CHM, G. Buckland, Playden, Fordwater Road, Summersdale, Chichester, Sussex.

G3DVY, L. Baty, Northcote, Acomb, Hexham, Northumberland.

G3EFB, Dr. A. H. Walker, 48 Carver Hill Road, High Wycombe, Bucks.

G3GPX, P. J. Bartram, Barendale, Heath Road, Woolpit, Bury St. Edmunds, Suffolk.

G3JRJ, F. Buckley, 118 Navigation Road, Northwich, Cheshire.

G3KOS, B. A. Faithfull, 68 Lampton Road, Long Ashton, Bristol.

G3OYU, B. J. R. Davies, Highcroft, Lusted Hall Lane, Tatsfield, Kent.

G3PQY, J. Lawrence (*ex-MP4TAC*), c/o W/O's & Sgts' Mess, 6 Regt. R.A., Newcombe Lines, Larkhill, Amesbury, Wilts.

G3PRR, I. S. Partridge (*VS1KX*), 104 Grange Drive, Stratton St. Margaret, Swindon, Wilts.

G3QG, W. C. Green, Mansion Flats, Luton Hoo, Luton, Beds.

G3RHU, M. F. Stanbridge, 31 High Street, Leiston, Suffolk.

G3XR, F. T. Richardson, 197 Highfields Street, Coalville, Leicestershire, Leics.

G5WQ, J. R. Witty, Glenside, The Coppice, Wards End, Poynton, Cheshire.

G5XX, Ariel Radio Group (Daventry), St. James House, Sheaf Street, Daventry, Northants.

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for May Issue: April 11)

(Address all reports for this feature to "Club Secretary")

PERCEPTIVE readers will probably notice that we are adopting, as from this issue, a rather different treatment for this feature. It is intended to make it less predictable, less a matter of routine, and to comment on whatever aspect of Club News strikes us as especially interesting in any particular month.

Thus one individual club may find itself described at some length (assuming that sufficient detail has been sent in for your "Club Secretary" to work on); or one particular facet of club life may come in for special comment.

There may even be a "Club-of-the-Month" feature, calculated to bring blushes (well-deserved ones, of course) to the faces of a few characters who, in our opinion, are doing an unusually good job of unpaid work.

To balance out the extra space that this treatment will need, those clubs who simply send in a short note concerning the dates of their future meetings will find them concisely noted under the heading "Club News in Brief," which will convey to readers all that they need to know.

We shall therefore welcome a certain number of club reports giving rather more detail than hitherto—possibly our regular correspondents might send in one every six months or so. But of course the space is not available for more lavish treatment of *all* Clubs! So do not be disheartened if there is no special reference to your own club—it will come in time.

CLUBS WITH NO CLUBROOM

Some of the largest club organisations in the Amateur Radio movement are not confined within local boundaries and cannot hold regular meetings. Their news sheets or journals therefore turn out to be something rather special—and are certainly of special interest to their members.

The **Amateur Radio Mobile Society**, for instance, publish *Mobile News* monthly, with G3NMR and his XYL Sylvia bearing the responsibility for production. It is a lively publication, with the accent on news from members, but not lacking in useful technical information and all those interesting snippets that

give character to a journal of this kind.

The **Radio Amateur Invalid and Bedfast Club** has been publishing *Radial* for several years. (The February issue is Vol. 8, No. 12.) This little booklet, usually of six pages, must be looked forward to eagerly by the club's "shut-in" membership, for whom it takes the place of a monthly meeting, with its copious supply of personal news. The January issue contained a list of the club's 56 licensed members; February followed up with the SWL's, numbering 89. Responsible for the work is Mrs. F. E. Woolley, G3LWY.

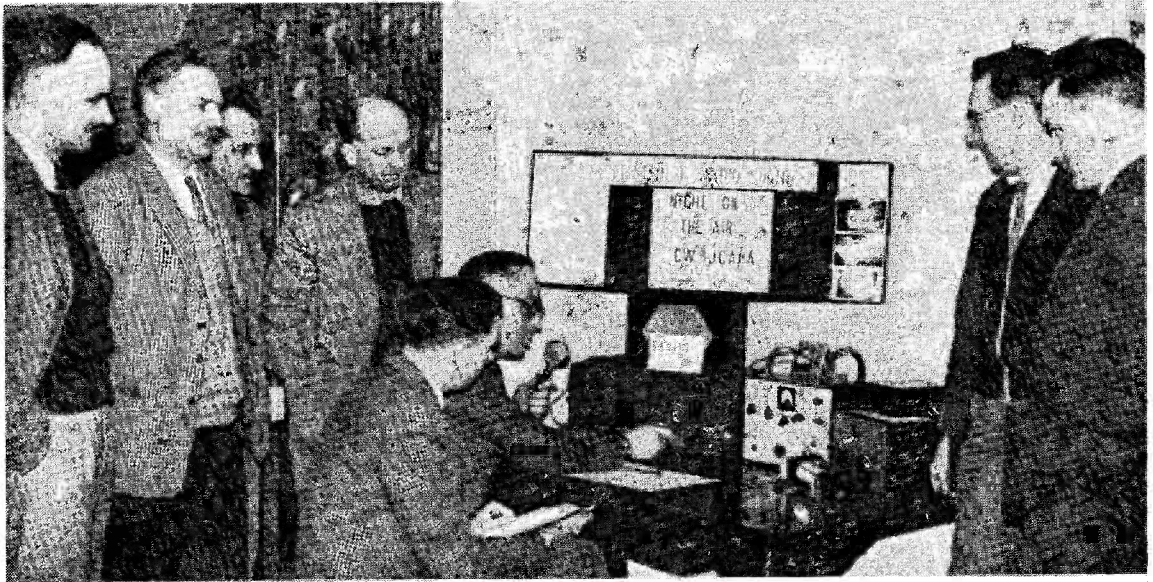
Another club that meets only on the air is the **Ex-G Radio Club**, whose U.K. representative is G4MJ. To belong to this organisation you must be a radio amateur born in the U.K. but now domiciled abroad; so the bulk of its members are Britons who hold VE or W call-signs, although there are quite a few others spread around the world. Regular nets are organised, and a monthly bulletin issued. This latter is packed with news, both personal and "DX-wise." Interested SWL's should watch "DX Commentary" for details of the Ex-G Nets.

Club Publications

Readers would be amazed if they could see the huge variety of club publications that reach this desk each month. The smallest (but probably one of



Some of the members and guests at the annual dinner and social held recently by the Barnsley & District Amateur Radio Club, when the attendance was more than 60, for a very enjoyable occasion. The club has since lost its president and founder-member George Wigglesworth, G2BH, who was present at the first meeting 50 years ago—for Barnsley has a history going back to 1913.



On February 25, the Flintshire Radio Society had a night-on-the-air. Here we see, left to right: SWL's Whitehead and Habesch; GW3PKH/T; at the gear GW3JGA (on the microphone), with GW3FPF; and, at right, GW3PCZ/T and SWL Antley, hon. secretary of the club, which meets on the last Monday of each month at the Railway Hotel, Prestatyn.

the most useful) is a little diary-size booklet put out by the **Civil Service Radio Society**. This contains details of the fortnightly meetings for quite a long period (the current issue covers September 1962 to August 1963), arranged four to a page on the right-hand side, with blank pages facing them for notes. Incidentally, the well-known station GB2SM, in the Science Museum, is available to members throughout the year on the third Tuesday of each month; it is a very important feature of the club's organisation.

QUA, a duplicated news-sheet published by **Plymouth Radio Club**, is found invaluable, the secretary reports, for keeping members informed about what is going on—or what events are coming. Although Plymouth meet every Tuesday, on the first Tuesday of each month they shift from Virginia House to the Guild of Social Service Centre and hold a business meeting followed by a lecture or film. Even with weekly meetings, *QUA* is an important part of the club's existence.

From **Coventry's** attractive and concise *News Letter* we gather that their meeting on April 8 is entitled "G5GR Through the Ages"; a fortnight later they have a film show. This little publication sets out forthcoming meetings and also other events of interest in such a way that they can hardly be missed.

The **Enfield Group** call their news sheet the *Lea Valley Reflector*, and it is already in its 14th volume. **Hastings** has just published No. 37 of *Natter-Net Notes*, a one-man publication started and kept going by their energetic secretary, G3MQT. Technical gen. has become a major feature; and the current issue has a full list of the club's members, over 80 in number.

We will deal in some detail with other publications from month to month, being content for the moment just to mention those from which various news items about club activities have been taken.

The **Midland Radio Contest Club** is an unusual organisation; its own station G3RSR is devoted simply to participation in contests and is installed at an ideal site on a hill eight miles out of Birmingham. The club is just launching its first joint constructional project, as a result of which members will be provided with electronic keyers. Meetings are held on the first Friday at the Hq., Windmill House, Weatheroak, Wythall, Birmingham.

Splatter is the official organ of **Purley**, and contains a commentary on the HF Bands month by month, written by G3FTQ. Club meetings are held on alternate Fridays at the Railwaymen's Hall, Whytecliffe Road, Purley.

The most voluminous of all publications to reach us this month is *The GM Magazine*, produced by the **Radio Club of Scotland**. Normal issues of this appear to run to about twelve foolscap sheets, but the bumper December issue made up to twenty-four! Personal news, technical matter, DX news, VHF, SWL, reminiscences and advertisements all go to make up this very lively publication, which must entail a

SPECIAL NOTE FOR CLUB REPORTS

It is essential that all Club reports for the May issue should reach us before Easter. Items for this feature received after Easter cannot be guaranteed appearance. Please post on Wednesday 10th to make sure of publication.

lot of hard work behind the scenes.

Among the smaller ones, but of excellent quality, is *Local Oscillator*, published by **Dudley**, and another concise but very newsy one is *Feedback*, put out by **Reigate**. This, in particular, gives a lot of information about local activity.

Note for Club Secretaries

Angus Murray-Stone, 5N2AMS, is a well-known DX'er who has operated from several "rare" countries (and proposes to do so again). He is on leave in the U.K. until the end of May or early June, and offers to show his collection of 35-mm. transparencies and 16-mm. sound colour films, covering his travels, to interested clubs within reasonable driving distance of London, S.W.1. But he makes it clear that a slide projector and a 16-mm. sound projector must be made available at the Club end.

Anyone interested is asked to get in touch with him as soon as possible at 14 Lennox Gardens Mews, London, S.W.1.

Homeless!

The **Roding Boys' Radio Society** are without a meeting-place at present "owing to complete electricity failure," which sounds rather mysterious! Their Tuesday evening meetings are therefore cancelled, but unofficial Saturday afternoon chats are being held instead.

Isle of Wight held an AGM recently, and elected G2NV president, G3OVI chairman and Capt. E. C. Dolling secretary. They now meet fortnightly at the Social Club, Lower St. James Street, Newport. Radio clubs wishing to hold field days in or outings to the Isle of Wight are invited to contact the secretary.

A new club and a new subject—the **Magnus Radio Society** (Magnus Grammar School, Newark-on-Trent) report to us for the very first time, and we note that on March 26 they had a lecture on The Treatment of Electric Shock, by Miss D. Dunnett, M.C.S.P. We consider this a very worthwhile topic, and are surprised at how little is said and thought about it.

Some clubs are unable to organise their programme very far in advance, and therefore we cannot publish details of forthcoming events. **Cannock Chase** tell us that they are in this category, but their coming season will include films, talks on Aerials by G3ABG, G3DII and G2DTQ, and a lecture on two-metre construction by G2DTQ. They will also visit the N.C.B. Divisional Computer Centre at Bridgtown and hold their annual dinner at the "Fleur-de-Lys," Watling Street. Note new secretary's QTH, in panel.

The *Newsletter* from **Wirral** carries an interesting description of the HPS-1 Portable Radio Telephone (158-163 mc), and an informative two-page article on Space Research, both by G2FNI. For meetings, see News in Brief.

An intriguing item called "Tramps' Night" was

Names and Addresses of Club Secretaries reporting in this issue :

ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, W.3.
 A.R.M.S.: N. A. S. Fitch, G3FPK, 79 Murchison Road, London, E.10.
 BARNET: F. Green, G3GMY, 48 Borough Way, Potters Bar.
 BLACKPOOL and FYLDE: J. Boulter, G3OCX, 175 West Drive, Cleveleys, Blackpool.
 CAMBRIDGE: H. Lowe, 47 Hurst Park Avenue, Cambridge.
 CANNOCK CHASE: C. R. Dixon, The Wood, Rawnsley, Cannock.
 CHILTERN: H. D. Coltman, G3PVJ, 301 Micklefield Road, High Wycombe.
 CIVIL SERVICE: G. Lloyd-Dalton, 2 Honister Heights, Purley, Surrey.
 COVENTRY: A. J. Wilkes, G3PQQ, 141 Overslade Crescent, Coundon, Coventry.
 CRAWLEY: R. G. B. Vaughan, G3FRV, 9 Hawkins Road, Tilgate, Crawley.
 CRAY VALLEY: S. W. Coursey, G3JJC, 49 Dulverton Road, London, S.E.9.
 CRYSTAL PALACE: G. M. C. Stone, G3FZL, 10 Liphook Crescent, London, S.E.23.
 DERBY: F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.
 DORKING: J. Greenwell, G3AEZ, Eastfield, Henfold Hill, Beare Green, Dorking.
 DUDLEY: R. W. Fisher, G3PWJ, 63 Swan Crescent, Langley, Oldbury, Worcs.
 ENFIELD: R. Langston, 54 Poynter Road, Bush Hill Park, Enfield.
 EXETER: S. Line, 46 Roseland Crescent, Heavitree, Exeter.
 FLINTSHIRE: A. Antley, Fairfield, Fairfield Avenue, Rhyl.
 HALIFAX: J. Ingham, G3RMQ, Lambert House, Greetland, Halifax.
 HASTINGS: W. E. Thompson, G3MQT, 8 Coventry Road, St. Leonards-on-Sea.
 HOUNSLOW: R. T. Heywood, G3NHH, 383 Whitton Drive, Isleworth.
 ISLE OF WIGHT: Capt. E. C. Dolling, Sweet Briars, New Road, Wootton Bridge, I.O.W.
 I.R.T.S.: T. O'Connor, E19U, 280 Collins Avenue, Whitehall, Dublin.
 LOTHIAN: W. T. Sutherland, GM3JWS, 47 Great King Street, Edinburgh 3.
 MAGNUS: R. Wallwork, G3JNK, Magnus Grammar School, Newark-on-Trent.

MANCHESTER: A. B. Langfield, G3IOA, 2 Rowland Street, Moston, Manchester 10.
 MEDWAY: P. J. Pickering, G3ORP, 101 Chatham Road, Maidstone.
 MELTON MOWBRAY: D. W. Lilley, G2FDF, 23 Melton Road, Asfordby Hill, Melton Mowbray.
 MIDLAND: C. J. Haycock, G3JDJ, 360 Portland Road, Birmingham 17.
 M.R.C.C.: J. Lockyer, G3OVA, 153 Ivor Road, Birmingham 11.
 NORTHERN HEIGHTS: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax.
 NORTH KENT: B. J. Reynolds, G3ONR, 49 Station Road, Crayford.
 PADDINGTON: B. R. Timms, G3MLE, 7 Nottingham Street, London, W.1.
 PETERBOROUGH: D. Byrne, G3KPO, Jersey House, Eye, Peterborough.
 PLYMOUTH: R. Hooper, 2 Chestnut Road, Peverell, Plymouth.
 PURLEY: E. R. Honeywood, G3GKF, 105 Whytecliffe Road, Purley.
 R.A.I.B.C.: Mrs. F. E. Woolley, G3LWY, 10 Sturton Road, Saxilby, Lincoln (acting).
 READING: R. G. Nash, G3EJA, 9 Holybrook Road, Reading.
 REIGATE: F. D. Thom, G3NKT, 12 Willow Road, Redhill.
 RODING BOYS: S. Wright, 10 Newton Road, London, E.15.
 SCOTLAND: A. Barnes, GM3LTB, 7 South Park Terrace, Glasgow.
 SHEFFIELD: D. A. Justice, G3PYL, 9 Leslie Road, Sheffield 6.
 SOUTHGATE: K. Spicer, G3RBP, 22 Clifton Avenue, London, N.3.
 SOUTH HANTS: P. A. L. Shoosmith, G3MDH, 7 Fairfield Close, Hythe, Southampton.
 SOUTH LONDON MOBILE CLUB: B. Negri, G3LXN, 17 Voltaire Road, London, S.W.4.
 SPEN VALLEY: L. A. Metcalfe, 1a Moorlands Road, Birkenshaw (acting).
 STOURBRIDGE: K. Macintosh, 50 Field Lane, Stourbridge.
 SURREY (CROYDON): S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon.
 TORBAY: Mrs. G. Western, G3NQD, 118 Salisbury Avenue, Barton, Torquay.
 WESSEX: G. J. Fowle, 138 Surrey Road, Branksome, Poole.
 WIRRAL: A. Seed, G3FOO, 31 Withert Avenue, Bebington, Wirral.
 WOLVERHAMPTON: J. Rickwood, 738 Stafford Road, Fordhouses, Wolverhampton.
 WORCESTER: T. W. Byrne, YMCA, Henwick Road, Worcester.

booked by **Medway** for April 1, and we hope they will enlighten us about this in their next report! At their recent AGM they elected G6NU president, P. Kirby chairman and G3ORP secretary. Meetings will now be held on alternate Mondays at The Bungalow, Riverside Gardens, Gun Wharf, Chatham.

Another North Kent club covering a wide area is **Cray Valley**, who also had their AGM in March. They meet at the Congregational Church Hall, Eltham, and publish a monthly newsletter.

The annual dinner and social was held at **Torbay** on March 2, with G5ZT of Plymouth as guest of honour. A Mobile Rally has been organised for August, to be held at Dartmouth—see Mobile Rally Programme in this issue.

Reverting to News Sheets: **Crystal Palace** must be one of the most regular reporters, and their current issue is No. 88 (single sheet, very concise, and with clear indications of forthcoming meetings . . .

CLUB NEWS IN BRIEF

- Action, Brentford & Chiswick:** April 16, AEU Club, 66 High Road, Chiswick—Demonstration of Tx and Rx Techniques, for new members.
- Barnet:** April 30—G3DZW, on Home Constructed Gear.
- Blackpool & Fylde:** At Squires-Gate Holiday Camp, every Monday evening.
- Cambridge:** April 5—G3AAE, on MF Propagation. May 17—Detailed description of Club Tx, built for 1s. 9d.
- Chilten:** April 25, British Legion, St. Mary Street, High Wycombe, 8 p.m.—Demonstration of the Collins KWM-2.
- Crawley:** April 24—G3AGP, on Electronics in Medicine.
- Derby:** April 10—Open Evening. April 17—First D/F Practice Run. May 1—Sale of Surplus Items.
- Dorking:** Second and fourth Tuesdays, 8 p.m., The Wheatshaf, Dorking.
- Flintshire:** April 29, Railway Hotel, Prestatyn—Slow Morse, Simple Hints and Kinks (GW3PCZ/T), Contests (GW3JJ).
- Halifax:** May 7, Beehive and Crosskeys, 7.30 p.m.—Working Mobile (G3LHQ).
- Hastings:** April 9—Transistor Circuitry. April 23—The New TV Detector Van.
- I.R.T.S.:** April 26, Wicklow Hotel, Dublin, 8 p.m.—Equipment for Field Day (E16U and E19F).
- Lothians:** April 11, YMCA, Edinburgh—Ancient Radio at Sea (GM3OWD). April 25—Monkey Glands for the HRO, and TVI-proofing (GM3PQU).
- Melton Mowbray:** April 18, St. John Ambulance Hall, Asfordby Hill—Transmitter Construction for NFD (G3OWR).
- North Kent:** April 11, Congregational Church Hall, Clock Tower, Bexleyheath—Talk by Mr. Hackney (Metropolitan Police).
- Northern Heights:** April 10—AGM. April 17—Discussion on The Amateur Licence. April 24—Open Meeting.
- Paddington:** April 17, Beauchamp Lodge, 2 Warwick Crescent, W.2—Lecture. April 24—Construction Night. May 1—Golden Jubilee Recollections (G6CL).
- Peterborough:** First Friday, Room 14, Peterborough Technical College, 7.30 p.m.
- Reading:** April 27—Junk Sale. May 25—Receivers and Gen. for SWL's.
- Reigate:** April 20, The Tower, Redhill, 7.30 p.m.
- Sheffield:** April 12, 8 Sandbeck Place, Sheffield 11—Stereophony (G3PYL).
- South London Mobile Club:** April 13—Any Problems? April 27—Ragchew.
- Spen Valley:** May 2—Conversion to 625 Lines (Baird TV).
- Stourbridge:** First Tuesday, Foley College, Stourbridge, 7.45 p.m.
- Surrey (Croydon):** April 9, Blacksmith's Arms, South End, Croydon—AGM.
- Wessex:** April 20—Visit to Dorchester G.P.O. Radio Station, 2.30 p.m.
- Wirral:** April 17—Constructional Contest. May 1—Junk Sale.
- Wolverhampton:** April 8, Neachells Cottage, Tettenhall, 8 p.m.—Ragchew. April 22—Inter-Club Quiz (G8TA v. G3JBN).
- Worcester:** April 18-20—at Hobbies Exhibition, Christopher Whitehead Boys' School, St. John's (GB3WOR).



"... And now I'll hand the mike back to Syd here ..."

April 20th, G8KW talking on KW Products).

A rather bulkier one never fails to turn up from **Southgate**, and the March 1963 issue includes a very useful article on RTTY. **South Hampshire's QUA** (no connection with the Plymouth publication of the same name!) contains a useful section entitled "In Other Magazines," summarising the contents of several, including this one (naturally!). The Group's April meeting (on the 13th) is to be a live demonstration of Amateur TV.

Manchester now have their programme fixed for the next two months, with meetings on April 10 (Junk Sale), 17 and 24 (First Aid and Safety), the 17th being an open night, to which all are invited, with XYL's and YL's.

Hounslow have built a Top Band (phone) transmitter which has been put on the air at the last two meetings. A talk on building similar equipment was given at the March 25 meeting by the chairman. Next gathering is on April 8 at Isleworth Town School, Twickenham Road, Isleworth, and fortnightly thereafter. It would probably interest present members to know that what in 1923 was the Hounslow Wireless Society held the call-sign 2YR—QTH: The Council House, Hounslow.

LONDON SIDEBAND DINNER

This is to be held on Saturday, May 11, at the Waldorf Hotel, Aldwych, London, W.C.2, assembly from 3.30 p.m. onwards. Details of the programme were given on p.42 of the March issue of **SHORT WAVE MAGAZINE**, and good support is already assured. Applications for tickets, at 50s. each inclusive, should be made to: N. A. S. Fitch, G3FPK, 79 Murchison Road, Leyton, London, E.10.

PHOTOGRAPHS AND ARTICLES

We are always glad to see manuscripts and pictures of Amateur Radio interest for possible use in **SHORT WAVE MAGAZINE**. A general note on the preparation of articles appears at the foot of the Contents page in every issue. Photographs (any size) should be clear, sharp, black-and-white prints, with descriptive notes on a separate sheet, *not* on the back of the photograph itself. All such material suitable for publication is paid for immediately on appearance.

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CATALOGUE NO. 15. Government Surplus Electrical and Radio equipment. Hundreds of items at bargain prices for the experimenter and research engineer, 2s. 6d. post free; catalogue cost refunded on purchase of 50s.—Arthur Sallis Radio Control Ltd., 93 North Road, Brighton.

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DX-40U, very little used, with VFO, £20; or would exchange commercial 2-metre or Top Band gear, cash adjustment either way.—G3DJQ, 35 Moor Hall Drive, Sutton Coldfield.

WANTED: 12-volt Command Dynamotor, Advance constant voltage transformer, QV03-10's, 12SF7's.—Hodgkinson, 19 Stoney Lane, Galgate, Lancs.

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3 Cm. GEAR clearance: 723A/B Tx/Rx complete, CV-129 Tx, both mains stabilised power packs, two paraboloids, 3 Wavemeters, 21 Klystrons, 29 Waveguide pieces, £20.—Woodhouse, Trenoweth, Porthpean, St. Austell, Cornwall.

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SALE: EDDYSTONE 870A receiver, five wave-bands including 15-160 metres, perfect working order, good condition, £17 o.n.o.? Or exchange other radio gear; prefer buyer collects.—Power, Chapel Green, Fillongley, Coventry.

OFFERS? EDDYSTONE 358X, good condition. with built-in stab. PSU, range 30-1.8 mc, general coverage, prefer buyer collects (evenings).—John Gray, A3072, 64 Ospringe Street, Ospringe, Faversham, Kent.

TELEVISION MARKER GENERATOR Model 1322, Bands I-III, Cossor, three available; Murphy Pattern Generator, Type 11, including power supply type A, one only; £5 each item, carriage extra.—Pride, Raikes Lane, Birstall, Nr. Leeds.

RSGB BULLETIN Vol. 34, 1 to 12; Vol. 36, 1 to R4; Vol. 33, 3, 5, 7, 8, 10, 11, 12. *Short Wave Magazine* Vol. XV, 4, 9; Vol. XVI, 8, 9, 10; Vol. XVII, 2, 3, 4, 7, 8, 9, 10, 11, 12; Vol. XVIII, 1, 2, 3, 4, 5, 8. 1s. 3d. each, p.p. 3d. Sig. Gen., 120 kc to 84 mc, £4 10s., p/p 5s.—Livermore, Upper Yeomans, Hall Street, Long Melford, Suffolk.

FOR SALE: PSU 1000v., 400 mA, £2 15s. 1131 Modulator p/p TZ40's and speech amplifier, £3 15s. Another modulator with TZ40's, £2 10s. All in used condition. Also large quantity of other surplus equipment. Can be seen at Cambridge Club by arrangement with Secretary, G3PEI, 34A Verulam Way, Cambridge.

SHACK SPACE WANTED. HRO Snr, four BS and GC coils, p/pack, box spares, £15. Halli-crafters S.27, 28-145 mc, £15. B2 Tx/Rx mint, complete all accs. and gen. bk., £10. ZC1, no mods. FB, £5. Mini-Beam 4ZU 10-15 metres, unused, £10. Woden DTM-18, 0/1250v. x 2/5v., 5A. DCS-14 Choke 12H 350 mA, PCS13 Swi-Choke 5/25H 350 mA. All brand new, QRO snip, £6 the lot. Wilcox-Gay VFO, £3. VFO Type 145 and p/pack 392, £3. Surrey.—Box No. 2768, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

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Tel.: Hainault 4546.



SMALL ADVERTISEMENTS, READERS—*continued*

COMMAND RECEIVER output transformers required, *ex* BC-455, etc. Your price.—G3OVA, QTHR.

WANTED: Set of bandspread coils for HRO-Mx; also 14-30 mc coil set, and RF-24 and RF-27 units; please state condition and price.—D. Wood, 250 Worple Road, Staines, Middlesex.

COMMAND Rx's 1.5-3 mc, factory mint condition and in original carton, £9. Two others, brand new and mint, £8 each; 3-6 mc and 6-9 mc, mint condition, £3 10s. each. TCS-12 Rx, brand new and mint, including Collins NL, £7 5s.; power pack for same, 30s. Front panel multi-pin connector socket, 20s. Manuals NC-100A, 25s.; 58 set, 15s.; Wilcox-Gay VFO, 25s.; BC-221 I-AH, 21s. All items plus carriage.—Box No. 2769, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SB10U-HF Minimitter Tx, mint condition, excellent SSB outfit.—G3RDW. (Tel: *Brownhills 3550*.)

FOR SALE: PCR2 with BFO, £2. R.109 with spares, £3. BC-455 (6-9 mc), £2; and BC-453 (Q5'er), £3. Both Command Rx's unused and in mint condition. Xtal Calib. No. 10, sticky dial, otherwise perfect, £2. 5-element 2-metre Yagi, perfect condition, £2.—R. Challis, 48 Harlech Road, N.14. (Phone: *PAL 6864*.)

COMPLETE Amateur Radio transmitting station, sell complete, or exchange W.H.Y.?—(*Finchley 4468*.)

RF UNIT No. 2, 100-156 mc and RF Unit No. 3 190-240 mc, identical with RF Unit No. 1, described September 1959 issue *Short Wave Magazine*, offered in new condition at £3 10s. each, p/p 5s. SCR-522, 100-156 mc, complete with mains PU RA62C mounted on rack, with cables and instruction books, nearest £12 10s. Buyer collects.—R. Jay, 69 Church Road, Moseley, Birmingham, 13. (appointment only Tel: *South 2285*.)

WANTED: Good-class Communication Receiver such as Collins 75A1/2/3/4, R.390A/388/309, S-line, AR88D mint, Racal RA.17. Also transmitter such as Panda Cub, K.W. Viceroy, Collins 32V2/3. Cash transaction, will personally collect.—Clappison, 291 Beverley Road, Hull, Yorks.

AIRMEC C.864 Rx in top condition, accurate continuous bandspread, 7 bands 100 kc to 30 mc, manual, £75; carriage by arrangement.—Berry, 12 Warwick Crescent, Harrogate. (Tel: *3807*.)

CHEESHIRE AMATEUR, now occupying small shack, has much good gear for sale. Gonset G66B, Master Mobile aerial and Master Matcher; Eddystone 740; audio amplifiers, power packs, etc. Large s.a.e. for lists.—Box No. 2770, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

TRANSISTORS new, small quantity OC44, OC45, OC81D, OC81, all 3s. 6d.; OC170, 4s.; OC171, 4s. 6d.; plus p/p.—G3MAD, 70 Arnold Road, Binstead, Ryde (3231) Lo.W.

SALE: R.103A, £2. R.208, £6. BC-433, compass, £3. TU5B, 10s. BC-455, £2. Type A Mk. III Transceiver, £4. RF26 unit, 10s. Buyer collects. Miscellaneous other items.—G3BYO, 18 Kent Road, Mapperley, Nottingham.

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SMALL ADVERTISEMENTS. READERS—*continued*

WANTED: R.1392D, or converter same range, also converter for Trawler band.—J. Tye, Inter-Nos, Swanton Morley, Dereham, Norfolk.

G2HQ, the *Short Wave Magazine* prize-winning station, has for sale a steel lattice tower and 20-metre beam, 40 ft. high; takes to pieces for removal; complete with indicator, and motor; will take additional beams; s.a.e. for photo and full details; offers? Wilcox-Gay VFO with fil. trans., £4; HRO Type RJB/1, with coil cabinet and 12 coils, spares and manual, £25. Many other items. 813 new at 45s.; 807 at 7s. 6d. Add post and packing, s.a.e.—Fawcett, 4 Woodfin Avenue, Sheffield, 11.

840C, best offer within 5 days accepted (collect (Essex). CR-100 handbook, 35s.—Box No. 2771, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

HAMMARLUND SUPER-PRO, BC-794B, 1·2-40 mc, 14 valves, S-meter, xtal filter, b/spread, p/p output, complete with power pack and converter/preselector for 20-30 mc, £22. Prefer buyer collects but will deliver reasonable distance from Brighton.—G3FXB, 86 Cross Road, Southwick, Sussex.

WANTED: Minimitter mast and beam, with or without rotation gear; also AVO 8 Mk. II.—Parsons, 96 Blackmoor Lane, Maidenhead, Berks. (26723.)

EDDYSTONE 840A Receiver, as new condition. £35. Eddystone 659/670 Marine receiver, good condition, £15. **WANTED:** AR88.—G3RAD, 1 Approach Road, Broadstairs, Kent.

SALE: LG.50 Tx converted for 160 to 10 metres; BC-453 with p/pack; 30 mc LPF; Cowgill motor, magslips, m-motors.—Offers to Box No. 2772, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: AVO valve tester, valve holder panel, and manual, £10; or exchange for Minimitter amateur bands converter. Manuals for BC-348-E-M-P-Q, 8s. **WANTED:** Two transformers 750-0-750 volts 250 mA-300 mA.—Frew, 9 Hollybank Place, Bloxwich, Walsall, Staffs.

NEW UNUSED Mosley Y3 Jnr. vertical aerial, cost £7 10s., accept £4 10s., carriage extra.—Baxter, Sunnyside, Morn Hill, Winchester.

DX-100U, as new, £50. AR88LF, p.v.c., diversity gain, S-meter, £30. Eddystone 750, £30. Buyer must collect; all in excellent condition.—Openshaw, 516 Walmersley Road, Bury, Lancs.

2-METRE xtals, FT-243: 8050, 8056·5, 8073·3 kc, all new and perfect, 13s. 6d. each. 2-metre F/S meter by Western Electric, large 200 μ A movement, first class instrument, £4. 2-metre 75w. phone Tx by leading manufacturer, completely self-contained, new condition, £60; s.a.e. for details. QQV03-10's, 32s. 6d. each, new boxed; all plus postage. **WANTED:** ARB CRV46159 receiver manual.—Box No. 2773, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

STUDENT AMATEUR requires cheap rig, phone and/or CW, all band or W.H.Y.?—A. Baker, G3PFM, 13 Winifred Road, Poole, Dorset.

SMALL ADVERTISEMENTS, READERS—continued

FOR SALE: PCR Receiver with circuit and built-in speaker, working order, bargain, £2.—G3RDZ, 38 Ash Close, Peterborough, Northants.

CR-100 RECEIVER. 6SG7 RF stages, S-meter, good condition, £15 delivered 50 miles, or offers?—G3PU, 4 Hillcrest Road, Weymouth, Dorset.

G.E.C. UHF PA unit containing two QOV06-40's and lines, £4 10s. Heathkit 2½in. 'Scope OS-1, excellent condition, £10 10s. Minimitter Multi-Q, £2. **WANTED:** Heathkit Mohican.—R. Harrison, 28 Carmalt Gardens, Putney, London, S.W.15.

WANTED: CR-100 or similar, must be in good working order. Also QOV03-20A.—Deacon, 69 Aspley Road, Quinton, Birmingham, 32.

840A Eddystone Receiver, re-aligned and in good condition, £29; carriage paid U.K.—GI3OTV, 15 Shandon Park, Belfast, 5.

HEATHKIT MOHICAN, only 15 months old, in good order, first offer over £25 secures.—Davies, 42 Farm Road, Frimley, Aldershot, Hants.

MINIMITTER CONVERTER 8 amateur bands, general coverage, 1.5 mc IF, £12. TCS Receiver, 1.5 to 12 mc, with power pack, loudspeaker unit and 100 kc xtal calibrator, £10; carriage extra.—G3HJG, 17 Torbay Road, Urmston, Manchester.

EXAKTA VAREX 2A camera, body beautiful, 35 mm. single lens reflex, immaculate condition, eye-level pentaprism, 12 seconds to 1/1,000, delayed action, M/X/F. The world's most versatile camera for Amateur or Professional, £45.—G3ANK, 145A, Station Road, Sidcup, Kent.

MOVING QTH, Clearing Shack, send s.a.e. for list of valves, magazines, components, etc.—Richardson, 170 Orchard Way, Croydon, Surrey.

GELOSO 4/102 with dial, £5. KW pi-coil, 15s. Rotary transformer 12v./365v., 10s. Heathkit GDO GD-1U, with additional coils 341-U, £9. UM2 modulation transformer, £2. Send s.a.e. for list of other gear.—Richardson, 170 Orchard Way, Croydon, Surrey.

AFEW 13-channel tuners with 6 biscuit coils, IF 34-38 mc, 10s. each. Two incremental type tuners, 40-95 and 170-225 mc, IF 9-14 mc, £1 each. IF transformers with iron-dust cores, 9 mc to 38 mc, 2s. each (saves time and temper). 4X150A, £1. QOV06-40, £2. Reclaimed TV valves, 2s. 6d. each. Tested TV components cheap, requirements please to:—Box No. 2774, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: 150-watt AM Tx, or parts, or part-built, working or otherwise. Collect bargain 100 miles.—Rayer, Reddings, Longdon Heath, Upton-on-Severn, Worcs.

WANTED: UM1 modulation transformer; Labgear pi-turret; HRO bandspread coils 80 and 20 metres.—G3PKJ, 34 Valley Avenue, Lightcliffe, Halifax.

EXCHANGE: 888A in perfect condition, for similar general-coverage receiver, BRT-400, 680X, SX-101A, etc.—G3EFD, Hillcrest, Leazes Lane, Hexham, Northumberland.

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V.H.F. RECEIVERS approx. 80 mc/s. 230v. A.C. power pack, 6" speaker. Valves: 4 KTW63, 3 Z90 (EF50), D63, DH63, KT63, 5U4G. Suitable for modification for 4 metres, etc. In good used condition, £3, carriage paid. Matching part stripped Transmitter chassis complete with 230v. A.C. Power pack, £2, carriage paid. Both units are 19" x 8½" rack mounting. Less Crystals. **NO DETAILS AVAILABLE.** 19" rack, 21" panel space, 15/-, carriage paid. Rx, Tx and rack together £5, carriage paid.

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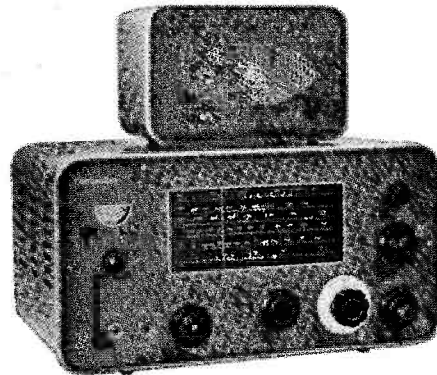
RECEIVER 48. American version of the 18 set. Covers 6 to 9 mc/s. 6 valves. B.F.O., R.F. stage. Power required L.T. 3v. at 150ma, H.T. 150v. at 8 ma. Complete with handbook, 42/6. Headphones to suit lightweight "Deaf Aid" type with lead and plug, 6/6. 10 spare valves in steel case, 10/-, Partly stripped transmitter chassis, 10/-, 500 Microamp 2" meter, 9/6. 1000 kc/s. Crystal, 7/6. All above in new condition. Postage 2/6 per order. Send S.A.E. for Leaflet.

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EDDYSTONE 840C. 550 kc/s. to 30 mc/s.	45	0	0
EDDYSTONE 888A. Amateur bands 1.8 to 10	80	0	0
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NATIONAL 188. 550 kc/s. to 30 mc/s. plus Amateur Bandsread	59	0	0
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PHILCO CAR RADIO converter. Five SW P/B bands. Should convert amateur bands. Unused in maker's packing, £4. UM3 unused, boxed, 70s. Lab-gear band-switched *pi*-inductance (E5033), £2. Hy-duty coax relay, 24v., 25s. Seven TZ40, make good g.g. Linear, one lot, all good, 70s. Box kite with wire and special reel, 30s. 14 valves, almost complete set for AR88, all new, £3. Minimitter FB5 aerial, unused, boxed, £3. Mini-scope with spare transformer, shows trace, but requires attention, £4. Smith's clock in oak, £2. Light duty Black and Decker $\frac{1}{4}$ -in. drill, 50s. Min. 807, 5B/254M, unused, £1. Some carriage please.—Box No. 2775, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

EXCHANGE K.W. "VICTOR" 120 watt Tx for EDX-100U, cash adjustment? Could deliver Sth/Central London, Surrey.—Coombes, 113 Blenheim Gardens, Wallington, Surrey. (FRA 2447.)

SWL would like information on fitting a product detector to a CR-100.—Lee, 15 Cedar Road, East Croydon, Surrey.

WANTED: Panda PR-120V or similar Tx, reasonable, cash waiting.—EI6AI, Castlereagh, Bruckless, Co. Donegal, Eire.

COLLINS VFO's, 1.5-12 mc, two available, for quick clearance, £5 each, plus 10s. carriage.—GW3LSB, Holcombe, Vicarage Avenue, Llandudno, Caerns.

WANTED: For R.A.E. aspirant, CR-100 or similar. FOR SALE: PCR 2, 230v. AC. All letters answered.—Jones, 5 Springcroft Drive, Scawthorpe, Doncaster.

WANTED: Panda Cub Tx; condition, price?—Write to Waugh, 15 North Grove, Blandford Camp, Blandford, Dorset.

SALE: McCoy 9 mc xtal filter with USB and LSB osc. xtals, new, £12. Planet U1 Tape Deck with two mono and one stereo Miniflux heads and bias osc. coil, new, £30. Denco 4-waveband coil pack, type CP-3F, new, £2. Geloso VFO 4/104, with dial, used, £4. Solartron Feedback Voltmeter VF-252, offers?—Box No. 2776, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SSB STATION Collins 75S1 with Hallicrafters SHT-37, little used, £250 the pair.—Box No. 2777, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Hallicrafters S.20R, 550 kc-44 mc, band-spread, internal PSU, LS, £14. Also HRO-M including PSU, handbook, coils, three LF bands, £13 10s.—G3OLU, 2 Westbourne Grove, Chelmsford, Essex.

EXCHANGE: PAILLARD BOLEX B2 8 mm. Eline camera, complete with close-up and distance lenses, shoulder case, etc., all in impeccable condition and barely used, for a quality SSB Transmitter, cash adjustment if necessary. FOR SALE: K.W. "Vanguard" 10-80 metre rig with low-pass filter, in mint condition, £45. CR-100 receiver in sound working order, £15.—Box No. 2778, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Hallicrafters Receiver S-108, one year old, best offer over £40.—Grubb, 41 The Drive, North Harrow, Middlesex.

SMALL ADVERTISEMENTS, READERS—continued

MOBILE/PORTABLE. 12v./200w. compact petrol generator, self starter, £12. 12v. 400v./200 mA rotary, £1 5s. Minimitter whips 160/80/40, £3 complete. Mosley mobile whip, 10/15/20, £3 10s. 160m. transceiver, 10w., no PSU, £5.—G3IES, (Edgware 0937.)

WANTED: Command Tx and Rx, for 80 metres, apply giving details of modifications, if any, to—S. J. Laverty, G13RQU, 21 Silverstream Park, Belfast, 14, N. Ireland.

A R88D, no mods.; Tx half-built (VFO 4/104, 6146 PA); Junk Box (relays, meters, etc.), £25; prefer buyer collects.—G3LUC, 25 Lywood Road, Leighton Buzzard, Beds.

WANTED: B2 Tx/Rx and power supply complete, for mains and battery operation.—Details and price to GW3QN, The Oxford, Clonmel Street, Llandudno, North Wales.

FIRST-CLASS CONDITION: Five HRO coils in cabinet, 50-2050 metres, £5; several 50-100, 11s.; spare 5, 3, coil cabinets, 10s.; meter, 12s.; R.C.A. potted audio trans. input, osc., driver, choke coupling, 4 for 13s.; Gardners shielded 0-510-540-570v. 420 mA and fil., 27s.; Govt. low-pass filters, 12s.; pair 3 in. magstrips, 30s.; TU ceramic formers, 2s. 6d.; switches, 4s. Several 826, 5s.; 829, 15s.; 832, 12s. Post extra. Eddystone 740, nearest £20, collect S. Yorks.—Box No. 2779, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WAVEMETER 1191A ("British BC-221") remarkably clean. PSU, spare valves, instructions, offers over £4 10s. 6v. PSU for HRO, 25s.—G3PZF, Farnborough (Kent) 54512.

WANTED FOR SPARES: R.C.A. AR77E or cabinet for same, please write, stating price, to—G3ONE, Blackmore, Ingatestone, Essex.

MINIMITTER TRANSMITTER (2/807) mint, £42. G2DAF SSB transmitter, QQV06-40 PA, xtals all bands, power supplies, case, £20. 1200 and 350 volt power packs, £8. BC-453, £2. **WANTED:** LG.300 Modulator and Power Unit.—G3HID, Armadale, Burnham-on-Sea. (Tel.: 2511.)

GENUINE COLLECTOR requires all types of miniature or suitcase Tx/Rx—as were used by the Polish, French, Dutch Resistance—such as type A.1, A. Mk. II, BP5, Type 3/Mk. I S-Phone, etc. Also accessories, attachments, and handbooks relating to this type of equipment. Good price paid.—M. Gee, 11 Whitehorse Lane, Stepney, London, E.1.

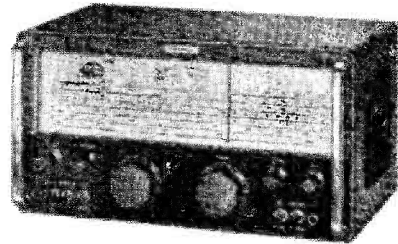
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SALE: HRO mint condition, four GC coils, power pack, £18, carriage extra.—V. M. Rowlands, Post Office Stores, Meifod, Mont. (Phone 221).

R.E.E. TELCOMM Mobile 160 metre Tx/Rx, R. 12in. x 7in. x 5in., £15. **WANTED:** Balloon equipment for vertical long wires.—G3KNB, 8 Oak Avenue, Walton Heights, Stafford.

WANTED: Good-class Communication Receiver, also Class-D Wavemeter; all letters answered.—F. Goree, 34 Heath Grove, Maidstone, Kent.

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SMALL ADVERTISEMENTS, READERS—continued

AR88D, S-meter, good condition, £35. PCR3 with built-in speaker, new front panel, mains p/pack, 12v. p/pack, v.g. condition, £10 10s.—Bell, 27 Churchill Avenue, Horsham, Sussex.

SALE: HRO Senior, 4 coils, including b/cast, Top Band, 80, 40, 20, 15; BS on 40, 20, 15 metres; PSU in steel case; good performance and appearance, makers' manual, £22. Only reason for sale, gift of modern Rx. Would prefer buyer collect, in which case 3-in. scope will be given free.—G5TV, 13 Monro Gardens, Harrow Weald, Middlesex. (*Grimsdyke 1540*).

CR-100, in good working order, new set of valves and tuning meter recently fitted, £20 o.n.o.? 4-watt amplifier and speaker, £4; or £23 the lot.—Dene, Druries, Harrow, Middlesex.

FOR SALE: 62 set, 1 to 10 mc Tx/Rx, mint condition, complete with phones, mike, key, handbook with circuit, £26.—Box No. 2781, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: AR88D, £30.—Bushell, Park East, Clarboston Road, Pems.

SALE: Minimitter Mobile Tx, 160, 80, 40 and 20 whips, 12v. transistor PSU, control box, now wired and mounted as one unit, run-in /M last season, £30. MR-38 8-band Rx, designed for fixed and mobile operation, stab. oscill., 12v. valves, £25. R.209 Rx 1-20 mc, 6v. input, 10 min. valves, £15. All carriage extra.—Jones, 3/50 Shelley Road, Worthing. (*Tel. 9852*).

WANTED: Olympic type T150 Transmitter, first-class condition essential, buyer would collect, reasonable distance Southampton.—Box No. 2782, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

CLEARING UNWANTED STOCK of mostly new valves, 815 (3), 30s. each; 805 (2), 30s. each; 813 with base, 40s. 4/65A with base, 40s. TZ40, 20s. Filament transformer, 10v. 8A. CT, and 10v. 10A. CT, standard primary, 20s. Good Panda Explorer transmitter, £40. All carriage extra.—Airey, 14 Brandles Road, Letchworth, Herts.

AR88D (fitted S-meter), immaculate, £45. **AR88LF**, £35. (Or exchange SB10U). Panda PR120V, £65. Complete 50-watt CW Tx, band-switched 10-160 metres; inspection welcomed.—GM3CRY, Craiglea, Bonfield Road, Strathkinness (Fife). (*Telephone 219*).

FOR SALE: Complete station, £45. Collins TCS 12, R.1475, BC-453, 454, RF-24, 25, 26. PSU and speech amp built into cabinet, fully metered, LP filter, TVI proof, G.P.O. checked, many other items, can be seen and tested any evening. Deliver North and West London.—G3NFP, 26 Gloucester Road, Tottenham, N.17.

FOR SALE: R.109T, brand new AR88D, MW BC-454 and BC-455 Command Receivers; s.a.e. details.—Thompson, Mere Close, Hull Road, Hornsea, Yorkshire.

EDDYSTONE S.640: (reconditioned), unmodified, prefer buyer collect, £22 o.n.o.?—R. J. Newey, 23 Lea-House Road, Causeway Green, Oldbury, Nr. Birmingham.

AR88 FOR SALE: Good condition, £28; buyer collects.—Mather, 2 Range Road, Manchester, 16.

EDDYSTONE 840: mint £22. R.109, 1.8 to 8 mc, £5. Bendix Tx 80-40 metres, £4. 60-watt Tx Top to ten, seen working, £35 o.n.o.?—Callers only.—Derrick, 23 Withins Close, Bolton, Lancs.

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IX4 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX5 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX6 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX7 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX8 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX9 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX10 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX11 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX12 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX13 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX14 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX15 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX16 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX17 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX18 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX19 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX20 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX21 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX22 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX23 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX24 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX25 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX26 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX27 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX28 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX29 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX30 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX31 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX32 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX33 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX34 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX35 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX36 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX37 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX38 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX39 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX40 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX41 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX42 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX43 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX44 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX45 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX46 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX47 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX48 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX49 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX50 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX51 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX52 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX53 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX54 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX55 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 12/6			
IX56 ... 5/6	6AT6 ... 5/6	6L6 ... 5/6	12A17 ... 5/6	83 ... 8/6	DF95 ... 7/6	FW4800 ... 8/6	PY80 ... 6/6	UF89 ... 1			

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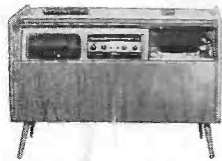
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