

The SHORT WAVE Magazine

VOL. XX

MARCH, 1962

NUMBER 1

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Features

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Features

Slide rule bandspread calibrated on 10, 15, 20, 40 and 80 metre amateur bands. One R.F., two I.F., and separate bandspread tuning condenser. Temperature compensated oscillator and built-in speaker. Frequency coverage: Broadcast Band 540-1500 Kc plus three S/W Bands 1550 Kc - 34 mc.

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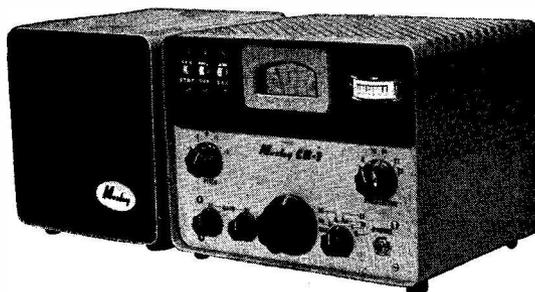


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Receiver is equipped with an automatic noise limiter which is very effective against impulse noises.

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S-meter functions on AM, CW or SSB, with or without BFO.

Five dual-purpose valves plus four semi-conductor diodes provide functions of 12 valve sections.

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SELECTIVITY: 2.5 kc. at -6 db.

SENSITIVITY: ½ microvolt for 10 db. signal-to-noise ratio on ten metres.

STABILITY: Less than 500 cycles drift after one-minute warm-up. Less than 200 cycles change for 10% line voltage change. Temperature compensated and voltage regulated.

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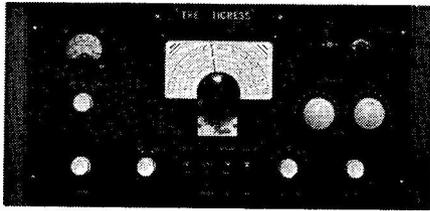
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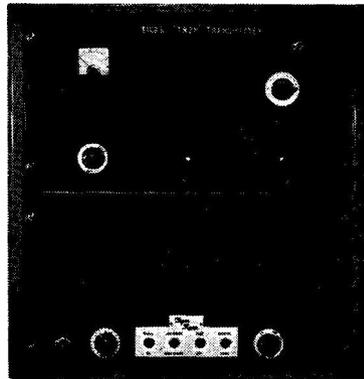
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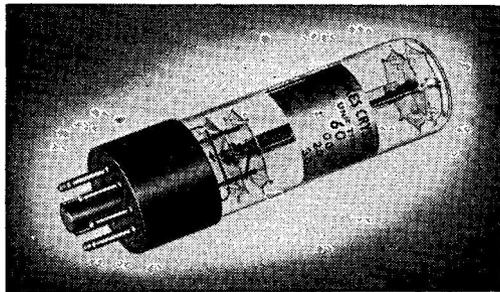
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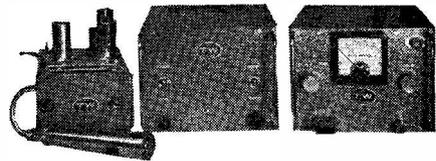
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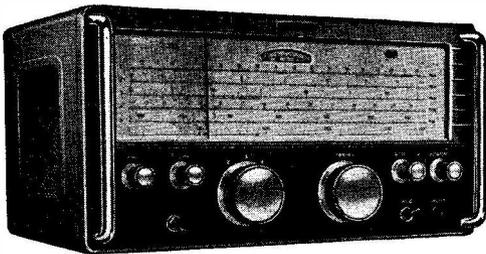
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INDEX TO
ADVERTISERS

	PAGE
Anglin	<i>cover iii</i>
Avo, Ltd.	53
Brookes Crystals	5
Cathodeon Crystals, Ltd....	55
Crystals & Components, Ltd.	3
Daystrom	<i>cover iv</i>
Easibind, Ltd.	56
G3HSC (Morse Records)... ..	56
G.W.M. Radio	54
Harris, P.	54
Henry's	55
Home Radio	6
Jack Tweedy	56
James Scott & Co., Ltd. <i>front cover</i>	
K.W. Electronics	8
Labgear	4
Minimitter	<i>cover iii</i>
Mosley Electronics	1
National Radio	52
Norman Birkett, Ltd.	52
Peter Seymour	4
Short Wave (Hull) Radio... ..	53
Small Advertisements	51-56
Smith & Co. (Radio) Ltd.	5
Southern Radio	6
Southern Radio & Elec.	56
Stratton	<i>cover ii</i>
S.W.M. Publications	2
Tiger Radio, Ltd.	4
Whitaker	<i>cover iii</i>
Withers	5
Young	6

SHORT WAVE MAGAZINE

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CONTENTS

	Page
Editorial	9
Heterodyne Frequency Meter with Crystal Calibrator, <i>by E. Pawson (VQ5IB/G8AP)</i>	10
Transistorised Mobile Transmitter, by M. W. Rignall (G3OYX)	17
QRP Transistor Transmitter for Mobile, by R. M. Galloro (G3PAA/M)	19
Mobile Rally Programme	19
DX Commentary, by L. H. Thomas, M.B.E. (G6QB)	21
The Repair of Moving-Coil Meters, by G. W. McDonald (G2OX)	29
SWL — Listener Feature	31
The G.73 Wavemeter, by H. G. Woodhouse, M.A. (G3MFW)	36
VHF Bands, by A. J. Devon	38
Amateur Microwave Equipment, Part II, by D. Clift (G3BAK)	41
The Other Man's Station — G3BIK	45
New QTH's	47
The Month with The Clubs — From Reports	48

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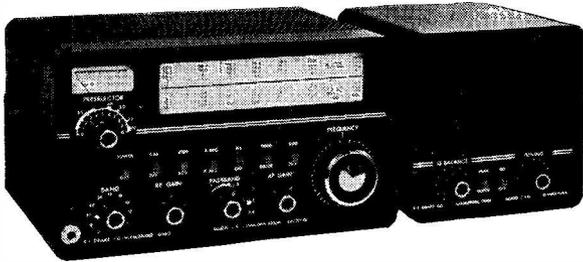
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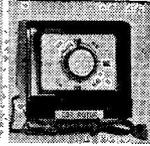
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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT-WAVE Magazine

E D I T O R I A L

Records *In reflecting on all the interests and channels of activity which can be followed in Amateur Radio, we have wondered whether AT station operators are as particular about keeping accurate records as were the amateurs of earlier days — and by “records” we do not mean simply the compiling of a neat and tidy log.*

It is true that the sight of a callsign entered some time in the past can evoke memories and for some that is probably enough. But there can be much more to it than that — notes on conditions and the level of activity during particular periods, equipment in use, the aerial system employed at different times and changes made, comments on different operators and the QSO's made, unusual contacts heard, notes on visitors to the station or calls made on others — are merely a few examples of the sort of thing which can be entered in the log together with the more usual details covering stations worked. None of this sort of information is likely to be of much use or interest to anyone except the operator concerned — but to him years later it can make the most absorbing reading, and may even disclose some useful fact or give the key to some problem.

Apart from this, the habit of keeping accurate records is worth cultivating for its own sake, because in a subject like radio, and in particular Amateur Radio, each generation tends to re-find, for its own interest, much of the data; this is a process which often results in old ideas and established facts being rediscovered as something new, or having the appearance of originality. No bad thing as a mental exercise, but something of which it is as well to be aware. In the old days most operators kept large notebooks in which they recorded all their experimental work. As the years went on, they compiled a great quantity of practical information and though much of it became useless as techniques advanced, such records are of great historical interest. We hope that many of our readers are keeping the same sort of records today.

*Austin Forster
G6FO.*

WORLD-WIDE COMMUNICATION

Heterodyne Frequency Meter with Crystal Calibrator

DESIGN, CONSTRUCTION
AND PERFORMANCE

E. Pawson (VQ5IB/G8AP)

This is a practical approach to a subject of interest to many an AT station operator—the provision of an independent, accurately calibrated and reliable frequency measuring unit. All such instruments—on our HF bands, at least—work on the principle of a variable-frequency oscillator used as an external heterodyne wavemeter. The problem is to build and calibrate such an oscillator to the required degree of accuracy and stability. This article explains how it can be done on the amateur work-bench.—Editor.

MOST amateurs at times feel the need of a reliable frequency meter and it is, in any case, obligatory to have a means of ensuring that the transmitter frequency stays within the amateur bands. Although many modern receivers incorporate a crystal calibrator, there are considerable advantages in having a compact separate instrument, which includes both a crystal standard and a stable, calibrated wide-range heterodyne oscillator. Good quality frequency-meters can be purchased—the BC-221 is well known—but, even second-hand, they are not cheap. In any case, it is the writer's view that building such a piece of apparatus (and getting it working satisfactorily) is not only very interesting, but also very instructive.

Having purchased a Brookes 100 kc standard bar, in vacuum mounting on a B7G base, and having obtained a 1000 kc crystal from a No. 48 Set, the author decided to build both these into a crystal oscillator, and to put a VFO (as a heterodyne oscillator) into the same box. While there is nothing new in this idea, nor in the circuits used, the detailed arrangement, and the results obtained, may be of interest to other amateurs.

Frequency Range of the Oscillator

Range switching was not considered acceptable, so attention was concentrated on a Clapp oscillator, of which the harmonics would be used on the higher-frequency bands. This leaves one with the choice of covering most of the bands with rather poor bandspread, or providing mainly for the 7, 14 and 21 mc bands. The latter alternative was chosen, as good bandspread was considered essential; in addition, those three bands were of most interest at this station.

The heart of the instrument was to be the Eddystone 898 dial, the full traverse of which gives 500 scale divisions. It was finally decided to make the calibrated range 3500-3600 kc, and to set the instrument so that this coincided with scale readings of 50 to 450 on the dial. Although the HO would, for convenience, be running on 3.5 mc, its main function would be on the 2nd, 4th, 6th (and, to a lesser extent, 8th) harmonics. The following ranges would thus be spread over 400 scale divisions:

7.000 — 7,200 kc;
14.000 — 14,400 kc;
21.000 — 21,600 kc;
28.000 — 28,800 kc.

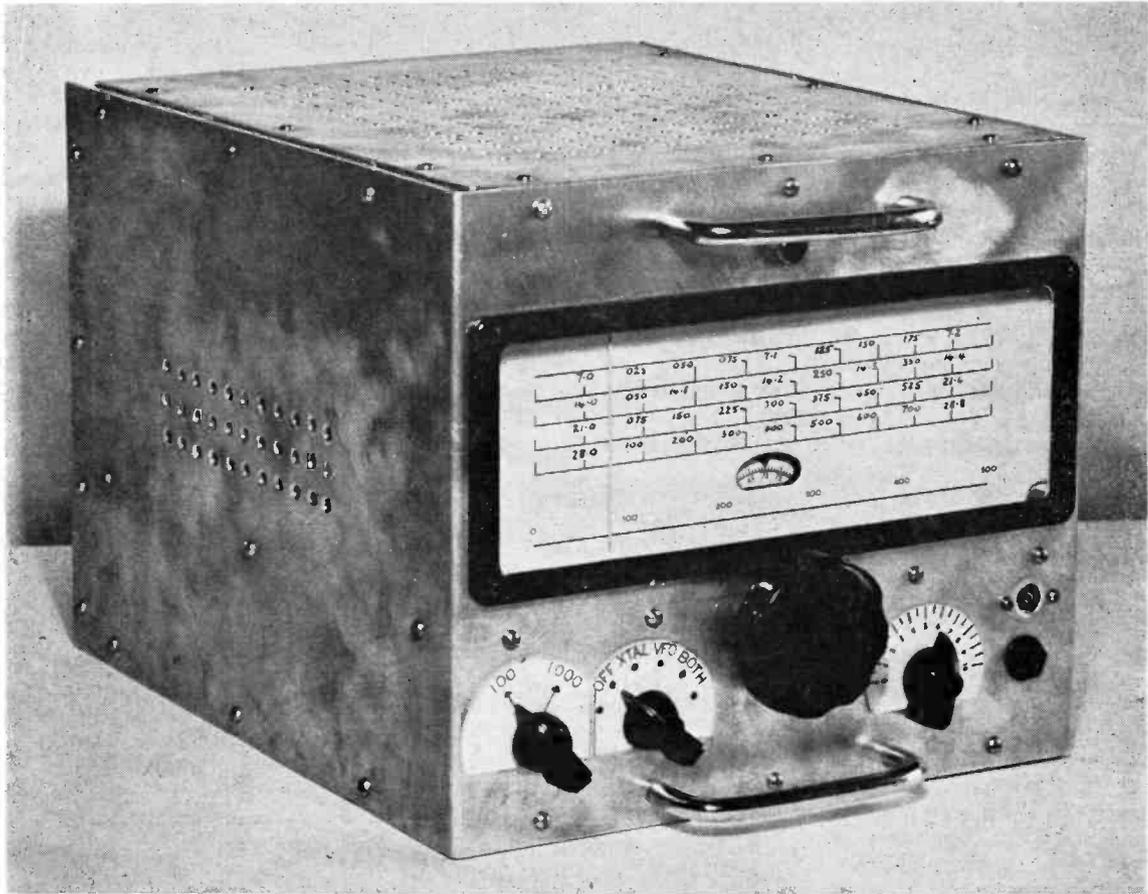
If it is desired to cover the 1.8, 3.5 and 28 mc bands adequately, the only real answer seems to be to capacity switching.

Circuit

One EF91 (6AM6), V2 in Fig. 1, is used in a conventional Clapp circuit, and a second EF91, V1, as a Colpitts crystal oscillator. A switch (S1) has been incorporated, so that either the 100 kc or 1000 kc crystal may be switched in, together with their respective bridge condensers. In addition, a diode D has been put into the output circuit to improve harmonic content.

It will be noted that the capacity in the VFO (HO) tuned circuit has altogether five components. C8 is the main tuning condenser of 13.5 $\mu\mu\text{F}$ maximum capacity, while C9 in series with it reduces its capacity swing, and permits exact control of the degree of bandspread. C10 provides most of the padding capacity, and C11 allows a small fraction (about 3 $\mu\mu\text{F}$) of the latter to be controlled from the panel, for zero-setting the oscillator. Finally, C12 is the negative-temperature-coefficient (n.t.c.) component, which materially improves the frequency stability. The inductance L1 is not adjustable.

At VQ5IB, a 320/6.3 volt power supply is



The heterodyne frequency meter as described in the article. It is capable of giving a high order of frequency measurement on the HF bands, provided the crystal calibrator can be accurately checked against WWV, WWVH or MSF. The crystal selector and function switches are on the left of the tuning control. The dial and tuning mechanism are of the latest Eddystone design, giving a wide sweep on the scale. Two crystal oscillator frequencies, of 100 and 1000 kc, are used and can be brought out separately; the zero-setting knob for bringing the instrument on to calibration is on the right.

on tap from an outlet on a small receiver, so one 90-volt and one 150-volt regulator tube V3, V4 in series were built into the unit. The crystal oscillator and VFO thus draw regulated supplies at 240 and 150 volts respectively. The total HT drain is about 16-18 mA. The function switch S2 controls HT as follows: position 1, *off*; position 2, *crystal on*; position 3, *VFO on*; position 4, *both on*.

Construction

The unit was built into a box $9\frac{5}{8}$ ins. wide x $8\frac{1}{2}$ ins. high, and $11\frac{1}{2}$ ins. from front-to-back, constructed from 16 gauge aluminium—see photograph. The width chosen was about the minimum which would take the Eddystone dial. Doubtless each constructor will build the box in his own way, but it was found con-

venient here to bend one piece to form the front panel and two sides. The chassis (with only a narrow flange), back, top and bottom covers were then made from four separate pieces, fixed where necessary by means of angle strips. This made a good solid job, and the generous dimensions assist heat dissipation and enhance stability. To improve this further, a series of 3/16-in. ventilating holes were drilled: 208 in the top cover, and 33 in each side above the chassis. A pleasing burnished appearance was achieved by giving the pieces a hard scouring with a power-driven wire brush before assembly.

Components and wiring are straightforward. The main dial is of best possible quality, and the tuning condenser C8 ($13.5 \mu\mu\text{F}$) is also a good quality Eddystone. The other expensive

component is, of course, the 100 kc standard bar, but a first-grade crystal is essential. Apart from these, most of the items were home made or second-hand, in many cases obtained from surplus equipment. Except for C12, Philips concentric air trimmers were used for all padding and trimming functions, as a large number were at hand from stripped 88 Sets.

The crystal oscillator trimmers C2 and C4 (two Philips condensers each) are soldered through small silvered strips, which are then mounted on a perspex bridge over a slot in the chassis. C2 and C4 are thus isolated from each other and from chassis.

The zero-setting capacitor C11 needs to be only 2 or 3 μF maximum capacity, so a little surgery was performed on an old 50 μF variable. All except one pair of plates were filed off; these were bent a little farther apart, and the capacity was finally brought to a suitable value by soldering on, in series, a sub-miniature 4.7 μF tubular ceramic.

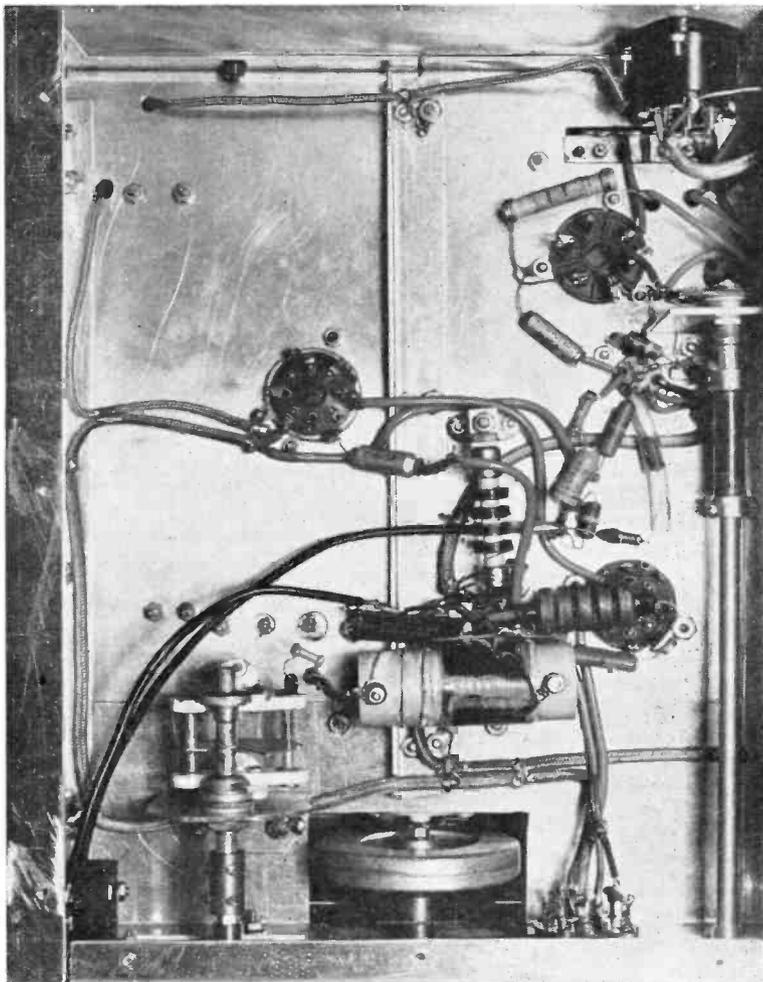
The coil is wound with 26g. enamelled wire on a 1-in. diameter ceramic former, such as those found in 21 Sets. Some of these have wide-spaced spiral grooving: the tendency of the wire to slip into the groove was overcome by first covering the former with thin (.01 in.) polythene. Some experimenting was needed in the number of turns, but the size finally arrived at was 45 turns close-wound, plus 3 turns spaced out over $\frac{3}{4}$ in. The purpose of the 3 wide-spaced turns was to bring the wire to the end of the former, as this is made with the fixing holes at the extreme ends. After completing adjustments, the turns were anchored with polystyrene cement. The finished coil was mounted under the chassis on two short pillars, consisting of 4 BA bolts with nuts and locking washers.

The power supplies at 320 and 6.3 volts

were brought into the back, through a recessed (safety) 6-way socket, obtained complete with plug from a 38 Set. (These ex-Army units are extremely useful as a source of bits and pieces!) The output from the two oscillators is brought through low value fixed condensers to suitable connectors on the front panel, such as coaxial sockets or jacks.

Setting Up

When using the crystal oscillator, *e.g.* when zero-setting the HO or calibrating, it has been found convenient to connect the crystal output socket to the receiver aerial socket. On the other hand, when using the oscillator as a frequency meter, it is often unnecessary to make



Under-chassis view of the Frequency Meter, showing general layout. The switch S2 (see circuit) is beside the dial-control flywheel, and the zero-setting condenser on the left of the coil. The power connections are carried in screened leads.

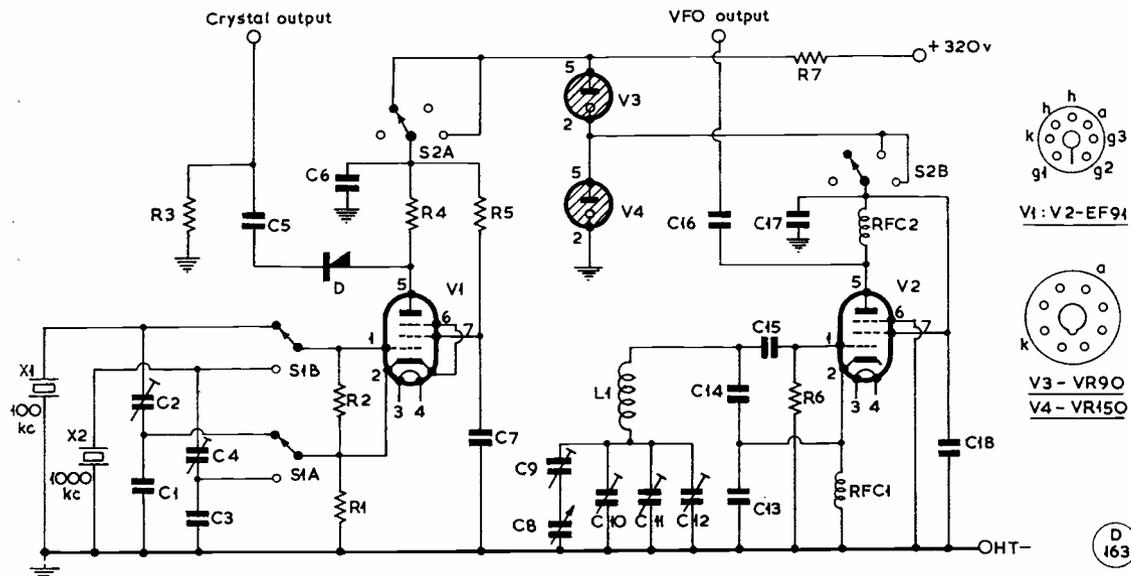


Fig. 1. Circuit of the instrument described in the article. The circuitry associated with V2 forms the stabilised variable frequency oscillator, the coverage of which can be calibrated to a high degree of accuracy — see text. V1 is a CCO with switched 100/1000 crystals for marking and checking the variable oscillator; it can also be used as a separate 100/1000 kc marker, giving band-edge and calibration beats into the receiver.

any connection to its socket. It beats satisfactorily with incoming signals, or with the exciter unit of the transmitter.

After warming up the instrument for about half-an-hour, the station receiver was tuned to the 15 mc transmission of WWVH. With the crystal oscillator running at 100 kc, trimmer C2 was adjusted to pull the frequency into zero-beat with WWVH during one of the unmodulated periods of transmission. The 1000 kc crystal was then switched in and a similar procedure followed, using the trimmer C4. The two trimmers were then fixed with sealing compound.

The heterodyne oscillator was next adjusted for frequency and bandsread. With the help of the crystal oscillator, the receiver was first tuned to 7000 kc. The n.t.c. condenser C12 was set to about one-quarter capacity and left there during this series of adjustments. The series condenser C9 was set nearly at maximum, the main tuning dial at exactly 50, and the zero-setting control C11 at about 60% of full scale. The HO was then switched on and the padding condenser C10 adjusted to bring the frequency to that of the receiver. Then, with the HO and crystal oscillator both on, the zero-setting control was used to zero-beat the oscillator with the 7000 kc crystal harmonic. (Note that it is necessary to bring the HO close to 7000 kc before putting the crystal oscillator on, as otherwise zero-beats can be

Table of Values

Circuit of the Frequency Standard

C1, C13,	.001 μ F, silver mica	R2, R3 =	0.5 megohm $\frac{1}{2}$ w.
C2, C4,	60 μ F trimmer (Two Philips concentric trimmers in parallel)	R4 =	22,000 ohm $\frac{1}{2}$ w.
C10 =	60 μ F trimmer	R5 =	100,000 ohm $\frac{1}{2}$ w.
C3 =	220 μ F tubular ceramic	R6 =	68,000 ohm $\frac{1}{2}$ w.
C5 =	6.8 μ F tubular ceramic	R7 =	5,000 ohm 5w.
C6, C7,	.01 μ F bypass type	S1 =	2-pole, 2-way wafer type
C17, C18 =	13.5 μ F variable (Eddystone 580)	S2 =	2-pole, 4-way wafer type
C8 =	3/30 μ F Philips concentric trimmer	RFC1 =	1.5 mH RF choke
C9 =	2 or 3 μ F variable (see text)	RFC2 =	2.5 mH RF choke
C11 =	7/45 μ F trimmer, negative coeff. (N. 500)	L1 =	45 turns 26g. enam., close wound, plus 3 turns winding length $\frac{1}{2}$ in. Wound on lin. dia. ceramic former. (see text)
C12 =	100 μ F silver mica	X1 =	100 kc standard crystal
C15 =	15 μ F silver mica	X2 =	1,000 kc crystal
C16 =	10,000 ohm $\frac{1}{2}$ watt	D =	General - purpose diode, OA81
R1 =		V1, V2 =	EF91 (6AM6)
		V3 =	VR90
		V4 =	VR150

obtained with the oscillator tuned to the wrong 100 kc harmonic, even though the receiver is on 7000 kc.)

The main tuning dial was then set at exactly 450, and the receiver used to determine whether the oscillator frequency was above or below the 7200 kc crystal harmonic. In accordance with the result, the series condenser C9 was slightly reduced or increased respectively. This whole process was repeated

until the heterodyne oscillator was accurately zero-beat on 7000 kc at a dial reading of 50, and accurately zero-beat on 7200 kc at a dial reading of 450. C9 was then fixed with sealing compound.

Temperature Compensation and Final Trimming

The setting of the n.t.c. condenser C12 has to be done before the main trimmer C10 is finally set and sealed, because it forms part of the total padding capacity. The procedure adopted with the original model was as follows:

The n.t.c. trimmer having already been left at about $\frac{1}{2}$ -capacity, the main dial was set at exactly 50, the functional switch at "both" and the power supply switched on. As soon as oscillation started (about 15 seconds), the zero-setter was used to bring the HO to zero-beat on 7000 kc, the time recorded and the instrument left running. At intervals, the main dial was altered to restore zero-beat, and the time and exact dial reading (estimated to 0.1 division) recorded. Suitable times were every 5 minutes during the first half hour, every 10 minutes in the second half hour, and thereafter every 15 minutes up to a total time of about $2\frac{1}{2}$ hours. The character of the drift can best be seen from a graph of the results, and one such example is reproduced here—Fig. 2. If the zero-beat reading goes appreciably above 51, or if it continues to rise after about the first 25 minutes, more n.t.c. capacity is probably required. On the other hand, if

the zero-beat reading does not rise initially in the manner shown, or if the subsequent fall brings the reading much below $48\frac{1}{2}$, there is probably too much correction. The n.t.c. trimmer would then be adjusted in the appropriate direction and a new test carried out.

Readers not wishing to perform these experiments may obtain a simpler check. The instrument is switched on as before, the dial set at exactly 50, and the HO zero-beat on 7000 kc. It is then simply left running for 2 hours. At the end of this time, the dial is reset for zero-beat, and the reading noted. If this is above 50, the instrument requires more n.t.c. capacity: if it is less than $48\frac{1}{2}$, the n.t.c. capacity needs reducing. After making the necessary adjustment to C12, a new check is carried out. The instrument should, of course, be allowed to cool right down between tests.

When the drift test is satisfactory, the ceramic trimmer is left, the main dial set at 50, and the zero-setting control put at 60% of full scale. The main trimmer C10 is adjusted to give a zero-beat on 7000 kc, and may then be fixed with sealing compound.

Calibration

The VFO is conveniently calibrated by running the receiver on the 28 mc band, and picking up each 100 kc harmonic of the crystal from 28000 to 28800 kc. The heterodyne oscillator is first zero-beat on 28000 kc with the tuning dial at exactly 50; at each of the subsequent 100 kc points, the zero-beat dial reading is accurately recorded. In addition,

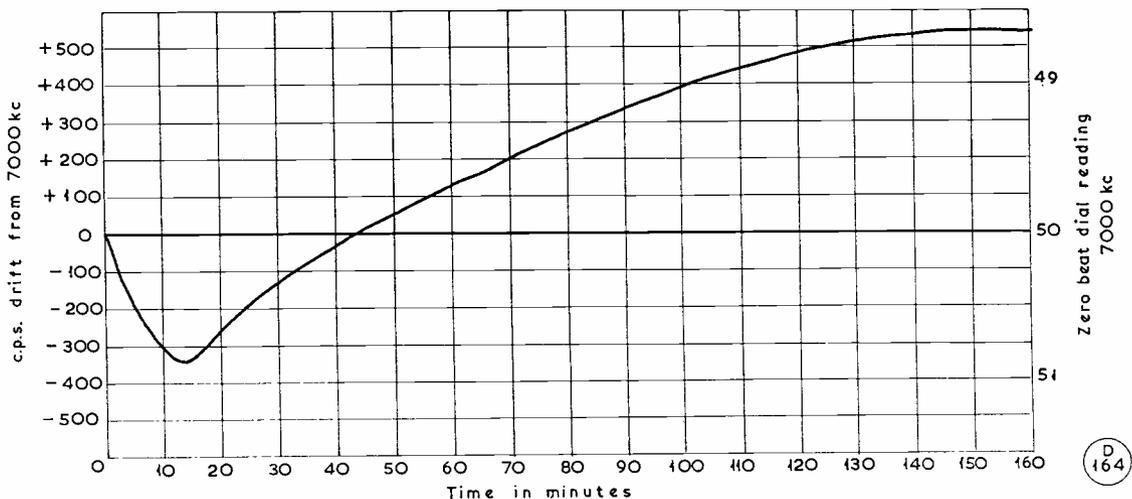


Fig. 2. The drift characteristic curve of the crystal-checked heterodyne frequency meter, in conditions as described in the text. As explained in the article, the shape of this curve can be varied according to the adjustment of the negative coefficient condenser. Where a long warm-up run is possible, it is sufficient to check the scale against the crystal standard as readings are taken.

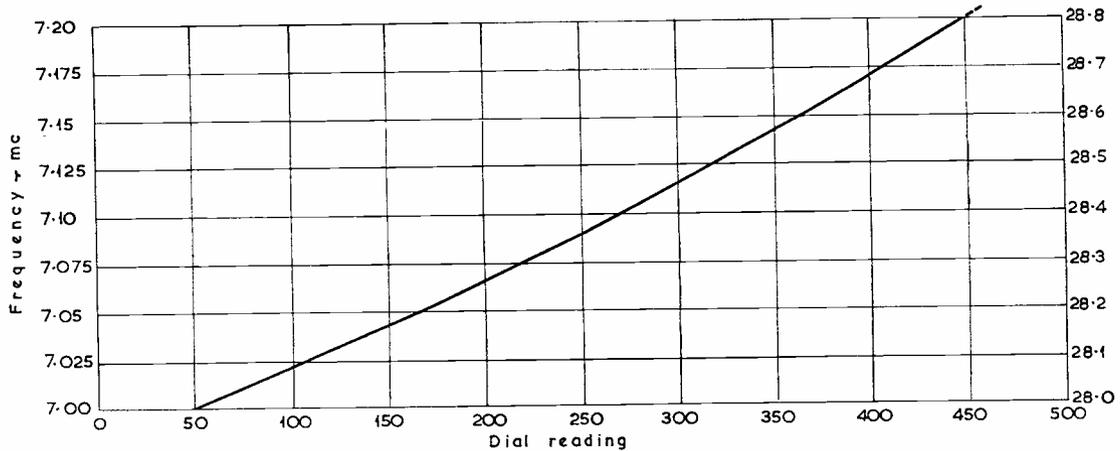


Fig. 3. The final calibration curve of the crystal-checked heterodyne frequency meter, as described in the article and shown in the photographs. From this basic curve, obtained from a specimen instrument constructed on the principles given in the text, graphs can be produced covering the higher frequency bands. Accuracy is limited only by the extent to which the crystal checker can itself be adjusted to zero-beat with some external frequency standard, such as WWV or MSF.

by tuning the receiver to the 21 mc band, four further calibration points may be picked up, corresponding to fundamental frequencies of 3516.6, 3533.3, 3566.6 and 3583.3 kc. From the 13 points so obtained, a graph of frequency against dial reading is constructed. In order to do this, it is strongly recommended that a "flexible curve" be obtained to assist in the drawing. If this is used, and adequate care and patience exercised, a perfectly smooth and highly accurate curve can be drawn—see Fig. 3. For this purpose, the flexible curve is far better than sets of "french curves."

Discussion of Results

The 100 kc crystal was easily set to zero-beat with WWVH, and required about the expected amount of trimmer capacity (50 $\mu\mu\text{F}$). The 1000 kc crystal obtained from the 48 Set, however, proved to be slightly inaccurate. After adjusting the trimmer as low as possible, it was still running 1.3 kc low on the 15000 kc harmonic. The rotors were therefore removed altogether from the trimmers, and this slight error accepted since, in any case, its main function is to provide 1000 kc identification points.

Some initial trouble was experienced in getting the heterodyne oscillator to go off satisfactorily, and the cause was eventually traced to wrong constants in the tuned circuit. The dimensions of the coil had been worked out "according to the book," but the L/C ratio actually present proved to be too high. After the coil had been pruned to the size given here, all was well.

Adjustment of the bandspread to exactly 400 scale divisions was quite straightforward and, when the setting was correct, the series capacity was estimated to be about 27 or 28 $\mu\mu\text{F}$.

Calibration was also very satisfactory. The final calibration graph is reproduced here and does not suffer from cramping at any part of the scale; in fact, it is quite a pleasing approach to a linear relationship. For convenience in use, it is useful to enter on to the station calibration chart the 7, 14, 21 and 28 mc frequency scales. One minor, though interesting, feature is the slight reversal to a sigmoid shape which occurs near the top of the curve. At first, this was thought to be experimental error, but calibrations under other conditions gave the same indication. It was finally confirmed by an extra frequency observation at a dial reading of 500 (shown in the dotted portion of the graph). Calculations by the author have confirmed that this is not an effect caused by the presence of series and parallel capacitors, in association with the tuning condenser. The latter is nominally a straight-line-capacity type, but it is suggested that, as it nears its minimum, the approach of the unmeshed end of the moving vanes of the stator will slightly diminish the rate of decrease of capacity. This effect would be confined to settings near the minimum and would cause the peculiarity referred to. Over the calibrated range, there is no detrimental effect on the linearity of the curve.

The aspect which the author found most interesting was the effect of temperature on

stability, and altogether 14 drift experiments were run. It is not necessary to give details of all these, but the main findings are summarised below.

The accompanying graph Fig. 2 shows the drift characteristic in the final arrangement. The zero-beat dial reading, also the drift from the original 7000 kc (dial maintained at 50), are shown plotted against time. During the first 40 minutes or so, the drift peaked to about -300 cycles and returned to zero. After that, it continued in a positive direction, reaching +500 cycles at about 130 minutes, when it flattened off and the frequency remained more or less constant.

When no n.t.c. capacity was used, the drift went continually more negative, and after only 30 minutes had reached -2.5 kc. On the other hand, when larger amounts of n.t.c. capacity than that corresponding to the graph were introduced, the initial "valley" diminished or disappeared. The subsequent rise was then greater, reaching values of more than +1.5 kc. The conditions illustrated by the graph therefore represent the best compromise, if one wishes to be able to use the meter soon after switching on. The graph shows that, for this degree of correction, if the meter is zero-beat as soon as it starts to oscillate, and is also reset once to zero-beat after running

about 80 minutes, it can be used the whole time after switching on, and will never be more than about 250 cycles in error (on 7000 kc). That maximum error could be further reduced, of course, if one elected to carry out any extra zero-setting adjustments.

The above is the author's preferred approach but, if one wished, slightly less n.t.c. correction could be used, so that the eventual rise in frequency would be less. The initial "valley" would then be greater, and the instrument would only be usable after that stage had been passed. In the author's final arrangement, the n.t.c. trimmer had been adjusted to an estimated value of about 13 $\mu\mu\text{F}$ (using type N500 trimmer).

To conclude the work, observations of temperature were made at two places inside the box: one close to the crystals, and one near the tuning condenser and ceramic trimmer. The temperature before use (and the room temperature) was 24 deg. C (75 deg. F). In five hours continuous running, the temperature only rose to 33 deg. C near the crystals, and 32 deg. C near the tuning condenser. No problems other than ordinary drift correction are posed by this nine-degree rise, and the 100 kc crystal would not change by more than 100 cycles at 7000 kc ($1\frac{1}{2}$ cycles at the fundamental).

INDEX TO VOL. XIX

Every copy of this issue of SHORT WAVE MAGAZINE carries—as a free loose supplement—a full index to Vol. XIX, March 1961 - February 1962. Any reader who should perchance find his copy without the index can obtain one free of charge on application, with a large stamped addressed envelope.

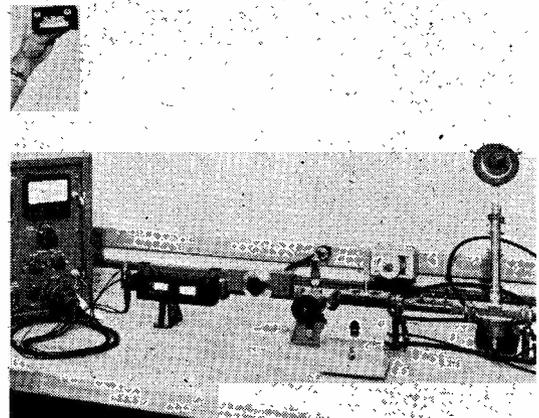
92nd SIGNAL REGIMENT, ARMY EMERGENCY RESERVE

The headquarters of the 92nd Signal Regt., A.E.R., is in East Scotland. The modern Army radio station there is equipped with the very latest gear, including QRO transmitters and receivers by a well-known firm. And there is an aerial farm really worthy of the name, over several hundred acres of land above which tower masts carrying rhombics and wide-band dipoles. The unit, of which the C.O. is GM6RI, has vacancies suitable for keen radio amateurs who would like to join a reserve organisation; callsigns held by other members of the Regiment include G3GVV, G3JNO and GM2HIK.

Training is limited to a fortnight only each year (in July or August), and pay is generous—at least 15s. a day, with a further 56s. a week for a married man, plus a bounty of £7 10s., making it a total of around £23 for the fortnight, of course with all found—and a jolly good time thrown in!

Wireless operators able to do speeds of 18 w.p.m.,

or skilled radio mechanics, who would like further details are invited to apply to: W. Robertson, GM6RI, School House, Tannadice, by Forfar, Scotland.



In this photograph, being held up on the left is an L-band (1120-1700 mc) amplifier consisting of two tunnel diodes; this amplifier which is self-contained for power, replaces all the equipment shown on the bench, and performs the same function. A new semi-conductor material, gallium antimonide, is now being used for tunnel diodes, and the noise factor has been got down to 2.5 dB.

Transistorised Mobile Transmitter

FOR TOP BAND WORKING

M. W. Rignall (G3OYX)

The design discussed here is of particular interest because valves and transistors are used together in a logical approach to the problem of adequate RF power capability in a compact and simplified mobile rig. It could all be done by valves (accepting a much heavier battery load) or it could all be done by transistors (getting very little RF power output). But by using transistors wherever possible and valves in the right places, the result is an economical transmitter in the 10-watt category, radiating a carrier that can be fully modulated.—Editor.

IN contemplating the design of a mobile transmitter three main factors were considered of prime importance: (a) Low power consumption; (b) Compactness; (c) Ease of operation. As regards (a) and (b) it is obvious that much can be gained by the use of transistors.

In the present state of the art, transistors capable of working at good efficiencies at 2 mc, to the maximum input power of 10 watts on 160 metres, are not readily available. In the present design, therefore, the use of transistors is restricted to the drive and modulator stages.

For the modulator a balance has to be struck between (a) and (b). A Class-A modulator will take more current but will require a smaller transformer (since the PA current and modulator standing current can oppose, giving a little standing DC). The drive requirements are also simpler.

A Class-B modulator will take less current but will require a larger modulation transformer and have a more complex and expensive driver (one more power transistor plus a phase splitter). Simplicity and cost finally decided that the Class-A modulator should be used.

For ease of operation PA and VFO tuning controls are ganged. No PA tuning meter was built in, the loading coil on the whip having a frequency-calibrated adjustment. All T/R functions are built into one switch.

RF Section

The VFO is a single Mullard OC44 in a grounded-base oscillator circuit, TR1. Its supply voltage is stabilised by means of a zener diode (D1) which is best described as a 6v. neon, the characteristics being almost identical. Power is removed from the oscillator during stand-by but the final frequency is reached within 3 seconds of switch-on due to the small thermal time constant of the germanium element in the OC44. Stability after this warm-up period is such that the drift does not exceed 500 c/s during a 5-minute transmission. TR2 is an untuned buffer, R4 also serving to isolate the oscillator. V1, V2 are conventional RF stages and need no further explanation.

As mentioned before, to facilitate rapid T/R changes the VFO and PA tuning controls are ganged. The coil L5 may have to be adjusted by a turn or two from the data given to track with L2, which must be adjusted so that the VFO tunes over the whole band.

Modulator

The modulator, running Class-A, uses only three transistors—TR3, TR4, TR5. An input of approximately 0.25v. peak-to-peak is sufficient to modulate fully; the input resistance is of the order of 1000 ohms depending on the transistors used. The input stage TR5 is a conventional grounded emitter arrangement working into an emitter follower. The collectors of TR3 and TR4 are commoned, thus reducing the dissipation of TR4 and providing a small amount of negative feedback. The audio input (at the point marked "mic" in the circuit) is from a moving-coil earpiece, as sold for transistor radios, but used as a microphone; it is followed by a transistorised pre-amplifier taking two OC44's, and having a total consumption of only 0.2 mA from a 1.5v. pen cell; this little amplifier gives a gain of 46 dB and its output, fed to TR5 in the circuit, is more than enough to enable the mobile transmitter to be fully modulated. The pre-amp. complete is built on a ½-in. tag strip; this is fitted inside a piece of ⅜-in. diameter tube, with the earpiece-microphone at one end. It is the audio output from this microphone-amplifier device that is coupled into TR5.

An alternative arrangement would be to use a carbon microphone with a 1:2 step-up transformer (transistor interstage type) the microphone polarising voltage being taken either through a resistor from the main 12v. supply, or from a separate dry battery. No pre-amp. would be needed and the transformer

secondary could be connected direct to "mic" in the circuit.

TR3, the final modulator transistor, must be fitted to the chassis, using insulating mica washers, to dissipate the heat generated by the standing current. The washers should be smeared with a little silicone grease or vaseline to improve the heat conduction into the chassis. The metalwork in this region should also be well ventilated and not sited too close to the car heater.

T1, for modulation, is a normal 30:1 audio output transformer of 40 mA primary rating. By correct connection of the secondary, the primary and secondary magnetising currents will oppose leaving no DC component in the core. The correct phasing is easily found by trial and error, since when wrongly connected the transformer will saturate, the result being only too painfully obvious—low modulation depth and poor speech quality.

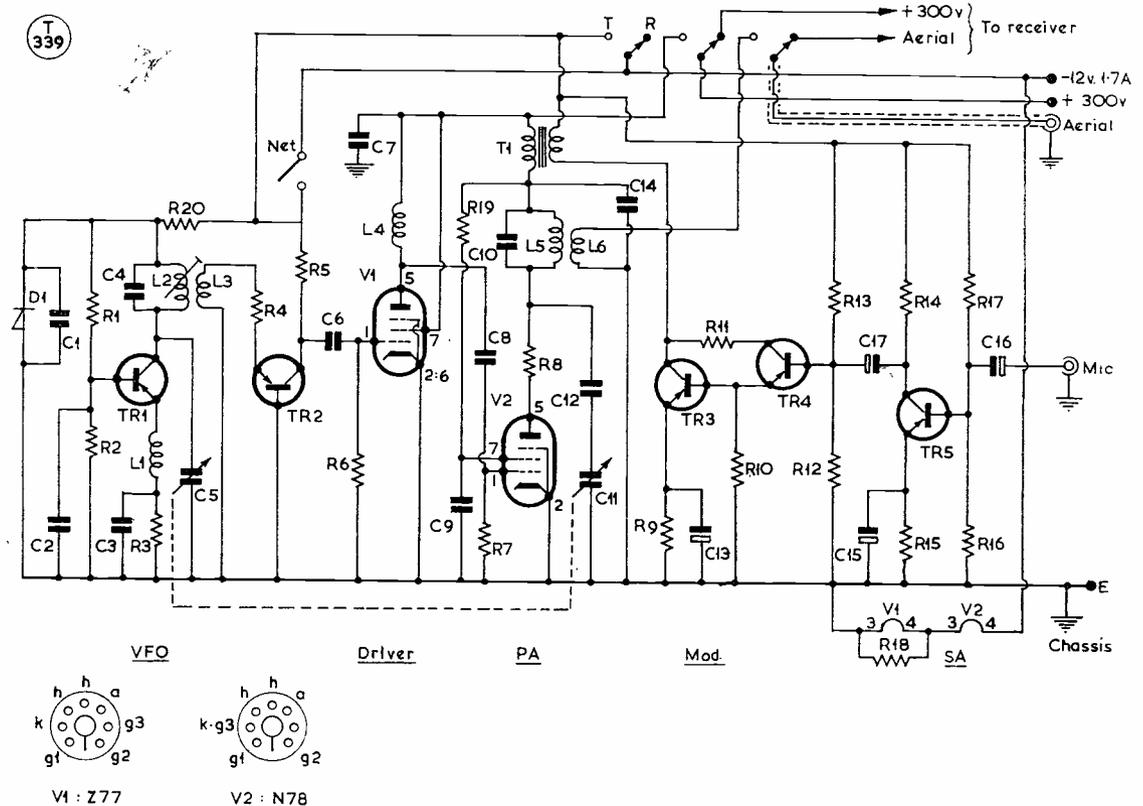
The emitter resistance R9 of the modulator

should be adjusted to give a standing current of 0.9-1 amp. The actual value will depend on the individual transistors used. This resistor should be wound in resistance wire and mounted clear of any transistors, for heat dissipation.

Mechanical Details

Due to the highly individual installation problems involved in amateur mobile operation, no specific layout dimensions are given, since every transmitter will be tailor-made to fit any available recess in the car. The layout of this transmitter is, however, less critical than an all-valve equipment, since pick-up between circuits is less due to the low circuit impedances prevailing in transistor systems.

The VFO and buffer stages are best screened in a separate compartment, although in the first model no FM effects or instability resulted without such precautions. A point to note is that the VFO should be placed as far away



Circuit of the 160-metre mobile transmitter described in the article by G3OYX. In all but the driver-PA stages (V1, V2) transistors are used, the OC16 at TR3 giving sufficient audio output to modulate the carrier fully. D1 is a zener diode, for stabilisation, and should be shown (in the circuit here) as a diode symbol with the negative side upwards, towards the -12v supply. At the AF input end, TR5, either a carbon microphone could be used through a 1:2 step-up transformer, or a crystal microphone with a transistor pre-amplifier. What amounts to one-knob control of the RF section is obtained by ganging C5 and C11, with L6 coupled into a tuned whip aerial. Using a transistorised HT converter for the 300v supply, the total battery load is less than 3 amps.

Table of Values

Circuit of the Transistorised Mobile Tx

C1, C2,	R10 = 560 ohms
C3, C8 = .02 μ F, paper	R12 = 5,600 ohms
C4, C10 = 220 μ F, mica	R13 = 10,000 ohms
C5, C11 = 50 + 50 μ F, var.	R14 = 3,900 ohms
C6 = 470 μ F, mica	R16 = 6,800 ohms
C7, C14 = .01 μ F, 750v., mica	R17 = 39,000 ohms
C9, C12 = .001 μ F, paper	R18 = 18 ohms, 3w., w/wound
C13 = 500 μ F, 6v. elect.	R19 = 18,000 ohms, $\frac{1}{2}$ -w.
C15, C16 = 50 μ F, 6v. elect.	T1 = mod. xformer (see text)
C17 = 50 μ F, 12v. elect.	TR1 = OC44, VFO
R1, R7 = 22,000 ohms	TR2 = OC170, buff.
R2 = 3,300 ohms	TR3 = OC16, mod.
R3, R4,	TR4 = OC72, driver
R15, R20 = 1,000 ohms	TR5 = OC71, amp.
R5 = 2,200 ohms	D1 = OAZ201, zener
R6 = 220,000 ohms	V1 = Z77, or EF91
R8, R11 = 100 ohms	V2 = N78.
R9 = See text (to give 0.9-1.0 amp. through TR3)	

(All resistors rated $\frac{1}{2}$ -watt unless otherwise stated)

TABLE OF COIL DATA

L1 — 4 turns 34g. on $\frac{5}{8}$ -in. dia. former, close wound.
 L2 — 60 turns 34g. on $\frac{1}{8}$ -in. dia. former, close wound.
 L3 — 12 turns 34g. on $\frac{1}{8}$ -in. dia. former, close wound.
 L4 — 1 mH RF choke.
 L5 — 45 turns 20g. on $\frac{1}{2}$ -in. dia. former.
 L6 — 8 turns over-wound on L5; adjust for Ae. coupling.

Note : L1 and L2 are on the same former with L3 over-wound on L2.

from the modulator as possible, since the heating effect of TR3 causes a marked temperature rise of the chassis in its near vicinity; this could lead to a slow VFO frequency drift, but adequate ventilation will minimise this.

Conclusion

Total power consumption is approximately 1.7 amps, plus the drain from the HT converter which will vary according to the type used; with a transistorised converter 80% efficient the total load is 2.9 amps. This compares favourably with the 6-7 amps required in an all-valve transmitter using a rotary converter.

QRP TRANSISTOR TRANSMITTER FOR MOBILE

R. M. Galloro (G3PAA/M)

TRANSISTORS have now reached a point where it is possible to use them in transmitting equipment, delivering RF watts up to high frequencies. The transistor transmitter QRP rig described here is small, light, compact, and portable, as well as being very economical on the batteries—the ideal basis for mobile operation on Top Band.

A ten-transistor transmitter has been constructed and tested out over the last few months, fixed and mobile, using only 90 to 180 milliwatts DC input. The results obtained with this very low power have been very remarkable (and at times hard to believe),

and every time a contact was made with other stations, modifications were tried, sometimes for better or worse results. A regular schedule with G3ORE (Caterham, 17 miles) and G2BSQ in Ashted, using this little handful of battery power, operating on phone, produced R5 S6-8 reports from both stations. This was using a 70-ft. aerial at the home QTH (Whitton, Middlesex). Another outstanding contact was with G3NEE (Waltham Cross), who gave RS-56. Recently, a CW test with G2BSQ was overheard and copied solid by G5AQ, located 14 miles from Eastbourne.

Testing this QRP rig out mobile, using a centre-loaded whip, and having made a sked with G3NHH, near Twickenham, it was found that mobile contact could be kept with him all the way from Twickenham to Chertsey. From Fox Hill on Chobham Common, checked on a survey map to be 13 $\frac{1}{4}$ miles from G3NHH, a QSO was maintained for over an hour, using 120 milliwatts and operating on phone static-mobile. Other tests from this same site have been equally encouraging, stations up to 12 miles distant having been worked on phone.

Transistor Transmitter

The transistor line-up as used on these tests consisted of an OC44 oscillator, OC44 untuned buffer, into an OC44 tuned buffer, driving two OC171's in the final; the modulator section, also all-transistor, delivered one watt of audio. The rig has now been modified to run one watt on the RF side, but the present modulator does not give enough audio to fill the carrier. However, a modulator with a line-up of, say, OC71-OC44 into push-pull OC44, into two OC23's in push-pull, should give sufficient audio output for the Top Band QRP rig, running one watt in the PA.

The writer would like to express sincere thanks to all who have helped with many reports and given assistance; they are G3NHH, G3ORE, G2BSQ, G6NW, G3NPU, G3OIC and also G3PCC.

MOBILE RALLY PROGRAMME

Further to the note on p.649 of the February issue of SHORT WAVE MAGAZINE, we have been informed of the following fixtures:

April 29: Trentham Gardens, Stoke-on-Trent (Midlands Amateur Radio Society).

June 24: U.S. Air Base, Barford St. John, Oxon (Amateur Radio Mobile Society).

June 24: Yorkshire Coast Mobile Rally, Spa Royal Hall, Bridlington, East Yorkshire (Bridlington and District Radio Society).

July 8: Bents Park Recreation Ground, South Shields (South Shields and District Amateur Radio Club).

August 29: Annual Rally, Rykneld Schools, Derby (Derby and District Amateur Radio Society).

September 16: Lincoln Hamfest and Mobile Rally (Lincoln Short Wave Club).

Details in respect of each of these will be published in the appropriate issues, as further informa-



tion is received from the organisers. While the clash on June 24 is unfortunate, it may not be of any great consequence, as the meetings are about 175 miles apart.

As regards Harewood House this year, we are informed that the Spen Valley Amateur Radio Society will *not* be undertaking a Rally there this season.

Organisers who have Rally events under consideration are advised to let us have their dates as soon as possible. Actual details can follow later, in time for coverage in the appropriate issue of the *Magazine*. For April publicity, the closing date is March 16.

The WABC/M Award

As those who noticed G5PP's article in our December issue will know, the mobile endorsement can be obtained on a WABC (Top Band U.K. Counties) Certificate; only one has been issued so far, to G5PP. The conditions are that the necessary minimum of 60 U.K. counties must have been worked two-way on 160 metres, strictly under /M conditions, *i.e.* mobile-rolling or static-mobile, with no external connection of any sort to the vehicle, which must be capable of being driven off while a QSO is in progress; a statement to this effect must be signed, and the necessary QSL cards shown. The Certificates will be issued in the existing WABC numerical sequence—see p.587 January issue, *SHORT WAVE MAGAZINE*—and the mobile endorsements will be numbered in series from No. 1 (held by G5PP/M). WABC/M claims should be clearly indicated as being for "Mobile," with the check list headed accordingly. Certificates issued will be notified in this feature.

And in this context, it might be added that our VHF Century Club (VHFCC) Certificate can also be gained with the /M endorsement, under normal VHFCC rules—see "VHF Bands," p.656, February *SHORT WAVE MAGAZINE*—and the conditions attaching to mobile working as mentioned above for the WABC/M award. For those who may be interested, two VHFCC/M's have so far been issued—to G3FRV/M and G5ZT/M.

Some Useful References

Those contemplating mobile operation, or looking for inspiration, may be interested in the following references, all to useful practical articles which have

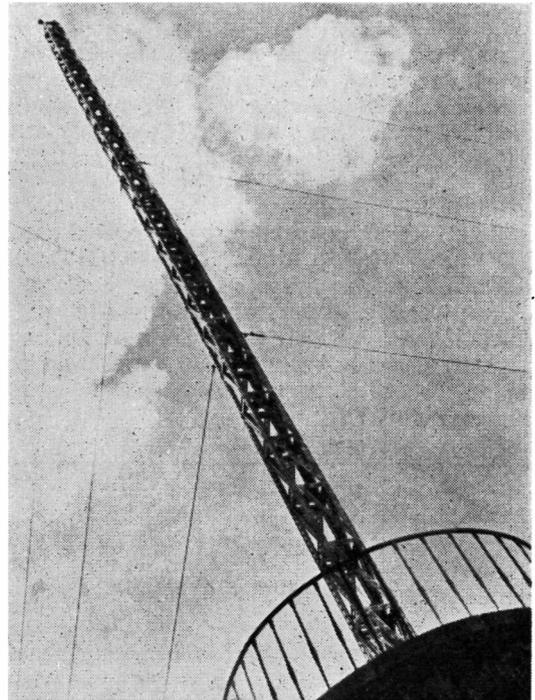
appeared in *SHORT WAVE MAGAZINE* during the last twelve months:

"Interference Suppression" and "Making a Mobile Whip Aerial" (*March, 1961*); "Mobile Transmitter for Six Bands" and "Stop That Noise" (*May, 1961*); "Coil Design for the Mobile Whip" (*August, 1961*); "Mobile Receiver for Six Bands" (*September, 1961*); and "Tiltable Mobile Whip" (*December, 1961*).

With well over 1,000 U.K. amateurs now licensed for mobile working (the count as at December 31, 1961, was 1,045 compared with 789 on the same date two years ago), all the indications are that we are in for another lively and successful mobile season.

INSTRUMENTS, ELECTRONICS AND AUTOMATION EXHIBITION

This will take place at Olympia, London, during May 28-June 2, when about 500 firms active in this field will be represented. Claimed to be "the world's most comprehensive exhibition of the impact of science on modern life," a provisional value of at least twelve million pounds has been put on the equipment that will be on show.



Dexion is well known as pre-fabricated constructional material in strip form. Here is a 60 ft. tower built throughout of Dexion.

If you are a regular reader of *Short Wave Magazine* you are in touch with all the latest developments in Amateur Radio

DX COMMENTARY

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

BACK to normal this month, and one of the largest post-bags ever received. The activity is there, the news is there, and plenty of correspondents are willing and able to send in their offerings—everyone is happy again.

It's not long ago that we used to comment briefly on Top Band, even more scantily on Eighty and Forty, and then proceeded to a section often headed "The DX Bands." Nowadays they are *all* DX bands, and the three LF bands attract rather more attention and activity than the three HF bands. This trend is bound to continue and even to develop, but it is good to see that 14 and 21 mc are still in a very good state, despite some of the gloomy prophecies. Under variable conditions, these bands range from mediocre to superb, but there is always something of interest for those who can't stand the LF-band QRM or haven't got the aerial equipment with which to compete with the "big boys."

When call-signs like VP8GQ, HR3HH, EL4A and VE3BQL/SU start creeping into Top-Band notes, and literally world-wide DX is a feature of Eighty (even on SSB) one obviously can't wonder at the change in the "balance of power." So don't be surprised if the LF-band reports become more numerous than the others . . . and if you have not yet sampled the peculiar joys of LF-band DX, now is the time to start.

DX News from All Over

The DX-pedition season will soon be on us, although very few definite plans are being banded about as yet. Danny Weil was



GB3MSA/G3AET

CALLS HEARD, WORKED and QSL'd

operating FO8AN from the Marquesas throughout January, but we gather that no separate DXCC status has been granted. TI2CAH/TI9 was another pretty rare one, but we have few reports of his even being heard in the U.K.

VE3CJ will be operating VP5BP from the Cayman Islands until around March 18, so if you haven't already found him, take a look—probably SSB and AM only.

The big date for the end of March is with VU2NR, who will then be in AC3 and AC5; CW and SSB on 21, 14 and 7 mc, home-brew 100-watt rig and a birdcage. (*Later*: Rumours are

that this has been cancelled again!)

DL9PF has plans for a Corsican sortie and also, possibly, for a shot at Turkey in July. He also has another mysterious place up his sleeve which would be "new for everybody" (what, are there *still* some left?)

More operation from Upper Volta. XT2, is promised by 9G1DP, but (alas for us) it's on March 24-25, the week-end of the ARRL Phone Contest . . . VO9HB plans a trip to Chagos Island—no dates yet available.

Gus Browning, W4BPD, is reported to have spent five days in Washington, trudging from one Consulate to another, but he

describes the trip as "very successful." He has acquired a number of introductory letters which will serve as door-openers. Incidentally, if he manages VQ7 operation from the Aldabra Islands he will have to get there by "long path" *via* Bombay and the Seychelles, all boat passages from Kenya being booked for the whole of 1962.

We received the following over the air from VE7IT . . . VR6AC, who was working until January 15 with a doublet, now has a TA-33 beam thirty feet up—and it will soon be higher. The pole he bought from New Zealand arrived (by ship, of course) and it took the entire population of VR6, male and female, to move it to his QTH, and all the men to erect it! He can be found on 14270-280 kc SSB on Tuesdays and Thursdays at 0500 GMT; and on Wednesdays on 14125 kc, same time. VE7IT skeds with him at these times and will put you through.

SWL Geoffrey Watts (Norwich) heard 5N2AMS putting in a good signal while operating /P from Gabon Republic on February 4. Geoff logged him for about two dozen QSO's, mostly with G's, on 21 mc AM. And he has also heard Danny, FO8AN, twice around 1630-1715 GMT (14075 kc CW).

GW3AHN (Cardiff) confirms the 5N2AMS episode—Angus actually made the trip on January 27-28, but his modulator broke down; so he repeated it on February 3-4. And apparently he said that that would be his only operation from TR8-land. Tom of GW3AHN says the QSO with TR8 gave him his 300th country and his 275th on 21 mc. The goal he has set himself is no less than 300 on 21 mc—with 25 watts—but he thinks it will not be achieved until the next sunspot peak.

FB8WW (Crozet) is said to be active on 14180 kc AM, around 0800 GMT . . . 5N2RDG's trip to Dahomey, TY2, has been postponed . . . VP1JH will be on SSB for one week, beginning March 2—high end of 21, 14 and 7 mc and also around 3800 kc . . . HK0AA, the Baja Nuevo expedition, is now planned for April 27-May 2; Serrana Bank (KS4B) on

May 3 only. Both on CW and SSB, Fifteen to Eighty.

FS7RT hopes to operate from Sint Naarten as PJ2MC during the second half of the ARRL Contest . . . KC6BC and KC6AQ run a sked on Wednesdays at 1000, around 14250 kc; *after* the sked they will both be listening for DX . . . Cayman Islands, represented by VP5BP, should still be around until March 18.

From Mike Matthews, G3JFF/VR2EA / VR1M / YJ1MA: Two spells of operating were possible as YJ1MA from Vila, New Hebrides, starting on November 17 for five days. During this session he worked 310 stations on 14 mc CW only. Then H.M.S. Cook sailed for Auckland to give six weeks' leave. The second "wave" was from January 19-30, and greatly hampered by tropical storms; 345 contacts this time, but 14 mc was so bad that they shifted to 7 mc. The only Europeans worked were G6VQ, 6ZO, 8KS and G13NPP.

Mike is at present back at Suva, and may be activating VR2EA once more; but in mid-March the ship sails again for Tarawa, whence they hope that some VR1M operation might coincide with a spell of good conditions. YJ1MA QSL's are coming out *via* WIHGT, who has the logs.

FO8AN struck very poor conditions for Europe, the only time for QSO's being 1600-1630 . . . and a jammer parked on 14100 kc daily at 1600 made copy almost impossible. He has now left for Tahiti . . . The British West Indies expedition is well under way and has been signing VP2VI from the British Virgin Islands.

Miscellany

Advance news of two wanderers: Mike Creighton, DL2AL, is going to Malaya in April and hopes to be active thence on SSB (probably from May onwards) signing 9M2MC. He intends, next season, to work on Eighty, in which case he will transmit on 3810 and listen in the 3790-3800 kc sector.

The second one is G3NAC, who goes to Aden, next June, for two years. His call will be VS9AAA and also, he hopes, VS9KAA. And

he promises to try and mount another DX-pedition of some kind while he is there.

Referring to the Kamaran Islands operation, G3GJQ (Swanton Morley) writes concerning the QSL situation. All contacts (5000 plus!) have been confirmed *via* the bureaux. Some 1500 have been despatched airmail in response to requests. And, from March 1. G3GJQ will no longer be handling VS9K cards, the log books being returned to the individual operators. So . . . you should have had your card by now, but if you haven't, don't worry G3GJQ about it unless your QSO was actually with him. He, too, says "We are open to suggestions for the venue of the 1962 RAF Expedition."

G3NWT (Sandiacre) writes: "Every batch of cards I receive contains a proportion for another G3 notably similar in call. I always dutifully forward these on . . . now never within two years have I received a card conversely misdirected. This must show that statistics only work out if they are taken over a long period."

Top-Band Topics

The level of interest in One-Sixty these days is quite extraordinary. This month it accounts for nearly half our mail, and one has only to look over the band any evening (or even early morning, nowadays!) to find it really bustling with activity. With the HF bands off colour in the late evenings, and Forty and Eighty a pretty fair shambles, more and more people are settling for some ten-watt GDX on Top Band. And SSB is becoming more and more popular, as one might expect.

First to cover the real DX, which has been better than ever: W1BB's report on the January 7 Trans-Atlantic test confirms what was said here last month. Conditions were good, and G's were heard over there for 2½ hours, the most successful being G6BQ, 6GM, 6HB, 3PU, 5JU, 3MBN and 3LIQ. W1BB worked KH6IJ with 579 both ways, and KH6/HC1 and KH6/VP7 contacts were made.

January 14 was little good for the North Atlantic path, though HC1AGI came through well in the

U.K. January 21, the next official test, brought luck to G6BQ, 6GM, 3PU, 3IGW, 3CHN, 3ERN, 3OIT, 3OQT, 3PGN and G16TK—and doubtless others. W's logged over here were too numerous to mention, and G5JU heard W0VEH/VP9 around 0710, but he soon disappeared.

January 28 was quite an interesting morning; G16TK heard VP8GQ, HC1AGI and HR3HH, and VP8GQ was evidently getting out very well (he worked HC1AGI). February 4, a scheduled test morning, was also good, with the same list of G's getting across. But of greater interest was the fact that HR3HH reported hearing G3PU—his first G. No QSO, unfortunately.

Individual reports more or less confirm all the foregoing. G5JU adds that he had a report from VE3BQL/SU, who heard him on January 21; on the 28th he found conditions poor and couldn't raise any DX.

G3PGN (Laindon) worked W2FYT on January 21 (0750) for his first W; and he also reports that G3PQA (Theydon Bois) worked VE1ZZ on December 23, which possibly gave him the first G3P -- contact across the pond on One-Sixty. Then, on January 7, G3PQA raised VE3KE and VE1ZZ again—but still no W's.

G3OQT (Romford) was lucky on January 21 (worked W1PPN and called by W2UWD). And on February 4 he heard UB5WF, HC1AGI, VE3BQL/SU, EL4A and HR3HH. He hopes for a sked with EL4A and has also heard that EP2BK has been on the band, to say nothing of ZB2A.

G3PQL (Salisbury) reports that G3PU worked VE3BQL/SU on February 4, and he also heard SV0WZ. He mentions that when W2FYT called CQ and asked G's to reply on 1801 kc, he started quite a lot of unnecessary QRM and wasted power. (It also showed which of them could measure frequency!)

G3OIT (Billericay) heard about 30 W's on January 7 and found W1BB at 589 around 0600—but he was receiving none but the strongest stations from this side; G3OIT has heard that ZC4PB is active on the band—but where and

when?

G3PHO (Sheffield) logged HC1AGI. W's and VE's on January 7, and says that his friend G3NEO was getting W1BB at 0940 GMT—the latest we have ever known... G3IGW (Halifax) also heard HC1AGI on January 14, but no W/VE stations audible; on the 21st he found it an excellent opening, and worked seven W1 and W2 stations between 0600 and 0820; he was also heard by VE3BQL/SU.

G3GGS (Chorley) raised VP8GQ on *Twenty*, and was told that the latter had definitely logged G5JU and G6BQ, and probably G3ERN also — during the January 21 test period. Peter, VP8GQ, intended to be on during the February periods, but working on 1830 kc, not in the W/VE section—which would be a pity!

G2YS (Rickmansworth) suggests that it would be fine if we could persuade the W's to take a ten-minute listening period and then to come on with the calls and RST of all the EU stations heard. (W1BB does often do just that, but after a five-minute period.)

Top Band—GDX and EDX

GM3PBA (Dumfries) says he may be on from Kirkcudbright for occasional week-ends. In six months' operating he has worked

253 different stations—all on One-Sixty—and made only 32 CQ calls without reply.

G3NAA (Chelmsford) managed at long last to raise GD, when GD3CMH turned up on SSB. Nine countries worked now—still no W's! GM3FDW (Dumfries) is busy on CW and SSB, and says that for a long time he was the only active station there. In fact, he had to wait for an expedition to arrive before he could work his own county; he will fix skeds, week-ends or Monday evenings.

G3OGE (Beckenham) is aiming at WABC on SSB, and has raised 20 in the first two weeks, best being GM3FSV (Orkney). He has only a 70-foot aerial, 15 feet high.

G3PDM (Durham City) has worked out his QSO's for the past six months (since being licensed) and finds 77 per cent of them have been on Top Band; 28 per cent of them on phone; five hundred QSL's sent out, 220 received. And his first session in 1962 brought 11 countries and five countries.

G4JA (Baschurch) worked GM3KLA (Shetland) at 0025 GMT one dark night, and twenty minutes later he heard VE1JX working his locals—very QSB, S6-zero. Alan couldn't raise him, but was pleased about the Shetland contact—giving him 61



UB5WF, Lvov, Ukraine, has been making himself well heard on Top Band and on 80m. Sideband, and has become very popular as EDX. He runs 150w., with a long-wire aerial, and has worked W/VE as well as the U.K. We have no full description of his rig, but evidently one item is an AR88. The name is Vladimir Goncharsky, and he speaks good English.

counties on the band.

G3NRW (Loughborough) says that although DX across the pond is very much in the news, there are still plenty of G's who haven't worked Rutland. So he is going there, April 20-22, and will be on

the air from 1900 BST each day. Normal mode, AM phone, but CW if required, and the ops. will be G3NRW, 3OVL and 3PDK. Don't forget the dates—Easter week-end, of course.

GM3C0V (Caithness) writes about his various expeditions into Sutherland, which he and GM3GUJ hope to resume when the finer weather comes. The site is about 35 miles west of John O'Groats, with a convenient flagpole for an aerial, open to the south but almost at sea level. On future expeditions all QSL's will be answered *via* the bureaux, unless an s.a.e. is enclosed, when they will go direct.

G3PHO has now worked eight countries, best recent QSO's being GM3FSV, GD3UB, GI3NZZ and 6TK, GC3EML, HB9QA and four OK's; all CW . . . G3GGS comes back to the ranks and says he has had no luck on the real DX as yet. He needs only *Jersey* for the magic figure of 98 worked—that's easier than being stuck for, say, Sark or the Scillies!

Grafton Radio Club will be holding their traditional Top-Band Contest on March 24 (CW) and March 31 (Phone). The first from 2230 to 0100, and the second 2130-midnight (GMT, of course). One point per contact, final score being the sum of points in both CW and Phone sections. RST (or RS) and serial number exchanges, and logs to G2CJN not later than April 11, with usual declaration. Certificates for the first three.

Late Flash: The City and Guilds Radio Society inform us that they will be taking an expedition to the *Scilly Isles* during the latter half of June. Details will follow in due course, but operation will definitely be on One-Sixty.

Eighty Metres

All through the years of high sunspot activity, *Eighty* could be dismissed with a single sentence or so. How things have changed—it is now a rip-roaring DX band, with no holds barred and, it seems, no DX impossible. Most of the activity is in the highest 20 kc (or, at times, only in the top five!) and is, of course, on SSB.

Here is the list of DX actually

worked by some U.K. stations who have become addicts of this band, and note the times—they may surprise you: VK3AHO (1845), 3V8CA (1920), SV0WT (1930), 4X4CW (1945), OY7ML (2010), UB5WF (2100), 4X4DK (2145), OX3AI (2140), EP2AT (2145), VQ4RF (1915) and ZS6TE (1900). That's only the mid-evening lot! For early risers: YV5ANS (0530), PZ1AX (0635), VE7MT (0420), XE1CV, VP9DL and HK4EB (0500), ZL's, VE's and W's. And for late stopper-upperers: CN8IK (0020), VE3BQL/SU (2300) and, from midnight onwards: VO's, VE's and W's galore. By mid-February the VO's and VE1's were doing a roaring trade with Europe as early as 2230-2300, with signals up to S8 both ways. (We heard them once at 2100-2130.)

Others not mentioned, but known to be around, include ET2US, MP4BBW, 5H3GC, ZL4JF (Campbell Is.), UL7JA, VS9AAC and plenty more. The G's who have been doing the mopping-up include G3DO, 5KW, 3FPQ, 8PO, 2PL, 3NVA, 2MA, GM3BQA, GI6TK and probably others not actually heard in the act.

Extensive use is made of the "MC" procedure—with so many stations at both ends all trying to use a single channel it is the only way. It's also very difficult to try and persuade the DX boys to break up into groups, since they all tend to stay on the channel where they can actually hear the DX QSO's going on.

One word at this stage—you will need a real receiver to participate in this little party; the QRM builds up to fantastic levels at times, but the stout-hearted types still get through. A modern receiver with all the trimmings, or an "oldie" fixed up with Q-Multiplier, Q-Fiver, Selectojet, audio filter and the lot are highly desirable. It's a distinct test of operating skill and reminds one of driving on ice, in a thick fog, with heavy traffic in both directions and no lights working!

There are practically no reports of CW DX on *Eighty*—SSB has taken charge in a big way. But G2DC (Ringwood) raised all W's

TOP BAND COUNTIES LADDER

Station	Confirmed	Worked
<i>CW and Phone</i>		
G6QN	98	98
GM3OM	98	98
G3JEQ	98	98
G2NJ	98	98
G3IGW	97	98
G6VC	97	97
GM3COV	96	96
G3APA	94	94
GM3AVA	92	92
G2DF	91	91
G3LWQ	90	92
G3NNO	83	91
G3OHX	79	84
G3NVO	78	85
G3OGE	74	80
G3NTI	74	75
G3OIT	70	83
G3OQT	69	79
G3NNF	66	74
G3PGN	59	64
GW3CBY	55	70
G3MGI	54	62
G3OLN	52	78
G3PDM	51	70
G4JA	49	61
G3IDG	46	49
GM3PBA	42	51
G3PLQ	27	56
G3PEK	6	35
<i>Phone only</i>		
GM3AVA	90	90
GM3OM	87	89
G3NBT	73	75
G3NAA	64	66
G3NNF	56	60
G3NNO	54	71
G3OIT	26	52

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

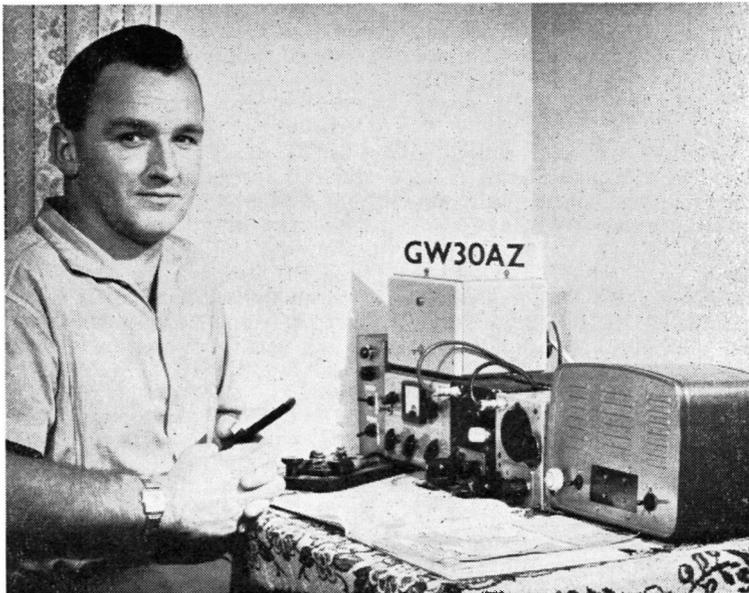
except 6 and 7, also VE 1-3, VO1, UA9, UA0 and the like. He remarks that the creepy-crawlies are on the increase all the time, and there are few spots between 3500 and 3515 kc for a DX signal to push through. Who will design a Creepy-Crawly Rejector circuit? There's a market waiting!

Late Flash: Continuous DX for more than twelve hours a day on Eighty was possible in mid-February, just as this was being written. Starting at about 1920 GMT with HZ1AB, 3V8CA, CN8IK and a few more, the DX was never absent until around 0830 on the following mornings, when the last ZL's were fading out.

Forty Metres

'Way back in January, G2DC wrote that this was the up-and-coming band for DX, and he liked the surprise element. One night just after midnight, W6HB came back to a CQ; four new ones were JA8LN, OD5LX, VQ8GQ and YV0AA, and others were PY7, T12LA, UA9 and Ø. LU, VE, W, VK and ZL. In February he added CP5EZ, EP2BH, JA8AJS, VP8GQ, VK, ZL and many distant Russians—but lost the prize one, VS4RS, through European QRM.

G3LPS always was keen on Forty, and his recent working includes UM8KAB, EP2BB, KV4AA, KP4CC, VP6GC, WA6LPV, CP5EZ, CT2AI, 3V8CA, VP6RG, ZC4's, UF6 and PY. One morning he got up at



John Akehurst has been licensed for ten years, and when this photograph was taken the QTH was 106, Llanmlloe Estate, Pendine, Carmarthen. He started as DL2VM in West Berlin, then had a spell in Korea as an SWL (no licence being obtainable), followed by two years in Tripoli as 5A4TZ, then back to Germany again as DL2BC, and after that home to the U.K. as GW3OAZ — with yet another posting in prospect. These Service types certainly get about, and make the most of their opportunities! GW3OAZ is in the Royal Signals and at present runs a Tiger "Tiglet" for amateur-band work, with a couple of modified BC-454's on the receiving side, one having been converted for full bandspread on 80m, and the other for Top Band. His aerial is an 80-metre dipole, with the feeders strapped when on 160 metres.

0700 and tuned the band for ninety minutes without hearing anything from over 1000 miles; then, at 0830, a W4 answered his CQ, followed by a WA6, and by 0900 the band was alive with DX. KP4CC was 589 at 0915. Best bag of the month was CP5EZ, who answered a CQ at 2300.

SWL Neville Bethune (East Barnet) has been logging W6's over the long path (1500-1600 GMT), and other DX includes HZ1AB (1510), EP2BH (1750), VP3YG (0730), VP8GQ (2215), plus UH8, UG6 and the like. VEONR/CR4 was also heard (2230)—he is really a Maritime Mobile but tends to sign with the nearest country prefix instead of /MM.

G2DC makes further reference to the impossibility of chasing DX on this band without being swamped by EU replies, and suggests that we should be doing a real service if we would set up a station to be known as the "official one for giving G contacts to EU stations," who could

then leave the others alone! What is wanted is some public-spirited character, with a good station, who will be content to work nothing and nobody but EU's, all the time! The obvious reason for all this is that the stations concerned just haven't got receivers that work—they call us because our S8-9 signals are the only ones they can hear at all. The DX is just a closed world to them (and probably even if they had tolerable receivers they wouldn't know how to search for it).

Twenty Metres

G2VV (Sunbury) has worked 5N2LKZ and 9Q5AAA on 14 mc CW, and says the latter insists on QSL's only via W2HMJ. (The operator, of course, is Harry of DL7AA.)

G3LPS (Blackburn) had a session on the band in January and found conditions quite good around 1300. Best for him were TN8AJ, VK6WT, 5N2JKO, CO2WD, VKØVK, 9M2UF, HK1AAF and SVØWZ—all CW.

TOP BAND LADDER

From January 1, 1962

(G30-- and G3P-- stations only)

Station	Counties	Countries
G3PLQ	47	7
G3PDM	42	6
G3PGN	35	8
G3OQT	32	4
G3PHO	30	8
G3PRM	28	4
G3PPU	24	6
GM3PBA	22	?
G3PJD	18	3

New Claims for this Table may be made at any time. Confirmations not required.

G3NOF (Yeovil) is QRT for the moment on SSB, but he worked some AM phone and collected VP5CH (Turks), VP9DL, W0VEH /VP9, ZL2APK and ZS3E, among others.

MP4BBW was very active, as usual, on SSB, and his list is so long that we quote only the unusual ones: W4UAF/KH6, YS1MS, KC4's, ZS7S, HS1X, VK0TC, YN1AW, YV0AA, KC6AY, CR9AH, KX6DB, VR6AC, KH6EEM/KB6, XW8AS, TG9AD, KX6BU, HS5OSQ, FK8AC, KX6AE, HC1FG and WG6AKU (the latter is a General Class licence holder with a novice call—the FCC slipped up!) Ian writes that XT2Z will again be on for the SSB Contest, that ZL4JF (Campbell Island) is active daily and that the AC3/AC5 trip will take place in late March. He has now received his SSB-WAZ (No. 30) and his phone WPX (No. 45). Heigh-ho for a nice tropical QTH! (And, late flash! MP4BBW has

been heard on Eighty SSB.)

G3NWT says there have been some good openings on 14 mc AM to Africa—at least as good as this time last year. G3GGS collected three new ones—VP8GQ, 6W8DD and TT8AG, as well as ZS3EW, ZS6APL/Antarctica and VP2VI. An "AC4AK" showed up on December 10 but was not taken seriously.

G2DC was unlucky enough to lose his Quad in the January gales, and has had to struggle along with a long wire. However, he worked FO8AN, VQ8BM, VP8GQ, VK0VK, 5R8AB, 6W8BD, 5H3HZ, UPOL10 and many other good ones. He has found conditions to the Pacific rather poor, although W6's have been very good around 1500-1700. (Incidentally, there are signs at last of a Pacific break-through in the early mornings—worth watching now.)

G3PCG (Matlock) is a new reporter, and is at present on 14 mc only. With 150 watts and a ground plane (and a nice QTH 900 ft. up) he has worked 62 countries, including VP8, HP1, CE, LU, 3W8, 9Q5, 5N2, HK, W6, VK, ZL and all. And he hopes to open up on 21 mc shortly.

Fifteen Metres

G3NWT forsook the 21 mc band around 1400 on February 4, as it seemed to have closed up except to W's. Listening again at 1800, he found ZS6CV (S9 plus 20), 9Q5, ZS4, 5N2, CR6-7, TN8, PY and the lot! (On the same day even Ten was doing something, too.)

G3MBL (North Finchley) worked AM with EL6F, ZD6HK, UA2KAW and the controversial SM5ZS/ZC6 . . . GW3AHN raised 5N2AMS/TR8 on AM (21216 kc xtal), as mentioned elsewhere.

G3NOF (also using AM) raised CO8RA, CR7, EL3B, HH2CL, VK6QL, VP9DL, VQ2's, VQ5AU, ZD6RM, ZL, ZS, 5H3PBD, 5N2LKZ and 2RSB, 9G1CC and 9Q5MF . . . G2VV says that this, his favourite band, is now behaving as 28 mc did when it was first going haywire—but he has a local problem with a very high noise level, due to sundry robot devices.

G3LPS thought the band was open more often, but mainly to W's—and until pretty recently it was packing up before he got home from work. That's getting better now, and it stays open quite late when conditions are at all reasonable.

G2DC comments on the definite improvement in this band during late January and early February, with DX from all directions. VS4RS and 5N2AMS/TR8 were a couple of new ones, as well as CO8RJ, EP2BK, EL4A, HH6AT, TI2MA, VP2VI, VP3MC, 5R8AD, 6W8DF and many others.

Our Heading Picture (p.21)

G3AET at the operating position, GB3MSA (Poldhu, Cornwall), for the opening ceremony of the Marconi 60th Anniversary celebration held over December 9-17, when an amateur station was established near the original site at which Marconi's first Trans-Atlantic transmitter was located. The gaggle of microphones was called for because the opening was being televised while the GB3MSA transmitter was modulated. In 197 operating hours spent on five bands from Top to 15 metres, 886 QSO's were made, of which 309 were on CW, 482 on AM phone, and 95 on Sideband. The generous support of Labgear, K. W. Electronics, Stratton & Co. (Eddystone), Mosley, Francis & Lewis, and the Marconi Company contributed much to the success of the whole effort.

The DX They Work

Small consolation to us in the U.K. to read of some of the stuff the W's manage to work, when we can't even hear it! For instance, from recent lists we note the following: VR4CV (0500), VS4RM (0720), TN8AF (1800), HS2M (1330), KC6BD (2030), TT8BF (2130), TI2CAH / T19 (2150), ZD8JP (2130), 6W8DF (2140), 6W8BQ (2130) . . . all on 14 mc CW.

It's even more tantalising on 7 mc CW: YJ1MA (1000-1300), VP2LD (1100), KR6LF (1200), KM6OG (1415), JA's (1330), HK7UL (0430), VS4RS (1330), KC6BD (0600), CP5EX (0345), HS1X (1200). Can you imagine

L F BANDS TABLE

(Countries Worked)

Station	3.5 mc	7 mc	1.8 mc
G2DC	101	141	12
G3FPQ	92	136	20
G3FXB	78	152	9
G2YS	75	94	20
G3JWZ	52	62	9
G3IGW	51	95	19
G3HZL	44	81	8
G4JA	43	58	10
G2BLA	39	73	9
GW3CBY	33	52	15
G3NYQ	28	31	11
G2DHV	25	35	5
G3NYA	25	32	9
G3NFV	25	27	16
G3NNO	23	24	10
G3PEK	16	30	8
G3IDG	16	22	9
G3DRN	13	42	9
G3PDM	10	23	8
G3NPB	8	21	9
G3OQK	5	23	7
G2FQW	4	33	1

This Table derives from Countries Worked. Order is based on band in first column, changed monthly.

hearing any of that DX on 7 mc CW in this country? If we really *did* have the 7 mc band—wouldn't it be nice? (And those are only a few calls, taken at random from long lists.)

Things They Say

"Marry not a radio amateur, for he is a strange being possessed of many devils . . . He knoweth countries only by their prefixes; he learneth his geography by Zones, and his directions are Great Circle bearings. . . There is but one key to his heart, and that is a Vibroplex, and the love-letters for which he yearneth are DXCC . . . Though his YL expecteth chocolates when he calleth, she openeth the package to find—filter chokes . . . He goeth on a holiday only to visit radio clubs, and returneth home only to pound brass." (*FEARL News.*)

Heard on Top Band: "I'll use my teleprinter cleaning brush" . . . "Oh, you've got a teleprinter now?" . . . "No, only a teleprinter cleaning brush!" (*MARS News Letter.*)

"I had to answer the phone in the middle of your over, and, believe me, I was twiddling the dial to make the pitch of his voice come right" . . . (*Well-known G, on SSB.*)

"One of the greatest skills of an expert operator is to remove all doubts and confusion in the minds of the stations calling him. Even though they may not be successful in contacting him, they will know at all times where they stand, in what direction his receiver is being tuned, and what his next move will be" . . . (*W4KVX, in DX Magazine.*)

"The antics of European stations amaze me. After I had worked VP6RG, a couple of YU's called me, but no one called the VP6. A few minutes later he was calling CQ DX again" . . . (*G3LPS.*)

"Yesterday I heard KV4CI on 7 mc give a sound tick-off to a WA2 for calling him after he had called 'CQ Europe.' The KV4 told him outright that he was a pest on the air. Maybe we need a few more courageous people like KV4CI?" . . . (*VE3BWY.*)

"Tuning up, testing and calling CQ on top of established QSO's seems to be prevalent I appreciate that a certain proportion of this is accidental, but when an S9 CQ appears on the channel it makes one wonder if all stations have receivers." (*MP4BBW.*)

The Overseas Mail

G3LMO writes from Singapore to say he is back in business as VS1GC once more, at RAF Changi; he runs a TT21 at 150 watts, with dipoles at present, but the old Quad is going up again soon. At first glance, he says. Fifteen is not what it was, for Europe, but Twenty phone seems promising.

W3HQO (Philadelphia) sends the latest news about the "Ex-G Net," which is flourishing these days, and tells us that new members include VS9APH, ZB1A, ZE4JN and VQ2AT, bringing the number very near the 100 mark. Reg of W3HQO hopes to be over here in July.

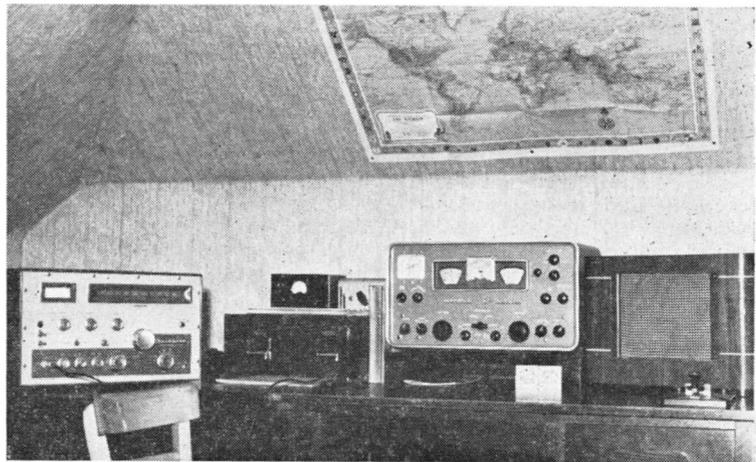
VE3BQL/SU (Rafah) wrote reporting several G stations heard on Top Band, but as they were all notified direct we won't list them. He is now a regular contact on 80-metre SSB, and is also running some more Top Band skeds.

DJØBF (Altena) is good enough to answer the recent query here

about suffixes after DM call-signs—in the "German Democratic Republic," or East Germany. DM3 and DM4 calls with two letters are Club calls (the former "K" has been dropped). The last letter (A to O, inclusive) signifies the district. Although private licences are very difficult to obtain, it is possible to obtain a joint club licence to operate one particular station. The individuals concerned then have, to all intents and purposes, their own call-signs, since they sign with the Club call prefixed by a third letter. Thus, the Club licensed as DM3DN might appear as DM3ZDN, DM3YDN or DM3XDN, according to which operator was in session.

The query about suffixes like XPN and UPN probably arises when members of one Club visit another and sign their individual calls—hence, DM3DN/UPN, and so on. To conclude, DM5 stations are school or ship installations; DM9 calls are issued to foreigners, and DMØ calls are exhibition stations.

Finally, DJØBF obliges with an explanation of "55," which has caused a puzzlement. It is a German abbreviation meaning "Viel Erfolg"—or "every success." It's quite common in inter-German contacts. Thanks to



GM3GNE is operated by D. A. J. Menzies, 60 Beech Avenue, Newton Mearns, Renfrews., who has been licensed since March 1950. After having owned a variety of receivers and transmitters, home-built and commercial, he now runs (left) an American Heath "Apache" transmitter covering the 3.5-28 mc bands, capable of 150w. input, CW and AM phone, and a Hammarlund HQ-180 Rx, which is an all-band general coverage job. The aerial system is a three-band Cubical Quad at a height of 55 ft. GM3GNE is considering SSB, as the "Apache" has a PA consisting of parallel 6146's, which can be operated as a linear amplifier.

Gerald, G3OOH/DJØBF for all this useful gen.

Ham Whyte (VE3BWY) has lots of trouble with the klot-brigade, but they are W's instead of our beloved middle-Europeans. If he calls ZS6KO on 3.5 mc, on a specially arranged sked, on come K8's, WA2's and such, calling either himself or CQ DX on the frequency; even when the QSO is established, the same thing happens. Incidentally, he did make the QSO, which gave him WAC on Eighty.

VK8NK (Alice Springs) is ex-G3BWO, who sends a nice picture and says that there are only two active amateurs in the town—himself and VK8UX. The latter being in the same street, they have to work out a roster for operating. Ralph's employment (Civil Aviation Dept.), is connected with phone working using 500 watts on the 3, 6, 8 and 11 mc aircraft bands—but he thinks he gets better results with his 100 watts of CW!

MP4BBW (Awali) sends his usual list of nice DX, which appears elsewhere. But Ian adds that jamming and what he calls "non-U commercial CW" seems to be on the increase at the HF end of Twenty, and says that "much of the junk originates from various embassies in OD5-land, some of the notes worthy of spark transmitters, not to mention a good 40-kc worth of key-clicks."

And, speaking of OD5-land, Bryan Bisley confirms that all amateur licences there were revoked on January 25—no issue until further notice, although some of the equipment has not been confiscated. (The owners have had to promise not to use it in any circumstances!) This is to do with the local political situation.

The SM5ZS prefix muddle is still not sorted out, although it appears that his suffix of ZC6 is more correct than SU would be—he is the wrong side of the border to sign SU, as does VE3BQL/SU. He has permission from the UN to sign SM5ZS/4U, and also from the Governor in the Gaza sector to sign SM5ZS/ZC6. The ARRL, says Bryan, apparently ignorant of modern history (for Palestine ceased to exist in 1948) will still count SM5ZS/ZC6 as a "new one" . . . but if he were to change his call, though not his location, he wouldn't be! That's what we're down to these days.

Bryan's own activities have been limited to 7 mc CW and 3.5 mc SSB from MP4QAO and MP4DAC, plenty of DX being raked in. In Qatar he is using 1 kW on CW, and 1.5 kW PEP on SSB!

The Ladders

The first publication of the new G3O --/G3P -- Top Band Ladder

appears this month, with a good starting list. And, of course, it's not too late for others to join. Counties and Countries worked since January 1, 1962—confirmations do not matter. Let's see which of the newcomers can really establish a lead on this one.

We regret to state that the proposed 14/21 mc Marathon for this year must now be regarded as still-born. It was first mentioned several months ago, and there have been several reminders, but we have received only *one* entry. So it's out, and we shall have to think of something else which is really wanted by our keener 'chasers. Ideas welcome.

And so to the sign-off, after a very exciting month of well-mixed activity. We are sliding down the sunspot curve, without a doubt, but the tremendous boost it has given to the LF bands compensates for the loss of *Ten* and the erratic behaviour of *Fifteen*. More and more news, please—send it all in and we will push it through the sifter.

Deadline for the April issue is **first post on Friday, March 16**. Don't miss the date, or assuredly you will be left out! Send everything to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. And, until then, we wish you Good Hunting. 73 and — BCNU.

C.U.W.S. ON SAFARI AGAIN

It will be remembered that last Easter Vacation the Cambridge University Wireless Society, signing GD6UW, mounted a very successful DX-pedition to the Isle of Man, operating on all bands. They plan to do the same again this year, over the period March 28-April 4; the operators will be G3MZM, G3PIT, G3PNC and G3OYW, and when signing their own calls they will use the GD prefix. Their equipment will include a Labgear Topbander for 160 metres and an LG.300 for 80-100 metres; sideband operation may also be possible, as well as VHF working, on two metres, from Snaefell.

INDEX — SOME STATISTICAL NOTES

The index to Vol. XIX, contained in this issue as a free loose supplement, discloses some interesting facts: During the year March 1961-February 1962, we have used the work of about 50 named contributors outside our own organisation; between them, they have been paid nearly £1,200 for their contributions, which have covered practically the whole field of Amateur Radio, from Sideband to RTTY, and from UHF to

Mobile. A good deal of space has been devoted to Aerials, and to the SWL feature, and some interesting practical material has appeared on the use of Transistors over a wide range of frequencies. On the operating side, much space has been given to results on the LF bands (80-160 metres) and full reports have appeared on the auroral, sporadic-E and tropospheric openings on the VHF bands. The volume of new technical material has been somewhat greater than in previous years.

RHYTHM METHOD OF MORSE TUITION

The Bennett course of Morse tuition, introduced some years ago, has proved very helpful to many readers. An explanatory pamphlet on this Course is now available, and can be obtained free of charge on application to: S. N. Bennett, G3HSC, 45 Green Lane, Purley, Surrey. Two courses of tuition (which is by gramophone record) are offered—the beginner's, up to 12 w.p.m. *plus*, and the advanced, for those who want to get into the really high-speed category.

For Mobile Rally Programme — see p.19

THE REPAIR OF MOVING-COIL METERS

PRACTICAL NOTES ON
DISMANTLING, CLEANING
ADJUSTMENT AND
RENOVATION

G. W. McDONALD (G20X)

HOW to repair a damaged moving-coil meter is a problem which faces the amateur sooner or later, depending on how careful is his method of working. Accidents with metered circuits are almost inevitable, and it is fairly safe to say that every amateur has at least one meter lying idle due to accidental damage. It requires the skill of a highly-experienced instrument mechanic to make an expensive multi-meter as good as new, and very often that will cost a good deal. However, it is about the average two-inch job obtained on the surplus market that this article is written. The writer cannot stress too strongly the importance of not meddling with the works of a

good-class, accurate meter movement—leave this one to the instrument mechanic; it will pay you to do so.

The overhaul of moving-coil meters requires a steady hand, patience, and a knowledge of the mechanical design. Most of us have these qualifications to some degree, so let us get on with it.

Tools

An elaborate set of instrument tools is not necessary for the work, and the reader can take his pick from the list given here—some are obviously essential, but the others just make life a little easier if an awkward job turns up.

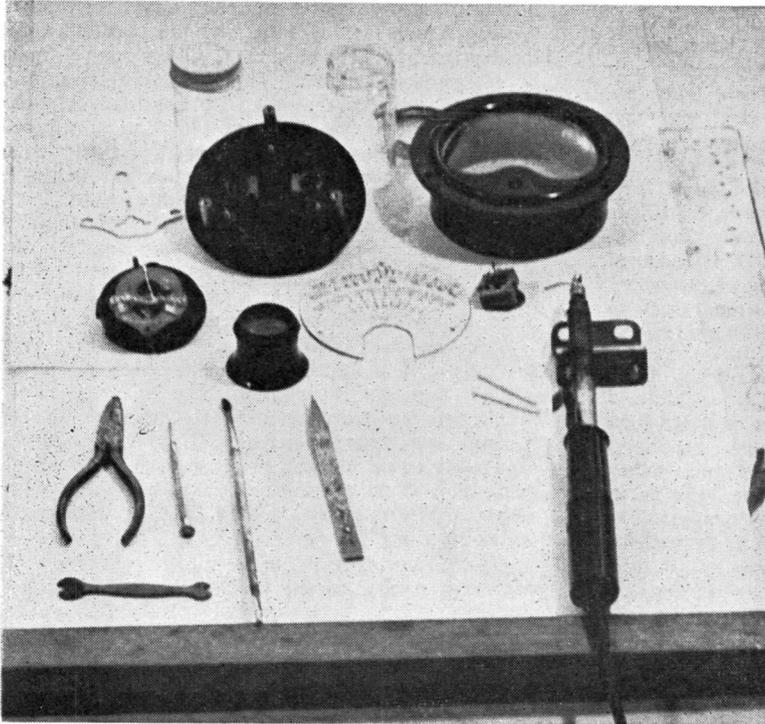
Meter repairing is not something to be tackled in a slap-happy fashion on any old bench. It is really a job best done on a table where there is no chance of odd bodies such as iron filings hiding down cracks. Sheets of thin glossy cardboard (known as Bristol board) are recommended for use as the actual working surface. The list of desirable tools is:

One set of instrument screwdrivers; brass spring tweezers; small, long, round-nosed pliers; small flat-nosed pliers; watchmaker's eye-glass; small electric soldering iron; small spirit lamp; odd lengths of 12- to 14-gauge bare copper wire for use as special soldering bits; a few sewing needles on cork handles; several shallow screw-topped glass jars; pieces of balsa wood for cleaning pivots, etc.; small quantities of methylated spirit and shellac; two camel-hair artist's brushes.

Getting to Work

Mechanically, the meter movement is like the escapement mechanism of a watch or clock; it may be large and robust, or small and delicate. The small moving-coil meters we are likely to be working with are in the latter category. It must be understood that any jerky movement when removing screws or parts will cause damage, so take the job both gently and slowly.

The first thing is to examine the meter carefully to see how to remove it from its case; this is normally a straightforward operation of removing small screws round the front or back edges and easing the case off the meter back-plate. If stiffness is encountered, do not try to "screw" the case off, as this will certainly damage the front zero-setter and probably the delicate springs as well. It is advisable always to watch the pointer



Tackling a meter repair job, showing essential tools, including a watchmaker's eyepiece. As the article explains, meter repairs and renovations are well within the capacity of the average amateur.

when removing the case, because any movement of the pointer under such conditions will indicate that something is going wrong.

The next step is to detach the scale plate. This should be firmly supported from the back while the screws are being undone to prevent it falling towards the back of the meter. Should the plate do this, it will damage, if not break, the pointer. (It is as well to use the correct-fitting screwdriver in the slots of all screws to prevent unsightly slot damage.)

All screws removed from the meter should at once be placed in one of the glass jars for safe keeping. Should any get lost, they will not, as a rule, be replaceable from the junk box! The sizes commonly used are BA 8, 10, 12. Watchmakers' sundriesmen can occasionally supply spares, but it is not every town that has such a supply store, so it is better to be careful of the ones taken out.

Inspection of the Movement

Before dismantling the movement further, it is now best to give it an examination to see if the fault can be found. Often this is only mechanical, such as a pointer stuck at full-scale deflection, or sticking at some intermediate part on the scale, or a badly-bent pointer. The cause of these faults is usually obvious if the pointer is moved with the camel-hair brush slowly across the scale and the motion of the coil and springs observed through the watchmaker's eyepiece. Common faults are adjacent coils of the springs rubbing together at some point of their movement, due to distortion of the turns. Particles of dirt, probably fluff or dust, may have lodged between the spring turns, causing the same fault symptoms as rubbing spring turns. These faults are nearly always found by examining the movement through the eye-glass. The cure for most of these faults is clear enough—remove the obstructions by gentle use of the sewing needle and "undistort" the springs to space out any touching turns. Delicate work, possibly, but, with time and a steady hand, not too difficult. Experience has proved that most of these troubles occur on the front spring of the meter, and it is as well to hope that this be the case with yours. Always examine as you dismantle; this prevents going further than necessary.

Complete Dismantling

If the cause of the trouble has not come to light at this stage, a complete dismantle may be necessary. It will call now for the removal of the magnet. When the securing screws of the magnet have been taken out, it will be found that it still sticks firmly to the pole pieces. Some force is necessary to get the magnet off the poles, and it must be done by carefully easing it off with finger and thumb—*no* pulls and jerks. Immediately the magnet is freed from its pole pieces, a "keeper" should be placed across the gap and the magnet put in a safe place on the bench where it will not be allowed to drop on the floor. (Magnets are more than just a lump of magnetic iron, and they are easily weakened by mechanical shock or knocking about.)

It is now possible to remove the coil assembly

from what was the back of the meter; the methods of fixing varies with the make of meter. We are now left with a pair of pole pieces, the suspension system, and the core, coil and pointer with springs attached. The final move is to get the coil out of the gap. This involves the unsoldering of the springs from the zero-setters, and care is required in applying the heat from the soldering iron so that the fine temper of the springs is not destroyed.

We now have the meter in little pieces ready for repairs if spares are available. This spares problem can usually be solved by the gentle art of "cannibalisation" if you have other old meters lying around.

Here the writer would advise that if at this stage the meter damaged is found to include pivots wrenched off and a burnt-out coil, it is not worth attempting to repair.

Cleaning the Movement

The various parts of the movement must now be carefully examined and cleaned before re-assembly. Cleaning of the coil sub-assembly must be "dry," simply by dusting with the camel-hair brush. Springs may be cleaned in the same way, and any distorted turns, which can cause adjacent turns to stick together, will have to be gently re-adjusted, using the fine needle or the tweezers. This is indeed the most delicate part of the whole operation.

Any straightening of the pointer can be tackled now. Carefully taking out the bends or, rather, "easing" them out, is done with the tweezers, using the lightest possible pressure. Pointers may be made of alloy tube or foil. This light construction is necessary in order that they do not load or damp the movement unduly, but very often the pointer gets completely broken off as a result of a heavy overload. Alloy tube of the diameter required is almost impossible to come by unless you happen to know an instrument mechanic who uses it professionally. We must therefore find a substitute material for pointers. A bristle, taken from the head of an ordinary domestic sweeping brush, can, after treatment, be used to make a satisfactory meter pointer.

The treatment is to select a suitable bristle, treat it lightly with a thin coat of shellac varnish and let it dry. Repeat the shellac coating, thinly, until the bristle has the necessary stiffness, and then blacken it, using waterproof indian ink. The new pointer is now ready to be attached to the stub of the damaged one. This is done using shellac as an adhesive; a very thin film is necessary, and let it dry thoroughly before handling the coil.

The cleaning of the pole pieces calls for little comment, except to see that they are really clean and dry. Carbon-tetrachloride ("Thawpitt") can be used for the pole pieces if they are very greasy.

Coil pivots are cleaned dry by sticking them gently into the balsa wood; pivot cups of jewelled bearings are cleaned by pointed sticks of the balsa wood. Coil pivots are subject to pitting, due to damp getting into the movement, and this causes the erratic operation of many otherwise good meters bought on

the surplus market. Cleanliness and smoothness of the pivots are the essentials of accurate meter movements.

Everything is now clean and the job of re-assembly has to be tackled. The writer never re-assembles a meter immediately after completely stripping it. Do the re-assembly when you are feeling fresh, not tired. Having got the job safely thus far, it would be a pity to spoil it, due to a careless or unsteady move during re-assembly.

Re-assembly and Balancing the Movement

Putting the movement together again is the opposite of taking it apart and under-stating the case, it may be, when one thinks of the time and patience involved! Having got everything back in the right place, one important mechanical adjustment must be carried out—that of balancing the movement.

Any meter having a perfectly-balanced movement will give the same scale reading, whether it is facing upwards, sideways, or at any other intermediate angle you like to use it. A good multi-range instrument always meets this specification.

For amateur work, it is sufficient if the meter reading remains constant at all positions in one plane. Balancing is carried out by adding weight to the counterweight arms of the pointer. These weights can take the form of very fine wire wound round the stubs, the position on the stub being variable. To balance the movement, the positions of these weights are adjusted until no change in scale reading is noticed when the meter is moved around. The writer prefers to balance a movement by sticking minute lead weights to the stubs, using shellac as the adhesive. The weights are easily made, in this fashion: Melt a small quantity of resin-cored solder on the tip of

a hot iron; then tap the iron sharply on the edge of the bench and a quantity of minute blobs of solder will be produced. These form the weights for balancing, and a very large variety of weights can usually be made this way. They are picked up, using the tweezers, coated lightly with shellac, and stuck to the stubs as required. Balancing the movement is a slow business, and the more time spent, the better the result.

Mention must be made here about zero-setting of the pointer. After the springs have been re-soldered to the zero-setters, the back zero-setter should be adjusted to give approximately zero scale reading. The front zero-setter must be set with its arm vertical, so that the slot in the arm can pick up the zero adjuster pin on the front of the meter case.

Re-calibration

When assembly and balancing are completed, the instrument must be checked for calibration against one of known accuracy. After a complete strip-down, it may be found necessary to make a new scale. The methods of doing both these jobs are well known and, as regards the latter, the easiest approach is thin card lettered in indian ink.

It is hoped that this article will lead the reader into another interesting by-way off the long and fascinating road of Amateur Radio. Much has had to be left out of the article—after all, it has not been written as a training manual for instrument mechanics, but simply to pass on some useful practical information to any amateur who may happen to need it. And, once having repaired a panel meter successfully, not only will you feel a glow of satisfaction—you will also take good care in future not to expose meters to avoidable hazards!

S W L • • • • •

USE OF THE BANDS — READER COMMENTS ON MANY TOPICS — BEGINNERS AND OLD TIMERS

THIS month we have received such a large number of letters from readers, all bringing up points of general interest which are worth airing in these columns, that the article on "How to Listen for DX" which it was intended to run in this feature has had to be held over.

However, there is space to offer some suggestions on how to use the bands to the best advantage at this time of the year, and although we do not propose publishing tables of DX Predictions, a few useful hints, based on past experience, can be given.

It will be noted from the correspondence that *Eighty-Metre SSB* is now a real DX pursuit and becoming increasingly popular. This will be found

between 3700 and 3800 kc, mostly congregated at the HF end. Signals from such DX countries as SU, ZC4, EP and the like were coming in during early February at any time between 1800 and midnight, and on good evenings the VK's would sometimes break through at various times between those hours. By 2300 the VO's and VE's were usually audible—and note that *they* are allowed to work below 3800 kc, whereas the W band for phone is 3800-4000 kc. So the VE's can be found working single-frequency QSO's with Europeans around 3780-3790 kc, whereas the W's sit on the other side of the fence and call on about 3805-3810, listening below 3800 kc.

Early mornings (and that meant, in February, 0730-0830) produce good signals from all W districts, VK and ZL; by the time this appears in print the times will probably be an hour earlier.

CW DX on Eighty appears at the same time but, of course, the LF end of the band is now permanently cluttered with non-amateur signals of all kinds—wobbly willies, jingle-bells, jamming noises, chirpy Morse, key-clicks separated from their signals, and all the general garbage one can imagine. If you can copy DX CW on Eighty through that lot, you may

regard yourself as at least on the way to becoming a good operator.

Forty metres yields DX at roughly the same times. In the evenings from about 1900 onwards, don't be surprised at anything you can pull through the European QRM. The W's fill the band all night long, and some of the further States peak in the early mornings, followed sometimes by VK's and ZL's. Again, in late January and early February, there was always some DX to be found until as late an hour as 0900.

Twenty should by now be in full fettle as an all-round DX band. European short-skip is liable to be a nuisance between 1000 and 1600, in particular, and the W's can be numerous enough to be troublesome during the late afternoons. The best DX hours are before 1000 and after 1900.

Fifteen is problematical—on a good many days it will not be open at all. The W's don't usually arrive until after mid-day, so the hours between 1000 and 1400, which are of little interest on the other bands, are sometimes the best on 15 metres. The Far East, in particular, is often there during the latter part of the morning. Once the W's start piling in, they more or less take charge until the early evening but, of course, the LF part of the phone band is not open to them and you can usually hear plenty of varied DX throughout the day—when the band is alive.

About *Ten* there is not much to say except that you should take a look once in a while. It will probably open more frequently this coming Spring, but, perhaps, only to South Africa and South America. Best times are mornings and afternoons.

What it comes to is that, by careful use of the bands, a great deal of interesting and worth-while DX can be found. And don't forget Top Band (160 metres) for what is known as GDX. How many SWL's have heard, say, 75 U.K. counties on Top Band, CW or phone?

READERS' FORUM

The usual wide variety of topics comes up from readers' letters this month, and we will quote those of interest at such length as space permits. Some letters run to incredible lengths and mention so many different matters that they have to be severely pruned down; others keep to one subject and are more concise . . . and they are the kind that we prefer!

First, we will introduce the newcomers to this feature, starting with *J. C. Vears (Epsom)*, who answers our query concerning the possible existence of RTTY SWL's. He has been a keen listener for some years, using various surplus receivers (the current one is a CR-100). He has now been bitten by the RTTY bug and has acquired a Creed 3X teleprinter (through our Small Ads., incidentally). He is building the necessary terminal unit and hopes to be receiving RTTY very soon, if all goes well. As he says, the only drawback from the SWL's point of view is the acquisition of a suitable teleprinter at a reasonable price; the receiving converter unit is within the capabilities of any keen SWL. More news later, we hope.

Stewart Foster (Lincoln) is 17½, studying for his "A" levels and a keen SWL since last September. He has an R.107 and 75 feet of wire, and has already made 1000 entries in his log. The magic figure of 151 prefixes having been reached, he joins the Ladder. Referring to the YU2OM/X mentioned last month, he adds LA5UH/U for good measure! But that's an easy one, since LA stations, when mobile, have to add a different suffix according to which part of Norway they are in at the time.

B. Pack (Frome) also joins the Ladder for the first time, having been an SWL for over two years. His progression was through a single-valver to an 0-V-1 and finally to an HRO-MX—a quick run up the scale for him! He is very depressed about the QSL situation, his reply percentage being no better than ten. He says: "I wish *Twenty* would open up in the evenings again," and it has already obliged. The early-closing performance only happens during the height of winter and is simply a matter of the hours of darkness. Even in late January it was very lively, some evenings, as late as 2000 GMT, compared with the 1800 closing that occurred during December. Finally, SWL Pack sends us a QSL card and asks whether it gives enough information. As there are six blank lines under the heading of "Remarks," we suggest that everything depends upon what he writes on these lines!

Peter Whipps (Enfield) is another to join the HPX Ladder, with a score of 161 achieved on a one-valve receiver and an indoor long wire. He confirms that the "X" suffix (YU6CB/X) has only a mobile significance. A recent lucky bout of listening gave him six new prefixes in an hour—HV1, IS1, VK5, 4X4, 5A5 and FA3. Peter is aiming at being on the air himself by early 1964 — we call that careful planning!

R. K. Towers (Nottingham) wrote on January 10, having bought his first copy of *SHORT WAVE MAGAZINE* that same day. He started about eighteen months ago, when he was given a BC receiver with the short-wave bands on it. *Forty* and *Twenty* came first, and the lack of bandspread caused such dissatisfaction that an HRO followed. Exams and other interruptions held things up, but a visit to G3OZF fired his enthusiasm once more, and all bands are now under observation again—with an entry on the Ladder.

M. Warrington (Burnley) is yet another who was started on "the downward path" by the family BC receiver; on that and another which he bought he heard about 100 prefixes. Now he has a PCR-3 and is learning Morse, as well as having heard

Correspondence from short wave listeners is welcomed for this feature, the next appearance of which is in the May, 1962 issue. Good photographs of SWL stations can be used and are paid for on publication; prints should be accompanied by adequate descriptive notes. The closing date is March 28 and all mail should be addressed: "SWL," c/o The Editor, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

enough prefixes to enter the list.

Len Lumsden (Edinburgh) has been watching the HPX Ladder with interest since it was started, but has only just sent in his first entry (234 on phone). He runs a BC-1147A (ex-U.S. Signals Corps) with a 66-foot wire, and would be very grateful if anyone could lend him a servicing manual or other technical gen. on that receiver (QTH : 33 Hillview Drive, Edinburgh 12).

John Goddard (Warwick) joins us for the first time, although he has been a reader since 1949; he started listening in 1946 and has logged 220 countries in 39 Zones. He has had various receivers—Ham-bander, AR88 and S.640 — but now runs a Mohican with an ex-RAF Decca AW-12 as stand-by. One of his favourite aerials is a 33-ft. Windom for Twenty, and the main interest at present is trying to log all the new African prefixes. Advice to new SWL's : "Be patient, search the bands slowly and thoroughly, never be in a hurry, or you may miss a rare one . . . and learn Morse, for most of the really rare ones seem to stick to CW."

Martin Pettit is a real newcomer, and a young one — thirteen years old. He started a year ago, has an R.1155B and hopes to acquire an HRO soon. The aerial is 150 feet of wire round the attic, and favourite band is Twenty. (Seems to us that less wire would be preferable — what about a dipole?) Martin queries HB4FD, heard during the CQ DX Contest, but we think he is OK, although why a solitary "4" should be issued we can't imagine.

Don Radley (London, W.10) reports for the first time — he is another HRO owner (what a crop of them this month!) and has two aerials, a 100-ft. wire and a folded dipole. Top Band and Twenty are his main interests — on CW. A few more prefixes and he'll be on the bottom rung of the CW Ladder.

Michael Bradbury (Stoke-on-Trent) runs a modified Marconi Type 52 preceded by a Minimitter eight-band converter. A two-metre converter and a Q-multiplier are under construction. With an 80-metre Zepp and a 20-metre dipole, the chief interest is DX-chasing and the main bands 160, 20 and 15 metres. Michael believes in instrumentation, obviously — a GDO and a multimeter have their place in the shack, together with a monitoring scope and a main control unit which switches HT and changes over aerials. About six hours a week are available for listening, and the R.A.E. in May is now the target.

Geoff Douglas-Smith (London, N.6) queries the call-signs like AE10HF, AE1AA and so on. This type of call is used by the American service which calls itself MARS (Military Amateur Radio Service) and works just *outside* the amateur bands. Frequencies on which you can find them are 13.998 kc, 20,998 kc and so on, although Geoff says those he heard were in the 3.8—4.0 mc section of Eighty. He has a home-made five valver for Top Band, a modified BC-454 for Eighty, BC-455 for Forty, and an RF-24 converter for the HF bands, as well as an RF-27 for 70 mc. On the latter band he has only

HPX LADDER

(Starting January 1, 1960)

Qualifying Score—150

SWL	PREFIXES	SWL	PREFIXES
<i>PHONE ONLY</i>		<i>PHONE ONLY</i>	
H. G. Shaw (Heswall)	578	C. J. Goddard (Warwick)	205
R. J. C. Coats (Cowie)	494	J. Ingham (Halifax)	197
A. W. Nielson (Glasgow)	492	J. Rigley (Donnington)	194
D. G. Evans (Denton)	448	G. Ferriday (Donnington)	186
C. N. Rafarel (Poole)	445	G. Docwra (Brighton)	185
P. J. Weyell (Richmond)	429	R. Grindley (Carlisle)	176
D. Edwards (Birkenhead)	400	B. Pack (Frome)	175
R. M. Nixon (Liverpool)	378	P. J. Lennard (Wartling)	169
M. T. Bland (Oakhām)	359	M. Warrington (Burnley)	169
G. Shucksmith (Barton)	352	P. Whippes (Enfield)	161
R. K. Western (Torquay)	325	C. N. Davies (Bicester)	154
D. Quigley (Coves)	318	S. Foster (Lincoln)	151
J. Forsyth (Alvaston)	309		
H. M. Davison (Ashtead)	291	<i>CW ONLY</i>	
D. Bell (Nottingham)	274	C. Harrington (Hounslow)	410
H. Warburton (Aldershot)	255	R. K. Western (Torquay)	402
P. Stevens (Wallington)	252	P. J. Weyell (Richmond)	343
R. K. Towers (Nottingham)	244	H. Warburton (Aldershot)	332
A. Halfacre (Norwich)	241	W. Ferguson (Glasgow)	317
D. Gray (Easington)	240	D. G. Evans (Denton)	313
L. Lumsden (Edinburgh)	234	H. M. Davison (Ashtead)	295
W. S. Teanby (Scunthorpe)	222	R. Ferguson (Glasgow)	254
R. Hunt (Sheringham)	222	P. J. Lennard (Wartling)	236
L. F. Meikle (Hexham)	220	C. J. Goddard (Warwick)	221
M. Pettit (Teddington)	206		

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

heard four amateurs in three months. Geoff would like to correspond with SWL's of his own age, which is sixteen. QTH : 27 Bisham Gardens, Highgate, London, N.6.

All the foregoing correspondents were complete newcomers to these columns. We hope that our regular readers will agree that a lot of enthusiasm is being tapped for the first time, and we hope to see more and more of such keen followers of the art. And now for some of the "old reliables" . . .

Top Scorer

H. G. Shaw (Heswall) not only maintains his position at the top of the HPX Ladder, but has added 22 new ones, the list including XT2, JZØ, TY2 and other rarities. He comments on good reception most mornings (0730-0830) from VK and ZL on Twenty SSB; also an occasional KM6, KR6, ZK1 or the like. He winds up "As many readers and yourselves have often said, DX on 40, 80 and 160 can be very interesting and rewarding — but, my goodness, it's bad for the nerves!"

Dave Edwards (Birkenhead) has now hit the enviable figure of 400. In the course of his letter, he says that he can very strongly recommend the R.1155 to anyone starting up as an SWL. With even an unmodified RF-24 unit ahead of it, you are off on all bands, Eighty to Ten, for very small expense. (If you can get hold of an "N" model, you're on One-Sixty as well.) His own R.1155 is now extensively modified, with an R-Niner, Q-Fiver, S-meter, noise limiter, output stage and bandspread tuning. But the main receivers are a CR-100 and a home-built job, the latter mainly for Fifteen. Dipoles for Twenty and Fifteen help things a lot,

and a miniature double-superhet is also on the way (so are exams !)

The "Pirates"

A. P. Tuite (*Kidderminster*) favours the 40-metre band, and has for a long time put up with the various "screches, howls, weird music, ticking terrors and jamming"; recently, he thinks things have eased up a little. A little while back, however, he heard a broadcast from All-India Radio to the effect that when the Indian elections take place, facilities are being provided for the various parties to broadcast their campaign material. A stipulation was made that "no offensive material be broadcast," but as the stuff will go out on four frequencies slap in the middle of the 40-metre band, it's pretty offensive (to us) before it even starts. SWL Tuite says he's longing to be able to stick on a 50-Kw jammer in the middle of it all . . . but perhaps someone else (you-know-who) will do that for us? This latest menace will continue for five weeks.

B. G. Hamilton (*Belfast*) did as was suggested in recent issues and wrote to Radio Peking "politely asking them to leave the amateur frequencies to amateurs." He had the stock letter back, enclosing a QSL card, a copy of the current programme schedule, a calendar for 1962 and an invitation to tune in to their daily news, commentaries and music programmes. And, on the frequency question, they inform him that "we always faithfully observe international agreements which we have signed or recognised. But those agreements which did not have the participation of our country do not have any binding force on us." So now you know . . .

P. Stevens (*Wellington*) scores 252 on Phone Only, but is now getting cracking with CW (about 8 w.p.m.!) He wants to know more about the BC-453 used as a Q-Fiver, which we shall be covering shortly. Meanwhile, he has acquired an R.1392D and has built a 'scope for use with his AR88D. The latter, he finds, radiates and interferes with the IF of the family's BC set when the 'scope is coupled up, and screening seems to throw things out. (But we don't see what can be radiating except the BFO, and presumably that is not on when he is monitoring phone. Maybe the IF's go regenerative when those external leads to the 'scope are connected?) Pet hates of SWL Stevens: QSO's without call-signs, and over-modulated Italian phones.

DX TV Again

Charles Rafarel (*Poole*) nearly lost his DX-TV aerials in recent gales, but fortunately his mast "jack-knifed" instead of falling, and the damage was only slight. He has managed direct reception from Ruisselede (Belgium) at last, and also gets the new Eire Republic station (Band III, Channel B7, horizontal polarisation, 405 lines). He suggests that this station would be "just the job" for SWL's in the Liverpool or North Wales area. Up to date, he has heard and seen 44 stations in 15 countries; but a Belgian friend, Jacques Herreman, claims a total of 109 stations in 20 countries including Japan!

Sporadic-E reception still occurs, with Stockholm and Minsk coming in for a short spell on January 6. Regarding the ordinary SWL pursuits, Charles says "conditions don't seem to be as bad as I pessimistically thought they would, and 21 and 14 mc have had some good DX."

W. S. Teanby (*Scunthorpe*) has found conditions variable, but likes Fifteen between 1100 and 1300, although Twenty has been the best band. For over a week he listened to VK6QL, around 1200 GMT between 21.2 and 21.25 mc—S8/9 without a trace of QRM each time. Philip Evans (*Shrewsbury*) also writes about Fifteen and mentions JA1ACD, S7 at 1415 GMT. He reports "CR2HT" as a good signal on 14 mc, 1800—but who on earth is *he*? Never heard of any CR2's before!

LF-Band DX

Bill and Robert Ferguson (*Glasgow*) looked at the LF bands on their BC-348Q and were so surprised at some of the DX that they stuck around. Results justified this, and they found plenty. On Eighty SSB the list includes CN8IK, HZ1AB, 3V8CA, VO's, VE 1-4, YV0AA, ZL 1-4, YV5ANS, HR3HH, 4X4DK, VS9AAC, VE3BQL/SU and W's as far distant as the Ø's. On Forty, things were almost as good, and on Top Band seven OK's were logged. Final query: VEØNR/EA8, then VEØNR/CR4—what "prefix" does this make for HPX? Answer is simple—firstly EA8 and secondly CR4—the VE part doesn't count in such circumstances.

Another HPX query, from Robert Nixon (*Liverpool*): Do /M stations count separately? No, they don't count at all. And does ELØJ/MM count as an ELØ or as an MM? Answer—as an MM. There are no ELØ's, anyway—it's part of the /MM arrangement. Robert wants articles on the Quad



Barry Lewis, 93 Fernleigh Avenue, Mapperley, Notts. is working for the R.A.E. and is interested in CW/DX on Top Band—he is up to his 15 w.p.m.

aerial and on an ATU for a 67-ft. wire. We will see what can be done.

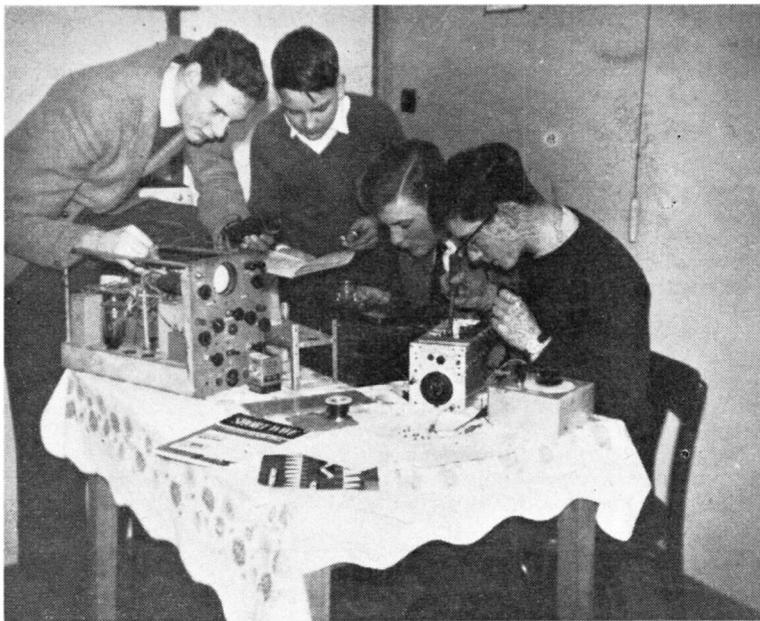
A. Halfacre (Norwich) points out that the KT1 and CN2 prefixes were both shown in our recent list as obsolete—yet he heard both CN2AB and KT2DL fairly recently. The point is that these prefixes were formerly *Tangier*, which doesn't count any longer, except as part of Morocco. The latter country uses CN still, but we didn't know that KT1's were still around. They shouldn't be, by rights. SWL Halfacre says Eighty has been his best band, with four continents heard, including PZ1, 4X4, HR3 and many W's and VE's (on SSB, we imagine).

H. M. Davison (Ashted) was lucky enough to winkle out HC1AGI on Top Band (0535 on January 7)—very few SWL's have snagged this one. He also heard UO5AA, UB5WF and many VE's and W's. Eighty, too, yielded plenty of interest on SSB. The list includes VS9AAL, CN8IK, FA8BG, 3V8CA, HR3HH and TG9AD. AM and CW also gave some good DX. Forty supplied a load of DX on CW, as did Twenty and Fifteen, and for good measure VE3BQL/SU and 4X4IL were logged on Ten. There's a good six-band man for you!

Old Timer Returns

T. W. Moss (Exeter) is a real veteran among SWL's—77 years old and still as keen as mustard. He sends us a QSL from what he claims to be the "rarest" SW broadcast station to be received in the British Isles—VPD2, Fiji, a 400-watter heard by him in 1937 on a 2-valve battery receiver. SWL Moss also has a log of 170 Maritime Mobiles on 14, 21 and 28 mc phone, and has been congratulated on this achievement by the secretary of the Maritime Mobile Radio Club. Nice to hear from such an old timer and to know that the hobby still grips him as hard as ever!

Neville Bethune (London, N.14) is yet another who has discovered the fascination of SSB on Eighty, and he has stuck to that band for the last month. Since October he has logged 60 countries thereon, most recent being VK3AHO and 3BM (1830), VE3BQL/SU (2215), CN8IK (1905), PJ2AA, HR3HH and KG1FD (all 0800-0830) and VS9AAC (2230). Note those times—they are not what you might expect in many cases. Since sending in this report, N.B. has moved to East Barnet, Herts., which, he says, "is a much better QTH"—so we expect to hear of some interesting results!



There are four SWL's in Donnington, Salop. This was taken at the QTH of P. Stevens, 23 Hawthorn Road, Wrekin Drive, Donnington, Wellington, Shropshire, and shows (left, round to the near right): SWL's F. Ferriday, G. Griffiths, J. Rigby and P. Stevens. All are extremely keen on radio and are working for the R.A.E. Phil Stevens has a slight advantage as he is already an operator on a CCF net. We wish these chaps the best of luck.

Dave Gray (Co. Durham) says his favourite band, Fifteen, has become "very patchy" and liable to QSB—so he has switched to Twenty SSB, which is "pleasing and reliable." Best times, mornings 0830-1200, and evenings after 1900. During the afternoons the USA stations swamp everything else. By the way, Dave is another with a leaning towards RTTY, and hopes to be receiving it within six months.

Harry Warburton (Aldershot) had a six months' gap in his log owing to duty commitments, but is back with receivers overhauled and re-aligned. He found January 21 a good morning for 80-metre SSB, with HK4, HR3, KZ5, TG9 and KP4 all putting in fine signals between 0700-0830. On the following morning he tried to repeat the dose—with no result! Week-end traffic is just as hectic on Eighty SSB as it is on the roads.

Douglas Bell (Nottingham) comments on Forty SSB, where, again, the morning sessions are the best. Between 0800 and 0830 he has heard W6's, XE and KC4USP/MM, 1000 miles south of New Zealand.

R. J. Hudson (Loughton) heard that YU6CB/X call, and confirms that the operator was working mobile. Regarding HPX, he asks whether confirmations are necessary—and for the sake of others we repeat that they are *not*; that we only wish to see a check list (with additions as they come); and that the letters and numbers form the prefix—e.g. G2, G3, GC2, GW3 and so on. SWL Hudson adds: "My R.208's reception is rather spoiled by a 66-ft. doublet which has one lead only." But wait a moment!

How can anything with one lead only be a doublet? What he has is just a "piece of wire" . . . and doubtless the provision of tuned feeders would make a worthwhile improvement.

Late Flashes

And now, in the last-minute batch of mail, we find still more letters from brand-new readers. We began with several such, and now we will end with a few more. "Chris" (that's all we can read) of Pontypool has been on the bands for three years, working through a Gonset 63 in Germany, a 680X and now a Geloso converter. Though sightless, he describes himself as "one of the more fortunate SWL's"—since he can be on the air at any hour you care to mention, owing to studying at home. He also has a tape recorder, two broadcast receivers, a 19-Set, R.1392 and an SCR-522. Not content with this, he is interested in *slow-scan TV*, on which his local radio club soon hopes to begin some tests. Chief moan—the commercial QRM on Forty.

George Walker (King's Lynn) has been listening for three years and makes the astonishing claim of being "one of the biggest short-wave monitoring stations in England." He has used an 840A, R.107, R.208; a 2-el. beam, a dipole and a long wire. The "shack" is 14 feet long, 8 feet wide and 10 feet high, and he goes in for tape-correspondence with several countries. He, too, likes Eighty SSB, and has heard the VK's, VE, LX, HB9, I1, 3V8CA and other Europeans.

As we sign off, a word of advice: with spring conditions coming fast, don't neglect those early-morning periods. Instead of the present peak at 0800 (this is being written in early February) you will find things at their liveliest somewhat earlier than that (DX follows the sun!) The best time to look around the bands will probably be 0700 or even earlier. If you prefer the comfort of bed, well, that's all right—but you can't always have both DX and sleep . . . So Good Hunting and don't forget that alarm clock.

THE G.73 WAVEMETER

MODIFIED AS A VHF
FREQUENCY METER AND
SIGNAL GENERATOR

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

THIS excellent instrument is obtainable in the surplus market at a very reasonable price; it is built in a way that very few amateurs would be in a position to copy.

The mains power supply, one-megacycle crystal calibrator, variable oscillator, modulator and attenuator, are each enclosed in a separate metal box, the whole being built into an extremely strong and RF leak-proof case. The mains input is suitable for 115–230 volts AC, which is fully filtered, and delivers 6.3 volts AC and 120 volts DC, by half-wave rectification.

Employing an EF37A triode-connected, the oscillator covers 100 kc to 25 mc in six ranges, with turret-switched coils. The HT supply is varied by a panel control to adjust the RF output, which is measured by a built-in valve voltmeter and plug-in microammeter. The variable condenser carries a

TABLE OF COIL DATA

- L1 — 43-54 mc; main coil 10 turns 32g., with 3-turn link (original Range 5 modified).
L2 — 54-67 mc; main coil 8 turns 32g., with 2-turn link (original Range 6 modified).
L3 — 65-84 mc; as L2, but with link of 2 turns, 16g. self-supporting.
L4 — 81-105 mc; main coil 5 turns, 16g. self-supporting, 2-turn link as L3.
L5 — 105-160 mc; main coil 2 turns, 16g. self-supporting, 1-turn link as L3/L4.
L6 — 140-201 mc approx.; direct connection across contacts, with small loop for link winding.

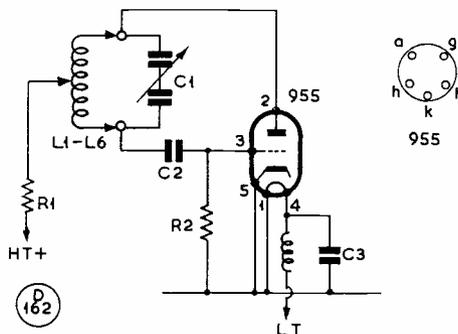
circular dial marked 0-100, with a vernier, and the frequency is determined by means of charts. The crystal calibrator uses a 6J7, and is brought in or out of circuit by a heater switch.

The attenuator has a continuously variable section using a 100-ohm potentiometer, and an extremely well-made step attenuator with precision resistors, mounted in a diecast block. The output is at low impedance. The modulator is an EF37 oscillating at 400 c/s, which can be used to anode modulate the RF oscillator, or can provide a straight 400 c/s audio output.

In addition to giving RF and audio outputs, the instrument can measure the frequency of incoming signals by beating against its internal oscillator, the beat note appearing in headphones.

VHF Modification

The writer has owned one of these wavemeters for over a year, and recently started to construct a VHF signal generator suitable for two metres and TV servicing work. After struggling with several



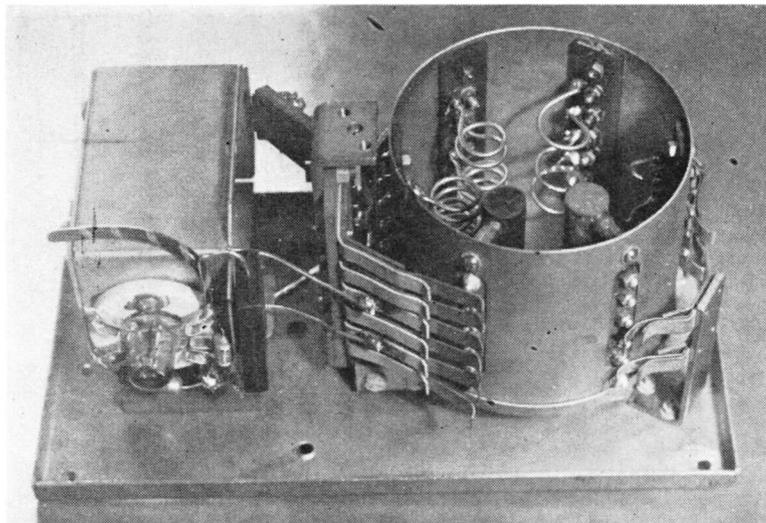
Circuit arrangement for the G73 modification suggested in the article. C1 is 5 μF per section; C2 is 50 μF ; C3 is .001 μF ; R1 is 1000 ohms; and R2 is 10,000 ohms. The values for L1-L6 are given in the table alongside.

completely ineffective home-made attenuators, the brain-wave came—buy a new G73 wavemeter for the basic screened units and attenuator.

With a few modifications this has provided a most reliable VHF signal generator and wavemeter, having all the original facilities but covering 43-200 mc in six ranges. The 100-290 kc range on the unmodified instrument was altered to cover 25-50 mc and the 280-900 kc range lowered to include the Droitwich frequency, so between the two instruments a continuous coverage of 200 kc to 200 mc has been obtained. With comparatively little effort the writer has permanently solved the problem of "searching for the band," and saved hours of fumbling with alignment problems.

The second G73 wavemeter first had its crystal calibrator modified by replacing the existing 1 mc crystal by a cheap surplus 8 mc type. (It will be found that beats from the 1 mc crystal are inaudible above 100 mc.) The calibrator anode coil was stripped of its windings, and rewound with 50 turns of 32g. enamelled wire, with a 50 μF trimmer connected across it. The calibrator frequency was then adjusted to 8 mc exactly with the existing trimmer across the crystal, using the station 100 kc crystal. The anode coil trimmer was then adjusted for maximum RF output, monitored on the receiver.

Removing the variable oscillator from the case, it was stripped except for the turret unit. The oscillator was rebuilt using a 955 acorn triode in a ceramic base and a 5 μF per section split-stator tuning condenser C1 (see diagram.) The general arrangement can be seen from the photograph, for which the turret cover and top bearing were removed. Coils were wound as given in the table opposite.



Illustrating the modification to the G73 Wavemeter, suggested by G3MFW and discussed in the text. It enables the G73 range to be extended to about 200 mc (1½ metres) and the instrument as modified can be used as a frequency meter or a VHF signal generator.

The unit was re-assembled and the dial covered with paper for direct calibration, a perspex cursor being fitted in place of the vernier. The internal crystal was used to mark out the 8 mc points up to 200 mc, the one-megacycle intervals being obtained from the 1 mc crystal in the original wavemeter. Conversion charts could of course be used if desired.

The instrument works very well, output being negligible with the attenuator reduced to zero. Frequency stability is good provided the oscillator output is adjusted correctly before measurements are taken.

There are several other old-type signal generators on the market with similar turret tuners; provided they are equipped with good screening and attenuators they could all be modified on the same lines to give an excellent VHF wavemeter and signal generator at very low cost.

NOTE ON THE "CALL BOOK"

As most readers will know, there is only one directory to the radio amateur stations of the world—the *Radio Amateur Call Book*. This itself has become so large that it has had to be divided into two parts: American amateur stations only (known as the "American Section"), and the rest of the world (called the "Foreign Section"). The total of call-sign/addresses listed is 300,000 plus, of whom the Americans form the majority (500 pages in the

Call Book), the outside-U.S.A. or Foreign section consisting of about 250 pages, in which the U.K. amateur station listings occupy 35 pages. The *Call Book*, as it is known all over the world, is published quarterly, and is thus kept well up to date. The American section costs 45s., and the Foreign section 27s.—or the two together at 65s., post free. We are U.K. agents for the *Call Book*, and it is always available from us, from stock. Orders to Publications Dept., Short Wave Magazine, Ltd.

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

DURING the last few weeks, the barometer has been showing extraordinary variations—from low to unusually high for the time of year—with VHF conditions erratic to the same degree. Except for a day or two towards the end of January, there has been no very steady period; by January 30, your A.J.D.'s barometer had registered 30.7 ins., falling to 29.7 within less than 24 hours.

The CW contest on January 28 encountered this high-reading spell and GDX conditions were fairly good for most of the day, with a reasonable level of activity; total loggings suggest that there were some 75-100 stations on, with things tailing off somewhat towards the end of the contest period. On any VHF band, a contest in the early part of the year is an even greater gamble (as regards conditions) than during the six months May-October, when, in general, better conditions can be expected.

Then came the great gales in February, with much slaughter done to beams as well as TV aerials—though the distortion of the latter does not seem to make as much difference to the picture as it should! Anyway, so far as 2m./70 cm. beams are concerned, great damage was done, and several reports this month speak of having to "wait for a fine week-end in March to get it back up again."

Four-Metre Successes

An interesting and very encouraging feature of the pattern of activity this time is the increase in 4-metre reports, together with news of yet two more "Firsts" for EI2W. On February 10, Harry worked GI3HXV for the EI/GI first-contact on the 70 mc band, and on February 16 followed with another one, EI/GM, by working GM3EGW—congratulations to all three operators on another milestone passed. EI2W is on 70.662 mc and is usually operating 2000-2100 hrs. daily, clock time.

GI3HXV/GM3EGW run a fairly regular Monday-evening schedule at 11.0 p.m., and GI3HXV also has skeds with G3EHY and G5CP/A for Sunday mornings; he is on most even-

VHF BANDS

A. J. DEVON

Conditions Poor Generally— Interesting Four-Metre Results— Reports on Three VHF Bands—

ings, with the beam on the Midlands, and plans to improve it to a 4-ele at 35 ft. GI3HXV is undoubtedly trying, and would be an interesting 4-metre contact for any G station.

G5CP (Wingerworth, Derbys.) is another keen 4-metre man; he works /A, on 70.35 mc, every Sunday morning, 1100-1230, and on Monday evenings, 1900-2000, clock time; Ron says he has been listening hard for EI2W—it looks as if a schedule between these two might help. Incidentally, G5CP has now worked 11 counties and two countries (GM3EGW) on four metres, and reports increasing activity on the band; G3NSW (Manchester) and G3AZU (Bradford) have recently been worked as new stations.

Yet another to get himself organised on to 70 mc is G3ICO (Yeovil); he runs an 832 in the PA, at 15w., on 70.29 mc; the receiver is an RF-27; an outdoor 3-ele flat-top is projected; and so far only G3EHY has been worked. G3ICO is available for skeds on Sunday mornings—*QTHR*.

From up in Scunthorpe, G3HRP, writing in for the first time, reports that since starting up on 4m. in November '60, he has had 257 QSO's in 6 counties, with G3JHM/A as best DX. G3HRP runs as Tx a 440B (a surplus job

that was plentiful some years ago) with 22 watts input; the Rx is a tunable converter into an Eddy-stone S.640; and the aerial is a 4-ele c.s. Yagi at 35 ft. He mentions G3KNP and G3MSB as two other Scunthorpe stations equipped for the band.

G8RO (Tangmere, Sx.) works G3JHM/A and G3K1, and would like to find more activity on the 4-metre band on Sunday mornings—though, indeed, there seems to be a good deal more of it than most people realise. G4OF (Gainsborough, Lincs.) would be

TWO METRES

COUNTIES WORKED SINCE
SEPTEMBER 1, 1961

Starting Figure, 14

From Home QTH Only

Worked	Station
55	G2CIW, G5MA
43	G3KPT
40	G2AXI, G3NNG, G8VZ
39	EI2A
38	G3OJY
36	G3PBV
35	G3CO
34	G5DW
31	G3FUR, GI3ONF
29	G2BHN
24	G5QA
21	GW3MFY
20	G3GSO, G5DS, GW3ATM
19	G3JWQ
18	G8VN
17	G3ICO, G3LTF, G3OBD, G5UM
15	G3FIJ, G3OSA

This Annual Counties Worked Table opened on September 1st, 1961, and will close on August 31st, 1962. 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 1962, 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, 1962 (with two months still to run to the end of the 12-month season), only amended scores from those already standing in the Table at that date will be accepted, unless they are new claims from operators licensed w.e.f. June 1962.

glad to fix schedules—any time, any station, any day of the week, *QTHR*; he has had over 400 contacts since starting on 70 mc in April last year, though comparatively few different stations have been worked.

All of which brings us, naturally enough, once again to the question of a 4-metre ladder on an annual basis. The claims actually received so far are: G3JHM, 14 counties worked since Sept. 1, '61; G5CP, 11C; G13HXV, 5C; and G3HRP, 4C. There may be a little misunderstanding about some of these figures, but the point is that there is now the possibility of starting a new ladder if we can have a few more claims. There are plenty of people who could show more than "four counties worked on 4m. since Sept. 1" (which is what we want to know), and, if they will do that, your A.J.D. will be glad to devise a table to cover all three bands together, on an annual basis. And, in the meantime, if you want a new band to work, and a quiet talk on a Sunday morning out of the hurly-burly of Top Band and 80m., four metres is worth a thought.

The 70-Centimetre Clip

G2FNW (Melton Mowbray) keeps in front in the 430 mc annual with 16C worked since Sept. 1, his new ones being G3KSB/P (who gets about a lot and is very helpful to county 'chasers) for Beds., and G3MNQ for Notts. G3JMA (Harlow) lost his VHF aerial array (both bands) in the February gales, but QSO's earlier enable him to claim G3CCH for Lincs. and G4AC for Suffolk.

One of the braves of the Midlands VHF fraternity, who says he still keeps active, "though perhaps not so much as of late." is G3HAZ (Birmingham, 31); he runs good gear on both bands, and can claim 12C for the new 70-cm. Annual; G3HAZ has a big constructional job in hand—a 6-band VHF/UHF receiver having all the trimmings, with a crystal-controlled 1st osc. and converters right down to 23 cm. Very nice.

Yet another prominent Midlands VHF man who was well

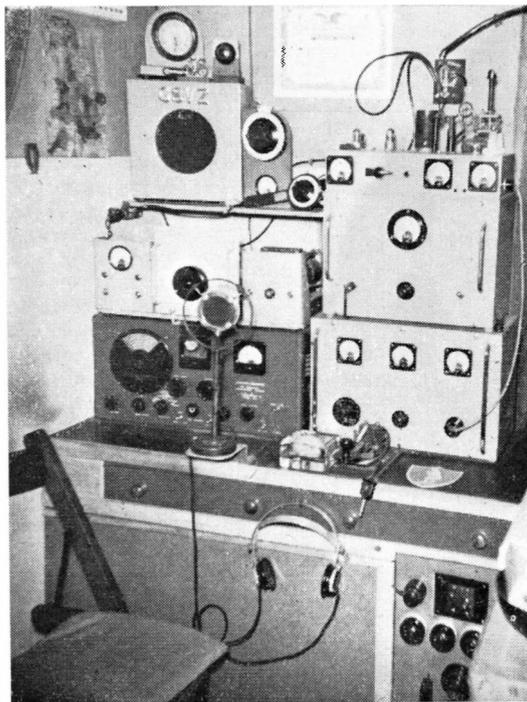
known in earlier days as an SWL — Ray Bastin, G3LHA. Coventry — writes in with 70-cm. claims, and says he is very busy with a new /P, /M Rx to take both 2m. and 70-cm. front-ends, combined with a lightweight 8/8 slot-fed portable beam; Ray reports reasonable 70 cm. activity in the Midlands area, with new stations coming on and the regulars keeping the flag flying. (Some years ago, this was the sort of thing we used to be saying about two metres.)

Herbert, G5QA (Exeter) remarks that nearly all his time is now spent on 70 cm., for which he has the CC converter working exceptionally well; the skeds with G3OYM/T and GW3ATM continue to be very reliable, with high signal levels over their distances of up to 100 miles or so. These three stations — GW3ATM, G3OYM/T and G5QA — look towards the Midlands every Mon-

70 CENTIMETRES COUNTIES WORKED SINCE SEPTEMBER 1, 1961 Starting Figure, 4 From Home QTH Only

Worked	Station
16	G2FNW
14	G3KPT
12	G3HAZ
11	G2CIW
10	G3JHM/A
9	G3LHA
8	G3NNG, G5UM
6	GW3ATM
4	G5QA

This Annual Counties Worked Table is reckoned from September 1st, 1961 and will close on August 31st, 1962. 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



G8VZ is operated on two metres by J. Redrup, Lyndale, Longwick Road, Princes Risborough, Bucks. Very successful results have been obtained over a long period, using a 12-ele bi-directional stack and only 12w. input. This photograph shows, on the right, the transmitter, power supplies and modulator and, on the left, the 144 mc frequency meter and monitor, with 100/1000 kc crystal marker, and the SX-24 main receiver; the two-metre converter is an ECC84 cascode arrangement.

day, Wednesday and Friday from about 10.0 p.m. onwards.

Doing well on 430 mc is G3KPT (West Bromwich), who is now up to 14C in the Annual, with 25C worked for the 70 cm. All-Time. G3JHM/A (Nr. Worthing) is likewise building up a good score on Seventycems—and from where he is that means hard work as well as regular activity.

Two-Metre Results

G2BHN (Yeovil) says it is so long since he last wrote in that he had to check through the log all over again to see how he stands in the scoring; he now runs a QQV06-40 in the PA, at 75w., and has a 6CW4 pre-amp. with the converter; G2BHN's total of different 2m. stations worked all-time is 159S.

The report from Jack, G2CIW

SEVENTY CENTIMETRES ALL-TIME COUNTIES WORKED Starting Figure, 4

Worked	Station
37	G2XV
30	G6NF
28	G3HAZ, G3HBW, G3JMA
27	G3JWQ, G3KEQ, G3NNG, G5YV
26	G2CIW, GW2ADZ
25	G3KPT, G3LHA
23	G3BKQ, G6NB
21	G3IOO
20	G3LTF
17	G3JHM/A, G3MPS
16	G2DDD, G3MED
15	G2OI, G4RO
14	G2HDZ, G3FAN, G3LQR
13	G3BA, G6XA
12	G5BD
11	G3AYC, G5UM
10	G3IRW
9	G5DS, GW3ATM
7	G2HDY, G3JHM
6	G3KHA, G3WW, G5QA
5	G3FUL, G3HWR, G3IRA, G3IUD, G3JHM, G5ML
4	G3JGY

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

(Birmingham, 31) mentions some interesting GDX raised during the contest on January 28—G3BW, G3JYP and G13GXP; but he found conditions changeable, and since then GB3VHF has been very much up-and-down, too. Jack always seems to be able to nose out an auroral opening, even if it is only a short one; on February 4 he found *Ar* conditions prevailing for half-an-hour or so around tea-time, and nipped in to knock off GM2FHH and GM4HR, with nobody else heard on the band.

G8NM (Lincoln) goes up three in the All-Time, to 30C. The next letter is from none other than G5DS (Surbiton, Sy.), not heard of for a very long time, who puts in claims showing he is still "with it"—and "getting the message." In fact, G5DS now has the very impressive total of 827 different stations worked on two metres. (Nice to hear from you again, John.)

New on the two-metre band is G3NPF (Southend), who worked 43 different stations in the five weeks to mid-Feb., best DX being G3ILD and G6ZP. He is on 145-017 mc, the Tx line-up being 8 mc EL91 osc./trip. into another EL91 tripling to 72 mc, a 5763 doubler, into a 6146 PA taking 20-30 watts, with ample grid drive. This whole transmitter, including speech side and 100w. power supply, is built as one unit in a box only 15 ins. long, by 6 ins. and 7 ins. His converter is g.g. 6AM4 RF into an ECC85 cascode with a 6J6 mixer and CC oscillator, the tunable IF coming out over 7-9 mc. His aerial is a 4-ele Yagi in the roof-space, and G3NPF describes himself as "extremely surprised at the good results with this gear." Future plans include a QRO Tx on 2m., RTTY, and activity on 70 cm.

Point for VHF/SWL's of today: G2DHV/P/M (*QTHR*) will always be glad to have listener reports, any time from anywhere; he will be out and around during the coming /M season. G2AXI (Basingstoke), whose beam system withstood the wind-pressure, chalks up 40C in the Annual and has worked G3BW (Cumberland) for a new county. He is going NBFM on phone, with 90w. input.

G3PBV (Haversham, Bucks.) is now running a QQV06-40A PA, at 60w. screen modulated, or 100w. on CW—he says "the increased power seems to help and has made a worth-while improvement." New stations are being heard on two metres, constructional work is in hand to improve station efficiency, 70-cm. gear is on the board, and the next opening—be it auroral, sporadic-E or tropospheric—is eagerly awaited.

G3ICO, G3JHM, G8RO and EI2W also register in the two-metre Tables, and have been entered accordingly. And if you hear GD's from the summit of Snaefell, Isle of Man, during March 28-April 4, it will be the Cambridge University Wireless Society chaps on a VHF expedition, handing out the GD prefix to all who they can work—including, we hope, Guy of ON4BZ, who has been after this prefix for at least ten years.

And, to keep you right up-to-date, it seems that another thing called OSCAR is going to be cast into space some time in April. Without wanting to denigrate the scientific value of these exercises, it seems that "Oscar" on the amateur VHF bands will become no more than a curiosity unless some findings can be published—in other words, what has "Oscar" proved, or contributed in the way of new knowledge, if anything? We may be able to find this out in the next month or so. But, in the meantime, it seems fair to say that the highly-organised, sophisticated, computer-controlled space investigation systems leave the hopeful individual enthusiast so far behind that the best he can do, if he is a realist, is just to read the literature and listen on the frequency.

Conclusion —

For your A.J.D., the coming month offers a brief respite, in that material for the April "VHF Bands" is not required until **Wednesday, March 21** (latest). Address it all to: A. J. Devon, "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. With you again on April 6, all being well. *73 de A.J.D.*, and thanks for listening.

AMATEUR MICROWAVE EQUIPMENT

CIRCUIT ARRANGEMENT — KLYSTRON SUPPLIES AND CONTROL — AERIALS

Part II

D. CLIFT (G3BAK)

The first part of this article appeared in our February issue, dealing with the approach to amateur microwave working, station layout and some of the considerations involved.—Editor.

Having considered in Part I the general problems of setting up a microwave link on one of the SHF bands available to amateurs, we now look at the practical requirements.

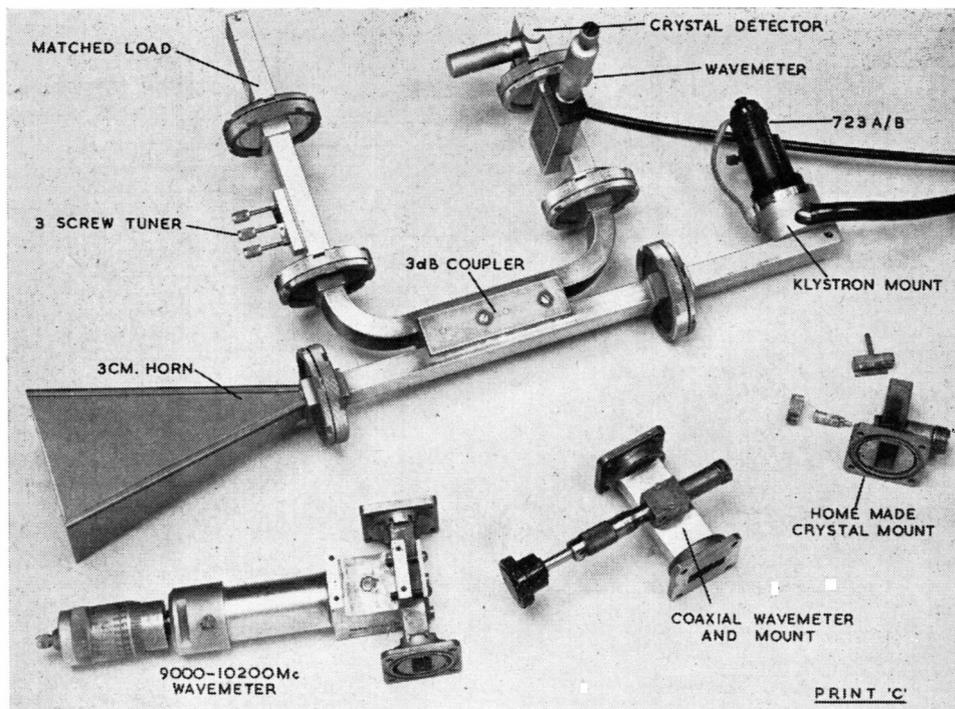
The circuit suggested by the writer, simplified by not having the complete IF/AF strip shown in detail, is given in Fig. 3. It fulfils all the requirements as already set out, and, with the exception of the 30 mc IF system and the waveguide pieces, is all contained in one case.

It will be seen that there are three sets of rectifiers,

running from two windings of the HT transformer, and a separate heater transformer. Two of the IF strips are internal, and switched by S3, and the other is external, and fed with switched voltages *via* the lower octal socket on the front panel. A common audio output stage gives sufficient power to work a speaker. Modulation facilities are AM/FM, and MCW, and the klystron and the two internal IF crystal currents are monitored by M1 and M2, respectively. The unit, in its case, weighs about 40 lbs.

Klystron HT Supply

V1, and the 500-volt winding of T1, feed into the smoothing network L1, C1, C2, and thence into the conventional stabilising circuit V2, V3, V4. The HT is controlled by VR1, and is capable of being set to any desired value between 270 and 320 volts. Ripple is down in the millivolt region, and the supply is stable to within 1 volt from no-load right up to 100 mA (although the drain normally is only about 40 mA). It will be noticed that either the positive or the negative can be earthed by the internal link. As was pointed out earlier, this feature allows for the use of klystrons where it may sometimes be necessary to earth the outer case, and *vice-versa*. M1 and S7 permit monitoring either the klystron cavity voltage or the cathode current. R13 is made such as to give



This photograph shows a number of the items used by G3BAK in connection with amateur microwave working; some can be home-constructed, and others are commercially available. As explained in the article, the secret of success is the 3 dB coupler or hybrid junction. Tuning can be done with ordinary BA-size screws fitted to the waveguide. Sizes for waveguides to operate on a wide range of amateur SHF bands are shown in Table I, on p.657 of the February issue.

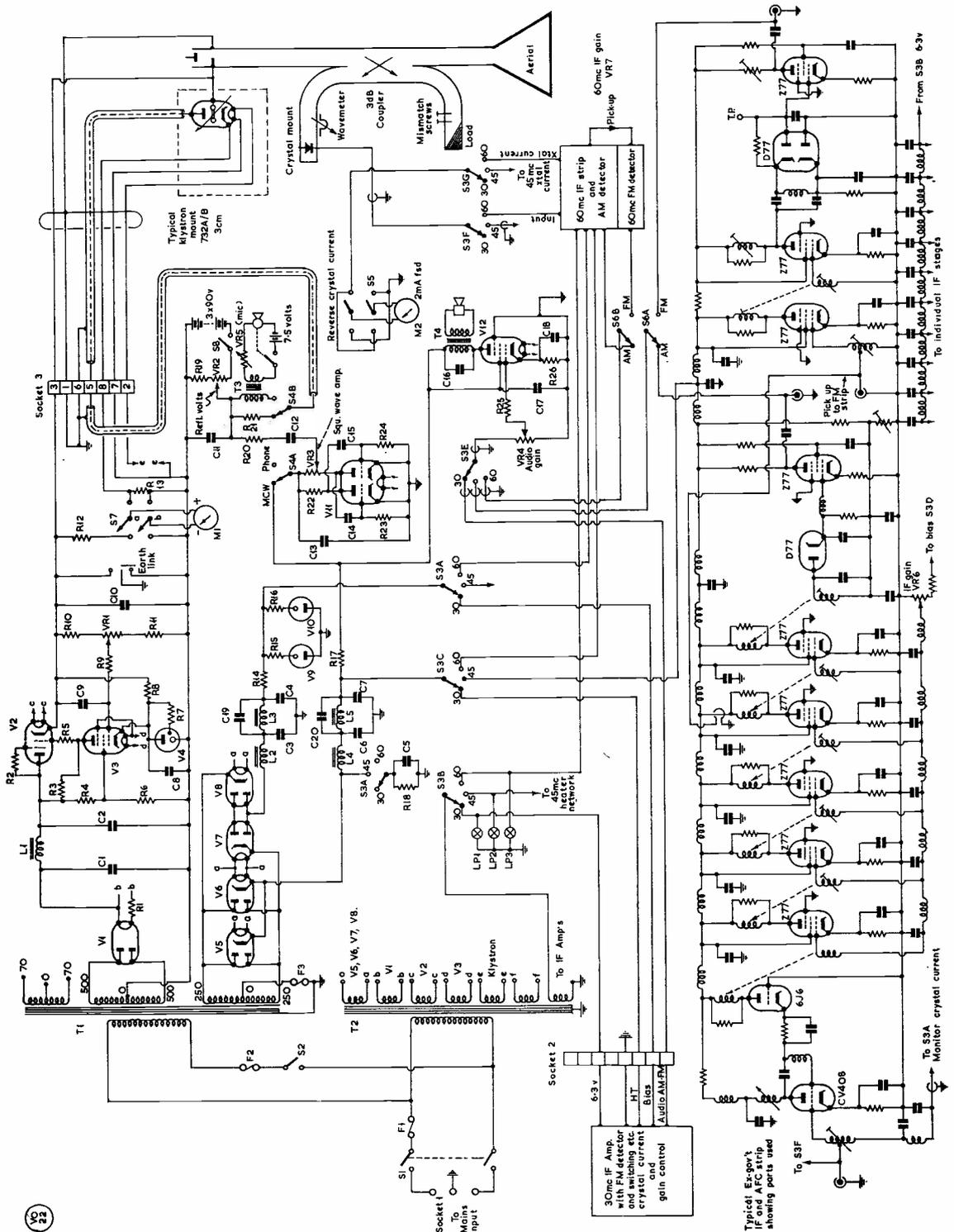


Fig. 3. Circuit of one station for a microwave link on the 3-centimetre band; the same principles apply to other bands in the microwave region — see Table I p.657 February issue. The 45 mc IF/AF strip actually used by G3BAK is that surplus type which was fitted with CV-138 (8D3) valves; the well-known Pye 45 mc amplifier, which is similar, uses the VR91 (EF50) and performs the same function; the equivalents to the CV-138 (8D3) are the Z77, EF91 and 6AM6. The klystrons available on the surplus market are nominated in various CV types, mainly with 6.3v./0.6 amp. heaters, but the essential characteristic is the mechanical tuning range (which, of course, should be in one of the bands shown in Table I, p.657, February). Within this mechanical range, the klystron is tunable over a shorter RF range; for instance, the type made to cover 9000-10000 mc mechanically can be set up electronically over 24 mc within that range. At these extreme frequencies, measurement is in terms of megacycles to get the equipment spot on frequency.

Table of Values

Fig. 3. Circuit of the Microwave Station

C1, C2 = 4 μF, 600v.	R4, R6 = 330,000 ohms,	VR5 = 10,000 ohms,	(sur-plus type)
C3, C4 = 2% h.s.	R5 = 10,000 ohms	linear w/wound	T3 = Mic. xformer, 50:1 to 100:1
C5, C6 = 4 μF, 450v.	R7 = 68,000 ohms	L1 = 15 Hy., 150 mA	T4 = O/p xformer, 6V6- to-3 ohm speaker
C8, C13 = 0.1 μF, 500v.	R8 = 33,000 ohms, 5w.	L2 = 2.75 Hy., 230-ohm,	V1 = 5U4G
C9 = 0.5 μF, 500v.	R9 = 270,000 ohms	L3 = 2 Hy., 145-ohm,	V2 = CV-345
C10, C11 = 0.5 μF, 500v.	R10, R12 = 300,000 ohms,	L4, L5 = 2 Hy., 60-ohm,	V3 = Z77, or CV-138
C14, C15 = .01 μF, 1000v.	1% h.s.	L6 = 180 mA	V4 = Q5150/15, or CV-287
C16 = .001 μF, 350v.	R11 = 200,000 ohms,	T1 = 1,000v., c.t., 80	V5, V6 = 6X4
C17 = 1 μF, 350v.	1% h.s.	VR1, VR2 = c.t., 500v., c.t.,	V7, V8 = VR-150/30, or CV-216
C18 = 50 μF, 50v. elect.	R13 = Meter shunt, to give 40-50 mA	VR3 = 50,000 ohms, linear w/wound	V9, V10 = B309, 12AT7, or CV-455
C19, C20 = 0.5 μF, 500v.	R14 = 1,200 ohms, w/wound	VR4 = 500,000 ohms, potentiometer	V11 = 6AN5, or CV-136
R1 = 0.43 ohms, 5w.	R15, R16 = 470 ohms	VR5 = 500,000 ohms, carbon, log.	
R2 = 100 ohms			
R3 = 220,000 ohms			

Notes: All resistors can be 10% Type 8 or 9, except where stated otherwise. For 'h.s.' read high stability. Value R12 depends on meter M1; adjust R14 to give 60 mA through V9, V10, off load. Value R17 will depend on HT xformer insulation. Adjust R26 according to valve and HT used for V12. Transformers T1, T2 are surplus types. For T3 insulation must be good between windings and core. Meter M1 is 0-1 mA f.s.d. meter M2 0-2 mA f.s.d. All switches are toggle, except S3, which is rotary. L2, L3 and L4, L5 can be found as surplus types.

about 40 mA FSD. Socket 3 feeds the voltages to the klystron, which, of course, is mounted on the waveguide. It is advisable to connect the cathode to the heater inside the power unit, as shown, to avoid producing hum.

Reflector Supply and Modulators

The reflector electrode of the reflex klystron requires to be fed with a voltage which is continuously variable over a range of around 100 volts, from about 100 to 200 volts, *negative with respect to the cathode*. As was pointed out earlier, the use of dry batteries is helpful in simplifying the circuit and reducing hum. VR2 is the front panel control for the reflector, and R19 prevents the reflector being taken down to voltages approaching the cathode voltage—a condition that must be avoided at all costs, as damage to the klystron will result. Superimposed on this DC voltage is the modulation. S4A-B give the choice of MCW or phone. S4A simply switches HT to the multi-vibrator V11, and the resulting square-wave is fed via C12 to the load resistors R20 and R21. (It has been found useful, for safety reasons, to use two resistors in parallel here.) Due to the very small current taken by the reflector, the load resistors can be made quite high. As shown in Fig. 1 (see p.658, February issue) for MCW to take place, a square-wave of sufficient amplitude (set by VR3) to sweep completely through one reflector mode is necessary. The phone position of S4B connects the microphone transformer in series with the reflector supply, and the position of the reflector control VR2 is adjusted as shown in Fig. 1 for AM or FM. A carbon microphone is used, VR5 being adjusted until a suitable degree of modulation is obtained.

IF Amplifiers and Supplies

As was pointed out earlier, the IF power feeds have been made separate from the klystron supplies. The reason for this, apart from that pointed out with regard to the grounding of the klystron HT, is that nearly all ex-Govt. IF strips run at either 150 or 200v. HT, and on previous units that the writer has built, it has been found very inconvenient to run these from the higher voltage line necessary for the klystron. It always seems far easier to produce 350 or so volts than 150v. from the transformers generally available! When dropper resistors are fitted, the fluctuation in HT as the gain controls are varied has been found to upset everything else in the system. The 250v. winding on the transformer used seems to fit in nicely with the IF strip requirements. Choke input smoothing gives about 160 volts (to cater for the American 30 and 60 mc strips), and the extra condenser switched in on the "45 mc" position of S3a provides for the British 45 mc strip at 220v. The difference to V11 seems small, and V12 is adjusted so that it runs at its full ratings on 220 volts. V5 and V6 are the positive rectifiers, and V7 and V8 are the negative.

The reason for the inclusion of the negative supply may not be quite apparent. From experiments on several types of ex-Govt. IF/AF strips (which for various reasons usually have complicated biasing

arrangements over several stages) the writer has found that, to alter this, usually leads to instability and/or change in the shape of the response curve. Consequently, it was decided to run all the strips in precisely the manner in which they were designed, and thus to save a lot of extra work and worry, at the expense of the extra components. Thus, the negative supply is stabilised by V9 and V10 in parallel, necessary because of the large current drawn by the biasing circuit of the 60 mc strip; the results seem to justify this decision.

Each of the three IF amplifiers is completely switched into operation by S3. S3b (2 wafers in parallel) switches the heaters, and the IF in use at any one time is indicated by lamps LP1, 2, or 3 on the front panel. Positive and negative supplies are switched by S3c and S3d, respectively. Each complete 45 and 60 mc amplifier section consists of the main IF amplifier from a radar set, together with the appropriate AFC unit, suitably modified, for the FM detector. One audio stage is left in both AM and FM units, and AM/FM operation is selected by the front panel switch S6. The circuit shows how this arrangement works for the well-known 45 mc strip, which is usually in good supply as surplus.

The 30 mc strip is external to the main cabinet, but receives the switched supplies from it. It is too large to go in the cabinet, and, in addition, has an extra head-amplifier with waveguide attached, so the best solution seemed to be to make this one completely separate, and feed back the switched audio signal to S3e.

For the beginner, this complicated scheme may seem rather unnecessary, and, in fact, where two operators work together, and can agree on a common

IF, the one is sufficient. An alternative scheme offering compatibility with all the commonly-used IF's would be to make a crystal oscillator-mixer arrangement down to, say, the 30 mc strip. The writer simply offers it as his approach to a rather difficult problem.

It will be seen that a crystal mixer in the waveguide system is the device by which the IF is produced. This crystal is normally run at between 0.5 and 1.0 mA (due to the klystron RF) and, when metered, provides a very easy method of tuning the klystron and measuring its frequency when the wave-meter is included in the installation. M2 is provided to do this, and is fed with a filtered DC current from the IF strip in use, via S3g. S5 is necessary, since (a) Crystals of the 1N23 (American) and CV253 (British) types, although interchangeable mechanically, provide DC outputs of opposite polarity!; (b) Different types of mixer mounts in waveguide and coaxial configurations do not have standardised outputs and, consequently, a shift from Mixer A to Mixer B results in a change of polarity. The 30 mc crystal currents (two, from a balanced mixer) are monitored separately on the external unit.

Bandwidth of the strips varies, but all seem satisfactory to cater for the slight drift of the klystrons, and for the FM deviation produced. The 30 mc strip has relay-controlled choice of two bandwidths and two are also given by the 60 mc unit, and is achieved by changing the detector from a crystal to a valve—a very ingenious scheme. The 45 mc strip has a fixed bandwidth. Generally, an IF amplifier having 4-6 mc bandwidth seems to be the most suitable, and is that of a number of ex-Govt. units from radar sets.

(To be concluded)

VALVE DATA MANUAL

The latest edition of *Radio Valve Data*, which has become a standard reference, has been still further enlarged, and now contains operating data on over 4,800 U.K. and U.S.A. radio valves, semi-conductors, rectifiers and CRT's; the co-operation of some 20 manufacturers has ensured that the information is accurate, comprehensive and up-to-date. The new layout is such that the required information can be found easily and quickly; the book has been completely re-indexed; and a list of equivalents is included. Published by Iliffe's, *Radio Valve Data* is of 156 pages, and can be obtained from us, from stock, at 6s. 6d., post free. It is an essential reference for all designers, service engineers, experimenters and radio amateurs. Orders to Publications Dept., Short Wave Magazine, Ltd.

ELECTRICAL ENGINEERS EXHIBITION

This very fine and most interesting Exhibition, which gets bigger and more varied each year—some 470 firms have taken stands this time—will be opened at Earls Court by the Rt. Hon. Peter Thorneycroft, M.P., Minister of Aviation, on Tuesday, March 20. It will remain open until March 24. Apart from a wide range of products in the field of light and heavy

electrical engineering and electrical appliances of every kind, there will be a number of specialised displays, including one showing that an aircraft of the R.A.F. V-Bomber Force now generates and uses enough electricity to light and heat an English village of 1,500 people. In addition to the indoor stands under the roof of Earls Court, there will be an outdoor display, of equipment either too large or too heavy to be brought into the building; one of these exhibits will be a 250 b.h.p. gas-turbine of advanced design, capable of driving a 160 kW alternator. Directly concerned with the organisation and running of this great Exhibition is P. A. Thorogood, G4KD, who has seen it grow from very small beginnings.

THEFT OF EQUIPMENT

We are asked to announce that on February 5, the following items were stolen from K.W. Electronics, Ltd., Vanguard Works, Dartford, Kent: One Hammarlund HQ-110 receiver, serial number 8026; and one Hallicrafters S-107, serial 263424. Anyone who may know anything about this equipment, or be offered it, is asked to get in touch immediately with the managing director of K.W. Electronics, Mr. R. G. Shears, G8KW (works telephone number *Dartford* 25574).



THE OTHER MAN'S STATION

G3BIK

FOR G3BIK (E. Chicken, 52 Marlborough Avenue, Grange Park, Gosforth, Newcastle-on-Tyne, 3) his radio career started with training at the Colwyn Bay Radio College, after which he sailed as a sea-going radio operator at the tender age of 16 years. He was first licensed as G3BIK in 1947, when all gear was battery operated, no mains being available. The first amateur contact was made on 160 metres by keying the negative HT lead supplying an 0-V-1 receiver, after hearing a CQ from G6UP, who then lived three miles away; the aerial was 30 feet long by 15 feet high. Resultant report was 569, which lasted until the LT battery went flat. (The QRO one-watt CC transmitter was still under construction at the time.)

Marriage in 1953 made him swallow the anchor and also caused a six-year gap in Amateur Radio activities. The present shack is a brick outbuilding adjoining the house. Equipment includes a CR-100 receiver with 6AK5 RF stages, stabilised oscillator and BFO, and Q-multiplier. The Q-multiplier is the outboard chassis on the right-hand side of the receiver. The main transmitter consists of a Geloso VFO driving an 807 PA to 60 watts, feeding an end-on 132-foot aerial through separate ATU and low-pass filter, on bands 80 to 10 metres.

The HF transmitter uses electronically-controlled sequential keying of the Geloso buffer and oscillator

stages. Phone is available from a crystal microphone feeding into a 50-watt modulator running push-pull 807's. The Top Band transmitter is a self-contained unit, on the shelf above the CR-100. It consists of a Clapp VFO, buffer amplifier, and 807 PA running at 9 watts, CW or phone. It feeds *via* its own ATU into the main aerial; other antennæ are a 20-metre dipole, and a 430 mc corner reflector dipole 35 feet high, beamed south. An excellent earth is obtained from a cold-water pipe rising through the shack floor.

The electronic T/R ("send-receive") switch, *plus* the aerial tuner units, ensures that the receiver is always working from a fully-tuned antenna, and complete break-in facilities are provided. The preferred mode of operation is CW and is produced by one of two keys connected in parallel—a straight and a bug key. The latter is home-made, and was described in *SHORT WAVE MAGAZINE*, October, 1960. (In the accompanying photograph it was being used to fire the flash bulb!)

Main interests are CW operation on Top Band, 430 mc work, and QRP TTx experiments on 160 metres. An input of 5 milliwatts to a white-spot transistor oscillator has brought in a report of 339 from a distance of 32 miles during daylight hours on Top Band. The 430 mc (70-centimetre) equipment consists of a tuned cavity crystal mixer unit feeding

into the CR-100 at 28 mc and a QQV06-40 PA is under construction.

Other gear includes a home-built oscilloscope, RC bridge, and grid dip oscillator, and a surplus-type crystal heterodyne frequency meter.

All the equipment is completely screened in metal boxes, inter-connected by coaxial cable to minimise the risk of TVI. To this end, a parallel LC circuit,

tuned to the local BBC TV frequency, is connected in series with the main aerial at the lead-in insulator.

The SHORT WAVE MAGAZINE *Great Circle Zone Map* on the wall has proved invaluable for determining aerial radiation patterns. Operating time is very limited, but for G3BIK the shack is all his own, and the door can be shut on all its untidiness without undue worry!

SPREAD OF SMALLS

This issue includes one of the largest displays of Readers' Small Advertisements that we have carried for some time. A wide range of attractive items is offered at very reasonable prices—and there are also numerous "wants" and exchange offers. If you have anything in the way of good and serviceable amateur-band equipment that you want to sell or exchange, or some particular requirement in the way of gear, you cannot do better than make it known through Readers' Small Advertisements in SHORT WAVE MAGAZINE, which covers virtually the whole U.K. market. The cost of our small advertising (which is essentially a reader service) is only 3d. a word, with a minimum charge of 5s. Many a 7s. 6d. advertisement has sold £100 worth of apparatus—and quickly, too.

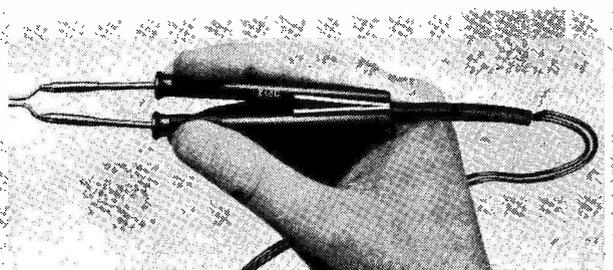
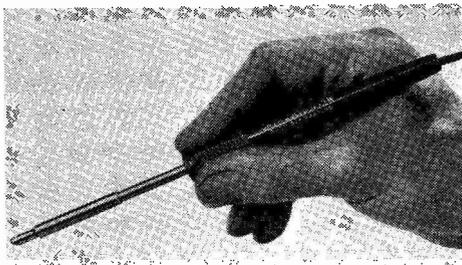
AMERICAN MAGAZINE SUBSCRIPTIONS

Readers interested in American radio amateur periodicals are reminded that we can accept subscriptions (and sub. renewals) for *QST* (48s.), *CQ* (44s.) and *73 Magazine* (30s.). These are post-free rates, for a year of 12 issues, delivery by surface mail direct from the American publisher. As a guide to size and content, an average issue of *QST* runs to 160 pages, with a large spread of advertising, many pages of activity reports, and five or six technical articles on amateur-band equipment. The content of *CQ* is similar, but it averages 112 pages. *73 Magazine* is a relative newcomer, and is different from the other two in that it publishes no activity reports at all—

apart from the advertising (about 33 pages), the remainder of its 88 pages are devoted to general technical and constructional articles. All three of these American magazines are smaller in page area, by about 20%, than SHORT WAVE MAGAZINE. Unfortunately, we cannot supply specimen copies or odd singles of *CQ*, *QST* or *73 Magazine*, as we act merely as subscription agents for them, for the convenience of U.K. subscribers who wish to remit through us in sterling. This we are glad to do, and all orders are forwarded by airmail. Remittances as quoted here should be sent, with order (or renewal notice) to: Publications Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

COVENTRY CATHEDRAL FESTIVAL

We are asked to announce that, in connection with the consecration of the new Coventry Cathedral on May 25, there is to be a period of festivities lasting from May 25 until June 16, covering a wide variety of cultural and sporting activities. The Coventry Amateur Radio Group will be putting on a special exhibition station, signing GB3COV, which will be open to the public. Needless to say, a suitable QSL card is being designed to commemorate contacts made by GB3COV on this important occasion. A large number of foreign visitors is expected for the Festival, and it is hoped that GB3COV will not only be worked, but also seen, by many amateurs from home and overseas. The GB3COV arrangements are in the hands of J. Boyce, 73 Maida Vale Crescent, Baginton Road, Coventry, Warwickshire.



On the left, the new Oryx miniature iron for normal mains voltage (110-250v.) operation; until the introduction of this model, Oryx irons were designed for lower voltages, from 6v. up to 50v. This new Oryx can be used like a pencil, and the working tip is replaceable, in a variety of sizes, from 4 mm. up to 6.3 mm. diameter. On the right is the Oryx soldering tweezer, designed for close, precision work, and operating from a 6v. supply; there are separate heating elements for each tip.

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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.

- DL2PO**, G. H. Foster (*G3POD*), 101 (Army) Pro. Coy., R.M.P., B.F.P.O.34.
- G30WF**, Dr. D. M. Manley, 8 Abbotswood, Guildford, Surrey. (Tel.: *Guildford 3607.*)
- G3PBJ**, J. L. McVennon, 11 Melbreak, Brigham, Cocker-mouth, Cumberland.
- G3PDF**, C. R. Helps (*ex-VS1KJ*), 39 Park Road East, Wolverhampton, Staffs.
- G3PDF/A**, C. R. Helps, No. 1 T.S., R.A.F. Station, Cosford, Wolverhampton, Staffs.
- G3PDX**, J. R. Barker, 35 Banders Rise, Merrow, Guildford, Surrey.
- GM3PIB**, P. Kaminski, 5 Tytler Street, Forres, Morayshire.
- G3PLJ**, P. F. Brown, 23 Shooters Avenue, Kenton, Harrow, Middlesex.
- G3PMH**, Amateur Radio Club, St. George's College, Weybridge, Surrey.
- G3PMY**, M. J. Harwood, ACA, 81 Stoneleigh Avenue, Worcester Park, Surrey.
- G3PNH**, J. B. Wilson, 128 Canterbury Walk, Warden Hill, Cheltenham, Glos.
- G3PNU**, E. Clark, 5 Bedford Street, Millom, Cumberland.
- G3PNW**, D. W. Wyatt, Valley House, Hawkfirst Road, Kenley, Surrey. (Tel.: *Uplands 2085.*)
- G3PNX**, Mrs. E. H. Wyatt, Valley House, Hawkfirst Road, Kenley, Surrey. (Tel.: *Uplands 2085.*)
- G3POR**, E. Lewis, Glanrhydd, Wisborough Green, Billingshurst, Sussex. (Tel.: *Wisborough Green 387.*)
- G3POW**, Radio Society, Farnborough Technical College, Boundary Road, Farnborough, Hants.
- G3POX**, G. D. Griffiths (*ex-ZC4FR*), 68 West Barrier, Finningley, Doncaster, Yorkshire.
- G3PPN**, D. A. Rees-Jones, 56 Higher Road, Hunts Cross, Woolton, Liverpool, 25. (Tel.: *Hunts Cross 1712.*)
- G3PPU**, P. J. Smith, The Cottage, Little London, Basingstoke, Hants.
- G3PQB**, S. W. C. Harbour, 535 Gladstone Street, Peterborough, Northants.
- G3PQC**, P. D. G. Turk, 25 Whetstone Road, Cove, Farnborough, Hants.
- GM3PQU**, A. T. Lawrie, 7 Marchmont Crescent, Edinburgh, 9.
- G3PRD**, W. L. Nilan, 44 Watson Road, Worksop, Notts.
- G3PRF**, R. N. Findlay, 68 Kynance Gardens, Stanmore, Middlesex.
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- G3PSH**, J. A. Coffey, 112 Geary Road, Dollis Hill, London, N.W.10. (Tel.: *GLadstone 2785.*)
- G3PSL**, G. N. Harvey, B.Sc., The Grammar School, Burton Walks, Loughborough, Leics. (Tel. *Loughborough 4669.*)
- G3PSV**, D. A. Park, Wickham House, High Street, Bagshot, Surrey.
- G3PSX**, W. A. Fletcher, 21 Howell Drive, Greasby, Upton, Wirral, Cheshire.

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- G3BIN**, A. E. Bosten, 9 McMullen Road, Darlington, Co. Durham.
- G3FVC**, E. C. Palmer, 18 Lansdown View, Timsbury, Bath, Somerset.
- G3GUW**, J. B. Lievens (*9M2UW*), 82 Weybourne Road, Farnham, Surrey.

- G3HCT**, J. Bazley, Brooklands, Ullenhall, Solihull, Warks.
- G3IUX**, E. R. Rose, 3 Greaves-town Lane, Lea, Preston, Lancs.
- G3JLF**, L. Beevers, 6 Marina Avenue, High Cross, Blackpool, Lancs.
- G3JUY**, A. Mallinder, Whitworth, Aiskew, Bedale, Yorkshire.
- G3KTL**, M. K. Dunn, 30 Sudbury Drive, Cheadle, Cheshire.
- G3LOW**, J. Barrett, 120 Clough Hall Road, Kidsgrove, Stoke-on-Trent, Staffs.
- G3LYK/A**, W. McLardy, c/o Officers' Mess, R.A.F. Station, Finningley, Doncaster, Yorkshire
- G3NAC**, J. M. Hern (*VS9AAA, ex-G3NAC/VS9A, G3NAC/VS9K*), c/o 8 Keydell Close, Horndean, Hants.
- GM3NYY**, W. A. F. Davidson, 13 Irvine Road, Kilmarnock, Ayrshire.
- G3OFV**, D. A. C. Jack (*ex-GW3OFV*), 209 Sig. Sqdn. (Inf. Bde.), Colchester, Essex.
- G30GX**, J. H. G. Allsop, 17 Hambro Hill, Rayleigh, Essex.
- G3OKI**, H. E. Ibbotson, 5 Leighton Road, Stanbridge, Leighton Buzzard, Beds. (Tel.: *Hockliffe 405.*)
- G3ORM**, Amateur Radio Club, 209 Sig. Sqdn. (Inf. Bde.), Colchester, Essex.
- G30UK**, M. J. P. Blake, 127 North Street, Bedminster, Bristol, 3.
- GW3PHN**, S. B. Lord, 5 Ger-y-coed, Pontyates, Llanelli, Carmar.
- G3PHV**, E. A. Bond, 61 Willow-garth Road, Dunston Hall Estate, Newbold, Chesterfield, Derbyshire.
- G3POB**, H. S. Howells, c/o Officers' Mess, R.A.F. Station, St. Mawgan, Newquay, Cornwall.
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- G5JM**, H. E. James, Beacon Lodge, British Camp, Colwall, Herefordshire, nr. Gt. Malvern, Worcs.
- G5UM**, J. Hum, 9 Burnham Green Road, Bulls Green, Knebworth, Herts. (Tel.: *Tewin 275.*)

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for April Issue : March 16)

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

ONCE or twice in the past we have referred to the benefits of inter-Club arrangements, especially where the Club population is dense and the travelling distance short. This month we note an Inter-Club Quiz between *Crystal Palace* and *Clifton*; also a visit between *Manchester* and *Northern Heights*.

Nothing but good can come of such arrangements, and we do not think that the opportunity is grasped by nearly enough clubs. For instance, we imagine that at least 75 per cent. of lectures, talks and demonstrations are drawn from the actual membership rather than from professional outsiders. Why not a system for exchanging lectures between one club and another?

The average amateur is not, perhaps, a good talker; but if he prepares a lecture which he will deliver among his own friends, in his own clubroom, it will be much easier for him to repeat it among relative strangers at a later date—the material may even be improved as it goes on its rounds.

We do not imagine there to be any rivalry between clubs—in the sense of wanting to keep their best talkers to themselves—and can see no reason why some of those blank spaces in the programme should not be filled by mutual arrangement with the neighbours.

Inter-Club contests (whether Quizzes or events on the air) are another matter; they can also be interesting and stimulating, and we will return to this subject on another occasion.

Barnsley recently held their annual dinner and social evening, with a good attendance of members and visitors from other clubs. Meetings continue on the second and fourth Friday, and the first one of the new season was a taped lecture on Astronomy and Cosmology. G5KM was due to talk on Crystal Filters on February 23, and on March 9 there will be a Junk Sale. For March 23 the subject is Hi-Fi. Next year the club will celebrate its 50th anniversary, when special efforts will be made to devise something fitting.

Bradford have a talk by G3LZW on Audio Amplifier Design and Construction, on March 13; the 27th is the date for their AGM. **Chesham** are putting the accent on the training of younger members, and their new course is well under way. All except two of the licences held by members have been achieved as a result of this club's activities—a good record, indeed.

Great Yarmouth recently held their AGM and elected G3NTV secretary (*see* panel for QTH). Meetings will be held at the Electricity Sports and Social Centre, The Quay, every Friday evening at 7.30 p.m. A full programme includes CW classes and R.A.E. training, also lectures and outdoor events. Visitors during the holiday season will be particularly welcome.

Midland have a Film Evening on March 20, and the subjects include George Ellison's visit to Moscow, the Uses of Tufnol Insulation, and "full supporting programme"; 7.30 p.m. at the Midland Institute, Birmingham.

Paddington held their first AGM and elected G3JEA chairman, G3LVK secretary and G3KNL treasurer. Their first year was successful (even allowing for a burglary in which their Tx and other gear was stolen!); membership has increased by 500 per cent, a news letter is published, and meetings are held every Wednesday at Beauchamp Lodge, Harrow Road, W.2. New members always welcome.

Purley will be holding a Competition and Exhibition of Members' Gear on March 16, every class of entry being catered for; normal meetings are on the first and third Friday, at the Railwaymen's Hall, Whytecliffe Road, 8 p.m.

Slade have a Mullard Film Meeting booked for March 9, at the Bennett Hall, YMCA, Snow Hill, Birmingham. The two films will be "Particles Count" and "Transistors"; 7.45 p.m., admission by ticket, obtainable from the programme secretary. Another Film Show will be held on March 23—details not yet available.

Spenn Valley held a successful Annual Dinner, at which the Swindon Cup was presented to G3FBP for outstanding services to the Club. On March 14 Mr. L. Dougherty of Halifax will be giving a talk on Radio Astronomy; Gomersal Hill Top School, 7.30 p.m.

Southgate give advance notification of their Spring Junk Sale, which will be on April 12 at Arnos School. Members of the group recently visited the Hq. of the London Fire Service and then went on to New Scotland Yard. A CW net is being run every Monday, 8 p.m. on 1860 kc, and a phone net will be started shortly.

South Hampshire got together for their annual dinner and social at the Cotswold Hotel, Portswood, on February 17; March 10 is the date for the

Southampton Group meeting, when the speaker will be G3FZL, on VHF subjects.

At their recent AGM, South Yorkshire elected G3HNJ chairman, G2BOJ treasurer and Margaret Brailsford secretary. Meetings are fortnightly, the next date being March 8, when three members will talk on the Basic Principles of Radar.

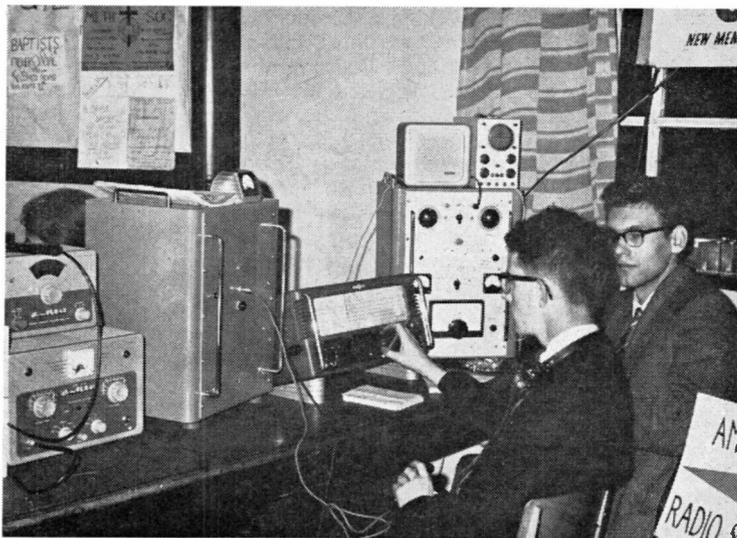
Acton, Brentford & Chiswick held their AGM and elected G3IGM chairman, C6RC vice-chairman, with G3GEH as secretary and treasurer; they foregather on the third Tuesday every month, 7.30 p.m. at the AEU Club, 66 High Road, Chiswick. Clifton will meet on March 9 to discuss preparations for Field Days and D/F events; on the 23rd G3IIR will give a demonstration of RTTY; and April 6 sees Clifton "at home" to Crystal Palace in the first round of the 1962 Inter-Club Quiz.

Peterborough, at their February meeting, saw a selection of first-rate 35-mm. transparencies taken on Christmas Island by G3DAF; on March 2 members are visiting the automatic telephone exchange at Peterborough, and on April 8 they will be hearing about Direction-Finding.

Crystal Palace meet on March 17 for a talk on Army Wireless Equipment by G3GVV. April 3 is the date for their Morse class and so on, at the home of G3IIR, and April 6 is the Quiz date with Clifton, mentioned above.

Crawley welcomed G6CJ and his talk and demonstration on Aerials at their February meeting. On March 28 they have a visit from Mr. D. J. Stevenson of the Automobile Association, who will explain the A.A. Communications Network. Visitors welcome, at the West Green Community Centre, Crawley.

Derby held their AGM and heard that their state, financial and otherwise, was very sound. Their chairman is G3FGY, vice-chairman G3KQF and hon. sec. G2CVV. March 7 is the date for their Junk Sale, at which members of the Nottingham Club will



G3OUL is the callsign of the University of Liverpool A.R.S. and on the occasion of a recent demonstration of Amateur Radio, they were able to obtain the loan of an LG.300, a DX-40U and an 888A, by the co-operation of the manufacturers concerned. Very satisfactory results were obtained on the 15-20-40-80m. bands, and in this photograph we see GW3ODI on the receiver and G3PIY in the background.

be present. Proposed events after that are a talk on Timber (March 14) and a Hot Pot Supper (March 21) at the White Hart, Aston-on-Trent. The 28th will be an Open Evening.

Flintshire report again after a long absence. Their AGM was held at the end of January, when GW3JGA/T was elected chairman, and GW3NQP hon. sec. Meetings will be held at the Railway Hotel, Prestatyn, on the last Monday of each month, the next date being March 26, booked for a talk on Colour Television (Local Experiments) by their chairman.

Grafton will run their usual Top-Band Contest on March 24 (CW) and March 31 (Phone)—for details see "DX Commentary." Reigate held their third AGM and reported a membership of 35 (17 transmitting members) and a healthy financial position; their chairman is G3FM and secretary G3NKT. Junior meetings are held on the first Saturday of the month and are well attended. Next regular meeting (March 17 at The Tower, Redhill) is booked for a talk on Mobile Operation by G3FRV from Crawley.

Yeovil have a full programme for this year, meeting every Wednesday at the British Legion Hq. Recent activities have included tape lectures with Mullard slides. On March 7 the subject is Semi-Conductor Devices, and on April 4, Basic Valve Circuits. Other forthcoming events are a demonstration of the Drake 2B receiver (G3OSH) and a talk on Electronic Organs (G3FQA). New members and visitors always welcome.

Halifax held their Annual Dinner in February, when G2BPJ made the first presentation of a Trophy, to be awarded each year to the member who has done most to further the objects of the club; the first holder is Mike Whitaker, G3IGW. On

NOTICE TO ALL HONORARY SECRETARIES

Appearance in this space is free to those Clubs who care to make use of it for publicity and the reporting of their activities. Hon. secretaries are asked to ensure that their reports, addressed "Club Secretary," Short Wave Magazine, 55 Victoria Street, London, S.W.1, reach us by the date given each month. It is impossible to write in late reports, received after we close for press. All reports must include the name and QTH of the hon. secretary, for publication in the address panel.

March 6 G3MAX will be talking about the "Con- vention of Surplus Equipment" (at the Beehive and Crosskeys Inn, 7.30). On March 20 members will gather at the same place and time, but the meeting will be an informal one, held at the White Windows Cheshire Home.

British Timken are preparing already for their Show in August, and have decided to operate on Twenty, Eighty and One-Sixty. Meanwhile they are having difficulties with a local pirate, but invite him to turn up at their meetings so that he may be suitably coached to obtain a licence.

Manchester were "At Home" to **Northern Heights** on February 28, when a supper and junk sale were held in their honour. They propose an outing to the Lake District in May, with picnics and portable operation; more details later. Meanwhile they meet at the King George VI Club, North Road,

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.
 BARNSELEY: P. Carbutt, G2AFV, 19 Warner Road, Barnsley.
 BRADFORD: M. Powell, G3NNO, 28 Gledhow Avenue, Roundhay, Leeds 8.
 BRITISH TIMKEN: J. B. Johnson, G3JJW, 44 Castle Avenue, Duston, Northampton.
 CHESHAM: Capt. C. G. Stephenson, G3CLJ, 21 Lynton Road, Chesham.
 CLIFTON: E. Godsmark, G3IWL, 211 Manwood Road, London, S.E.4.
 CRAWLEY: R. G. B. Vaughan, G3FRV, 9 Hawkins Road, Tilgate, Crawley.
 CRYSTAL PALACE: G. M. C. Stone, G3FZL, 10 Liphook Crescent, London, S.E.23.
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 FLINTSHIRE: H. T. Jones, GW3NPQ, Bedwyn, Queens Park, Rhyl.
 GRAFTON: A. W. H. Wennell, G2CJN, 145 Uxendon Hill, Wembley Park, Middx.
 GREAT YARMOUTH: B. E. Gillingwater, G3NTV, 79 Lancaster Road, Great Yarmouth.
 HALIFAX: G. Sunter, 24 Booth Fold, Luddenden Foot, Halifax.
 HASTINGS: W. E. Thompson, G3MQT, 8 Coventry Road, St. Leonards-on-Sea.
 MANCHESTER: A. B. Langfield, 2 Rowland Street, Moston, Manchester 10.
 MIDLAND: C. J. Haycock, G3JDJ, 360 Portland Road, Birmingham 17.
 NORTHERN HEIGHTS: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax.
 PADDINGTON: N. Lambert, G3LVK, 22 Sunderland Terrace, London, W.2.
 PETERBOROUGH: D. Byrne, G3KPO, Jersey House, Eye, Peterborough.
 PURLEY: E. R. Honeywood, G3GKF, 105 Whytecliffe Road, Purley.
 R.A.I.B.C.: W. E. Harris, G3DPH, 4 Glanville Place, Kesgrave Ipswich.
 REIGATE: F. D. Thom, G3NKT, 12 Willow Road, Redhill.
 SLADE: C. N. Smart, 110 Woolmore Road, Birmingham 23.
 SOUTH BIRMINGHAM: T. W. Legg, Flat 3, 80 Alcester Road, Birmingham 13.
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 SOUTH SHIELDS: D. Forster, G3KZZ, 41 Marlborough Street, South Shields.
 SOUTH YORKSHIRE: Mrs. M. E. Brailsford, 15 Ayrson Walk, Cantley 4, Doncaster.
 SPEN VALLEY: N. Pride, 100 Raikes Lane, Birstall, Leeds.
 SURREY (CROYDON): S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon.
 WOLVERHAMPTON: J. Rickwood, 738 Stafford Road, Fordhouses, Wolverhampton.
 YEOVIL: D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil.

CLUB PUBLICATIONS RECEIVED

We acknowledge, with thanks, receipt of the following Club Publications: **Southgate** (Newsletter, February); **Derby** (Newsletter, No. 1); **R.A.I.B.C.** (Radial, February); **Purley** (Splatter, February); **Slade** (Contact, January); **Midland** (News Letter, January); **Hastings** (Natter-Net Notes, January); **Wolverhampton** (News Letter, February); **Surrey** (SRCC Monthly News, February); **South Hants** (QUA, February); **A.R.M.S.** (Mobile News).

Manchester 10 every Wednesday at 7.30. March 14, Morse and R.A.E.; March 21, Practical Night; March 28, Lecture (subject not fixed).

Northern Heights have had a tape-recorder demonstration and an informal evening; next event is on March 21, when members will hear a talk by G3GJV on his mobile equipment. April 4 is booked for a ragchew and April 18 for the AGM.

South Shields report that recent meetings have included their Constructional Competition, a lecture on SSB and a Film Show; on March 28 G3GBF will discuss Aligning Communication Receivers. The weekly meetings continue, Fridays in Trinity House Social Centre, Laygate.

Surrey (Croydon) met on February 13 for a Junk Sale, which included some of the gear left by the late F. J. Brook (G2FSY). On March 13 their usual meeting will be held, but the subject of the lecture is not yet known. Blacksmiths Arms, South End, Croydon, is the meeting place.

Wolverhampton have a committee meeting on March 5 and the judging of their Home-Constructed Equipment Competition on March 12. Then the 26th is booked for a talk by G3KMT.

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10-WATT Telecom. 2-metre Tx/Rx, unused, £50. 13 xtals from 3.5 to 3.8 mc, ¼-inch spacing, £5. Electric motor, capacitor, 1-h.p., 240v. 6 amp., unused, £12. Offers wanted for the following: 2-metre aerials; crossed dipoles; two halos; skeleton slot.—C. Lovell, 17 Albion Mews, London, W.2.

WANTED: Manual and circuit diagram for Hallicrafters SX-28 and American Services Voltohmmeter 1-166.—Hall, 107 Blackbush Spring, Harlow, Essex.

2-METRE Nuvistor converters, xtal controlled, built-in PSU, silver-plated copper chassis, IF 28-30 mc. (To order, 10s. extra); price only £8 10s. o.n.o.? Deliver 30 miles London.—G3OPX, 5 Weir Hall Gardens, Edmonton, London, N.18.

WANTED: One R.107, good condition (fitted S-meter, if possible).—Full details and price to: R. Makin, 1 The College, Malvern, Worcestershire.

AR 88LF, first-class resprayed cabinet, manual; first £25; prefer test and collect. Electronic bug key with Spr. sidetone, £5. VHF Rx R3A/ARR-2X, £4. 3-in. scope, no pwr., £4. RCA Speech Amp., £4. Carriage. Offers?—Phone St. Helens, Lancs., 3903.

FOR SALE: Eddystone 888A, speaker, S-meter, £70 o.n.o.? Vanguard, £40 o.n.o.? 3-element Mosley Tribander, mast, feeder, motor and control unit, etc., £15. Quantity valves, 813, etc.—Smith, 9 Midholm Road, Shirley, Croydon. (SPR. 3642.)

Q-FIVER for sale, good condition; bargain, £3 10s.—Cox, 3 Regina Drive, Walsall, Staffs.

EXCHANGE 8mm. projector and/or B.H. 16mm. silent projector, 35mm. projector, camera, enlarger—for good receiver, table-top transmitter, wavemeter.—Box No. 2572, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: LG300 with PU/Mod. companion unit, excellent condition; best offer over £65; Glasgow area. WANTED for AR88LF, RF coil pack; must be in excellent condition.—Box No. 2573, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

GELOSO VFO 4/102 with dial and escutcheon, plus pi-output coil N.4/110 and HF choke. All new in makers' cartons; £8 10s.—Sheard, 84 Spring Road, Abingdon, Berks.

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- 10 **JAP STICK MIKE.** Black and chrome (xctal) beautifully designed with switch, neck cord, screw fitting for base. 100-8,000 c.p.s., 39/6 + 2/- P.P. Heavy base to match 12/6 + 1/6 P.P.

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DST100 and P/pack	17	10	0
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Power Pack	3	10	0
Coils	1	10	0
R.107	13	0	0
BRT 400	75	0	0
Tiger 60	47	10	0
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SMALL ADVERTISEMENTS, READERS—continued

WANTED: Bandsread coils for HRO Receiver. handbook for TCS Receiver.—L. Arnold, 24 Albert Road, Stechford, Birmingham, 33.

AR11 SPY Tx/Rx, complete with xtals for 20m. band, new condition, and in complete working order, £14 o.n.o.?—Write: Powell, 68 Bridgnorth Road, Stourton, Nr. Stourbridge, Worcestershire.

EXCHANGE Minimitter MR44 and Eddystone speaker in mint condition for Wearite 4A or Brenell MK5 tape deck and good ribbon mike—or sell £35.—Whitehead, 64 Willans Avenue, Rothwell, Leeds, Yorks.

FOR SALE: Type 36 Tx, covering 20, 15, 10 metres, 50 watts CW/Phone, £8. Free delivery 50 miles. — G3LEX, 17 Lywood Road, Leighton Buzzard, Beds.

HALLICRAFTERS Receiver, Type SX-28, frequency range 550 kc to 43 mc, immaculate condition, £30 or nearest offer?—P. C. Caine, 19 Aldersley Close, Tettenhall, Wolverhampton.

GRUNDIG TK20, FB condx.; cost £45; exchange for LG.50 or similar Tx; cash adjustment as necessary.—Gough, 2 Valley Road, Chilwell, Notts.

SUPERB Two-metre Transmitter, in grey louvred table-top cabinet, 17 ins. x 9 ins. x 11 ins. high; completely self-contained, phone/CW, two switched crystal frequencies, all controls on front panel, aerial outlet for receiver; push/pull modulator with input for crystal microphone; 832A in PA; condition as new, not modified war surplus; £35 (delivered 50 miles, or by arrangement).—Jeapes, 165 Cambridge Road, Great Shelford, Cambridge.

SALE: Top Band Command Rx, £4; BC-453, £4; B2 Rx, 80m. range modded 160m., £1; R.109 mains p/pack, £4; 100 kc xtal, 10s.; FL8 Filter, 10s.—Box No. 2574, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

GELOSO G256 Tape Recorder; exchange for Mobile Tx/Rx or W.H.Y.?—G3PHS, 28 Parkhurst Road, Sutton, Surrey.

HRO-6 Amateur Band Coils, spare valves and crystal, noise limiter included, not fitted p/pack; will deliver, or meet, up to 40 miles from Stowmarket; £18.—Gidlow, 55 Stowupland Road, Stowmarket, Suffolk.

S.W.L. Engineer, selling up CR-300, £8; B36, £6; S. URR/13B, £10; TF-144G, £15; ID/APA/59, £4; TF39OG, £5; Monitor-type 56, £7; 80 brand-new modern TV valves, £25; also junk; s.a.e. list.—Brown, 7 Fernbank Road, Bradford, 3.

FOR SALE: Hallicrafter SX-110 Rx, £60 o.n.o.? As new; any trial.—Phone Eltham 7881: G3JYT. 10 Green Lane, London, S.E.9.

TELEPRINTER, Creed Model 3, and RTTY converter wanted; must be in 100% condition. **FOR DISPOSAL:** 150-watt Tx (with valves) (Chinese copy LG.300), mint condition, £18. Woden mod. transformer UM3, £4. TZ40's, 15s. PU's and Mod. ex-1131 Tx, 100% condition, £3 each. Carriage extra all items.—Write Box No. 2575, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

MANUAL for R.308 wanted; good price paid; short-term hire considered.—Box No. 2576, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

TYPE 3 Teleprinter, power supply, FSK converter and CRT Monitor, £12.—Floyd, 14 Westbourne Grove, Westcliff-on-Sea, Essex.

SMALL ADVERTISEMENTS, READERS—continued

WANTED: R.1224 Receiver; 18 Set; pair TU handles.—Details, please (all replies answered): R. Copeland, GI3NZZ, Dunaman Park, Kilkeel, Co. Down, N. Ireland.

WANTED: Tx, commercial, 10-160, 10-80 or 160 metres only; must be good condition and preferably including power pack; state price.—Box No. 2577, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

MINIATURE Tx and Rx unit (B2), covers 20, 40, 80 metres, £10.—Box No. 2578, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

AR 88LF for sale; re-wired, front panel re-stoved and chromed, £35 o.n.o.? Williamson Amplifier (professionally constructed), Partridge o/p Transformer, £10; owner going abroad; buyer collects.—Smith, 603 Pinner Road, Pinner, Middx. (Pin. 9947.)

CQ AUSTRALIA: G3HPW will be visiting Sydney from April to July inclusive this year and seeks accommodation for self and wife. Also purchase, hire or otherwise, of simple, inexpensive gear in anticipation obtaining VK licence.—A. Milner, 21 Brooklyn Way, West Drayton, Middlesex, England.

WANTED: Eddystone 888 or 750; Heathkit VFO; Minimitter mobile converter; please state price and condition. **FOR SALE:** G4ZU 3-band beam, £7. Rack and panel Tx, 80-10 metres, with Geloso VFO, £20.—Please write to G2FLY, 71 Deakin Road, Erdington, Birmingham, 24.

SALE: Eddystone Marine 670A Receiver, as new; 30 mc-150 kc, AC mains or 100-230v. DC, built-in speaker, £25 o.n.o.?—Mackay, Hall Place, Burchetts Green, Nr. Maidenhead, Berks. (Regret no callers Sundays.)

COMPLETE STATION for sale: QRO rig, pair 813 in final, Class-B mod., pair TZ40, Willcox-Gay VFO driving 2-stage exciter, 5-stage speech amp. with clipper, D104 mike, J36 bug key, four separate power supplies, relay controlled; housed in 7-ft. rack, fully metered; Class-D Wavemeter; Eddystone S.640 with S-meter and 2-stage pre-selector; Emmerson CEX-10172 portable Rx, 5-13 mc; two heavy-duty booster transformers for station and final power supplies; GEC 17-in. TV 12-channel Rx, perfect; complete set spare valves for Tx, S.640 Rx, pre-selector, and power supplies. Cupboard full assorted spares, etc.: Two tables, 2 chairs, 2 sets shelves, £95 complete. Will consider selling separately.—G3EMD, 99 Shenstone Valley Road, Quinton, Birmingham, 32. (Telephone WOODgate 4470.)

SHORT WAVE MAGAZINE, November 1958 to 5 date (July-August 1958 missing). Twenty-four *RSGB Bulletins*, 17 *Radio Constructors*, 23 *Popular Electronics*, 17 *Practical Wireless*; best offers?—Roxbee, 9 Crowndale Court, Euston, London, N.W.1.

FOR SALE: Instructions 19 Set, Mk. II and Mk. III. Magazines: *Short Wave Magazine*, 1946-50 (50); *Practical Wireless*, 1947-60 (100); *CQ*, 1952-60 (45); *QST*, 1946-61 (44); *Radio Constructor*, 1951-60 (41). Number of copies in brackets.—Offers to: Harvey, 2a The Avenue, Rubery, Birmingham.

HALLICRAFTERS S-20R with manual, internal speaker; needs mains xformer and some attention; £4. Class-D Mk. II Wavemeter, £2 15s.—G3PFB, 19 MSQ, Woodhouse, Loughborough, Leics.



Safety first every time with these patented spring-loaded AVO Prodclips.

Cleverly designed for use as insulated prods, they are invaluable for reaching and holding test points which are difficult of access. Suitable for use with AvoMeter, Multiminer and Avo Electronic Test Meter Leads. post free 15/- per pair

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EDDYSTONE 770R. 19 to 165 mc/s. ...	185	0	0
EDDYSTONE 840C. 550 to 30 mc/s. ...	58	0	0
HRO's with coils and P.S.U. ... from	25	0	0
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Coming shortly: the NC155X Amateur Bands only receiver and NC105X General coverage receiver.

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TRANSMITTING VARIABLE CONDENSERS by Johnson, Cardwell & Cylind 4000v. spacing, 3500 p.f., 22/6 (3/6); 1000 p.f., 17/6 (2/6); 2000v. spacing 7, 40, 60 or 100 p.f. or 2, 2.5 or 2 x 40 p.f. all 7/6 each (2/-). **WODEN H.T. POWER SUPPLY UNITS** in table cabinets 24 x 14 x 10 wt. 1 cwt. input 200/250v. Output 1500v, 500 ma./a. fully smoothed, including 4-RG1/240 Rectifiers, £11 (30/-). Savage, as above but 24" x 19" x 15", £10/10/- (30/-). **WODEN E.H.T. TRANSFORMERS**, 200/250v. to 4800v. 1 amp. 12" x 9" x 9", £9 (20/-). Pockets Dosimeters, 25/- (1/-). **LIGHTWEIGHT HOLLOW WOOD AERIAL POLES**, 4" dia. 1 1/2 ft. long, smooth finish, easily coupled to any length, 15/- (5/-). 2 1/2" **MICRO/AMMETERS**, 1st Grade 0/25 (calibrated 0/125), 22/6 (2/6). **ELECTROVOICE** Type 600 moving coil microphones with push to talk switch and cord, 70/- (3/6). T-17 microphones with switch and cord, 40/- (2/6). Post Office table type carbon microphones, 12/6 (2/6). Miniature 1 1/2" dia. flush 0/1 m/a calibrated 30 divisions 0/60, 30/- (1/6). **HELICAL POTENTIOMETERS**, 75,000 ohms, 8 turns, 12/6 (1/6). **MINIATURE SEALED RELAYS**, 1700 + 1700; 700; 145 + 145 or 2.5 ohms, all 7/6 each (1/6). **AM-26/AIC AMERICAN AMPLIFIERS** with 4 valves and dynamotor for 28v.; 5 watts output, 25/- (5/-). **24v. 1A SMOOTH D.C. SUPPLY**, comprising transformer, metal rectifier, choke, condenser input 200/250v. A.C. the four 27/6 (3/6). **AUDIO TRANSFORMERS**,

40 PAGE LIST OF OVER 1,000 ITEMS IN STOCK
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Bendix, R.C.A. or G.E.C. Mike, 7/6 (1/6). Interstage, 7/6 (1/6). ET-4336 Driver, 15/- (3/6); 85 watts, Woden, 40/- (7/6); 200 watts, G.E.C., 65/- (7/6). **P.O. RACKS**, 5ft. high 19in. wide, 35/- (10/-). **RECTIFIER SETS**, 200/250v. A.C. to 110v. 750 m/a or 50v. 1A in metal cabinets, 59/6 each (7/6). **CHOKES**, high quality guaranteed, plus 50% continuous rated 1H. 270 m/a, 15/- (3/6); 20H. 400 m/a, 20/- (5/-). **MORSE KEYS**, British enclosed, 7/6 (2/6).

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RECEIVERS MARCONI CR300. 15 kc/s. to 25 mc/s. 230v. A.C. Power pack built in, good working order, £15, carriage £1.

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BAROMETERS, approximately 6" diameter, Brass case, wall mounting, calibrated in Millibars, 35/-, post 5/-.

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RESISTORS. 100k 1/2 watt box of 6, 6d.; 1 meg 1/2 watt box of 6, 6d.; 10k 1/2 watt box of 3, 3d. Postage under 12, 1/- over free.

HEADPHONES DLR type, 6/6, post 1/6.

TIME SWITCHES. 14 day, 5 amp contacts as removed from street lamps, good working order, complete with new key, 15/-, post 2/6. These have "Quick Make-Break" contacts and are suitable for D.C. or A.C. up to 250 volts.

CAPACITORS, paper, 4uf. 600v., 1/6, post 1/-, 6 or more free.

METAL RECTIFIERS. 100 m/a, 200 volts, 1/6, post 6d.

One Only **MINIMITTER MR44 RECEIVER**, £25, carriage £1.

AMPLIFIER, type N24, 230 A.C., 4 watts output at 600 ohms, output transformer easily changed, 35/-, carriage 10/-.

CLOCKS. Ex-Navy, wall mounting, good quality 8-day movement, overhauled, guaranteed 12 months. Black case, £4/10/-, Brass, £5/10/-, post 5/-.

LOUDSPEAKERS, 10" in wood box, 3 ohm with 600 ohm line transformer, 12/6, carriage 5/-.

MAINS TRANSFORMERS. Tapped primary. Outputs, 6.3v. 1a. three times, 5v. 2a, 290-0-290v. 80 m/a., 15/-, post 2/6. Also 250-0-250v. 80 m/a, 5v. 2a., 6.3v. 4.5a., 17/6, post 2/6.

3" PYREX RIBBED AERIAL INSULATORS, 1/6, post 1/- up to 6, over free.

All equipment offered is complete but not tested unless otherwise stated. Carriage charges are for Mainland only.

Terms: Cash with order. Early closing Wednesday.

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SMALL ADVERTISEMENTS, READERS—continued

WANTED: HRO-MX manual. EXCHANGE F.204 Rx, 3 to 27 mc. for VHF Rx, Type R.1392.—Bean, 51 Heathfield Square, Wandsworth, London, S.W.18.

FOR SALE: KW Victor Tx, as new, £45. KW Match SWR meter, as new, £3 10s. KW LP Filter, as new, £2. Eddystone loudspeaker, mint. 25s. Tiger Z-match with 12v. relay fitted, £3 10s. New boxed 250 + 250 μ F Clydon split-stator variable, 15s. New boxed Eddystone 598, full-vision dial and drive, 15s. Xtal cal. No. 7, 1000 kc. 100 kc. 10 kc. with power supply, £2 10s. New 1962 RSGB *Amateur Handbook*, £1. Mint 1959 *ARRL Handbook*, 15s. Mint *ARRL Antenna Book*, 10s. Caxton's *Modern Practical Radio and Television* encyclopædia, as new, £1. *Short Wave Magazines*, Jan. 1957-Jan. 1962, incl., 35s. *Practical Wireless*, Apl. 1957-Feb. 1962 incl., 30s. *Radio Constructor*, Jun. 1959-Jan. 1962 incl., 15s. *RSGB Bulletin*, Ap. 1960-Jan. 1962 incl., 15s. All items o.n.o.?—Box No. 2579, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: R.208, mint condition, with manual, £9 10s. ZC1 Mk. 1, converted 160m., with mike, £9. R.1132A, tunable 100-125 mc, £3 10s. Power unit 234A with meter, £2 10s. (suit above). German Tx/Rx, battery-powered, 3-7.5 mc, £3 10s. Minimitter Multi-Q, £3. Dumont Service 'scope, non-working, due to long storage, 30s. American Test Meter 1000 o.p.v., £2 10s. Manual with details of 19, 22, 21, R.107, and 12 Sets, 30s. 358X Top Band coil. 5s. Callers welcomed.—Hardcastle, Rigton Grange, East Keswick, Leeds.

FIRST-CLASS VHF Receiver, Type R.1392, unmodified and complete with 15 valves, S-meter, etc.; covers 95 to 150 mc; £3 10s. (carriage paid).—Beadle, 6 Chapel Cottages, Thearne, Beverley, Yorks.

WANTED: High-grade Communications Receiver 75A4, Hammarlund SP600-JX, Collins R.390A or R.391, etc. Also cheaper type as stand-by set. Cash waiting.—Clappison, 291 Beverley Road, Hull.

WANTED: Two Capacitors. Johnson Type 250E30; or one capacitor, Johnson Type 500E30; or one capacitor, Johnson Type 1000E35; or any variable capacitor 250 + 250 μ F, 2500 to 3000 volts working.—R. Bennett, 70 Park Lane, Chippenham, Wilts.

FOR SALE: New Valves: 813, 30s. each; 5U4G, 83, 5Z4M, 6V6M, 6L6G, 807, 4s. each; 1T4, 1R5, 1S5, EF92, 2s. each. MCRI Rx, 4 coils, needs servicing, 40s. Please forward s.a.e. for list of other amateur gear.—Box No. 2580, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

HEADPHONES, 25-ohm, specially made by Brown's to match "Mohican," 27s. 6d.

WANTED: High resistance moving-coil headphones for AR88D; compact signal generator; two 300 μ F variable condensers.—Ray, Coniston Avenue, Dalton-in-Furness, Lancs.

HROST, professionally modified, miniature valves, 10-160m., valve S-meter, stabilised BFO, PSU, as new condition, good performer, £28; or exchange for more compact Rx without plug-in coils, W.H.Y.?—Box No. 2581, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

£12 10s. EACH: AVO 8, BC-221, Grundig Cub, table-top phone transmitter, 13 valves, 120w. 15-0, 1-inch CRT's, microammeters, 829B's, 832A's; carriage extra.—Box No. 2582, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SMALL ADVERTISEMENTS, READERS—*continued*

SHORT WAVE MAGAZINE, March 1952-December 1960, with indexes, £5 the lot, plus carriage.—Stebbing, 146 Stockport Road, Altrincham, Cheshire.

CLEAN, recent R.A.E. Course and long player required.—Burgin, 15 Richmond Park Road, Sheffield, 13.

R. 107 with manual, £8; also offers for clean *Short Wave Magazines*, Aug. '58-Jan. '62; *R.S.G.B. Bulletin*, July '57-Jan. '62; carriage extra.—Carr, 27 St. Margaret's Road, Mickletown, Methley, Nr. Leeds.

SALE: Minimitter MC8 8-band converter; appearance as new, but needs re-aligning, £9.—G3NMJ, 5 Almonry Fields, Battle, Sussex.

HALLICRAFTER "Challenger" SX-15, £12; "Buddy," £8; CR-100, £15; Wilcox-Gay VFO, £3; W.1191 (faulty), £2; delivered 20 miles. WANTED: B/S HRO.—Fish, 61 South Road, South Ockendon, Essex.

HRO60T, cabinet engraved, etc., with matching four-coil fronts and arm guides, suitable for putting HRO into modern cabinet; cost over £40; best offers? HRO dial (grey) to match; AR88 main tuning gears, brand-new, £2.—Box No. 2583, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

HRO GC Coils, 1.7-30 mc, 21 mc BS, £5 10s.—G3KDK, 21 Hollybank Grove, Hasbury, Halesowen, Birmingham.

WANTED: "Advance" E1 or E2 signal generator; must be in good working order. — J. Reddington, EI8AJ, Baldonnel, Dublin, Eire.

FOR SALE: BC-454, 3-6 mc Command Rx, brand-new, with remote control unit, £4. R.1584, 30-60 mc, £2 10s. BC-639, 100-156 mc, £3 10s.—Box No. 2584, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: DX-40U, six months old, but unused, £30, or offers? — F. Pilling, 22c Hainworth Village, Keighley, Yorkshire.

SALE: Five-band 120w. CW/Phone Tx, PSU; requires slight attention; collect it for £12 10s.—Jenner, 121 Glenhurst Avenue, Bexley, Kent.

FOR SALE: G3HSC amateur licence Morse course record, 30s. o.n.o.? Hardly used; s.a.e.—Coleman, 199 Westward Road, London, E.4.

VHF TR-1985, cables, PSU, etc.; needs attention; £7. SWL requires teleprinter. — D. Gray, 1 Sunderland Road, Easington Village, Co. Durham.

WANTED: DX-100U in good condition; also Tri-Band Quad or beam.—Particulars to Box No. 2585, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

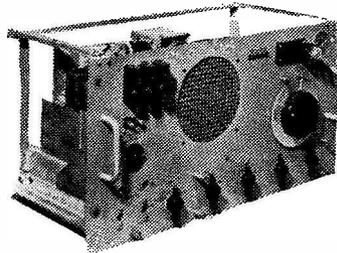
WILL SELL or exchange BC-221 frequency meter, as new, for Receiver, S.640, SX-24, etc.; cash either way. W.H.Y.? Also wanted: W.E./Converter AM-913/TRC.; s.a.e.—G3LIN, 12 Woodward's Road, Daisy Hill, Westhoughton, Bolton, Lancs.

HALLICRAFTER'S RECEIVERS, VHF, 27 mc-225 mc, ARR-5, £26; S-36A, S-27CA, S-37, 13B/URR, 210 mc-410 mc; s.a.e. list.—Wright, 4a Nepal Avenue, Atherton, Manchester. (TEL. 991.)

HRO-MX with 7 GC coils, spare valves and handbook, £16. Suitable power pack, £1 10s. Delivered free within 80 miles.—Troon, The White House, Seahouses, Northumberland. (Tel. Seahouses 464.)

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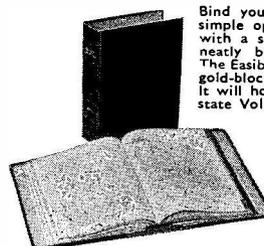
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