The SHORT WAVE Magazine

2/-

EXCLUSIVELY FOR THE RADIO EXPERIMENTER & TRANSMITTING AMATEUR

VOL. VII No. 6 AUGUST 1949

PRECISION ELECTRONIC EQUIPMENT

ALL GOODS OFFERED ARE OF RECENT MANUFACTURE, NEW AND UNUSED, GOVERNMENT SURPLUS ONLY WHERE MARKED

HUNTS E.H.T. CONDENSERS. New, recent manufacture, ·1 mfd. 7Kv, 14/6 each.
EX-GOVT. NEW E.H.T. CONDENSERS, all hermetically sealed, —·1 mfd. 2·5Kv, 2/6; ·1 mfd. ·5Kv, 3/9; ·02 mfd. 8Kv, 3/9; ·02 5Kv, 1/6.
CO-AXIAL CABLE, 80 ohm, 9/- per dozen yards.
TELESCOPIC DURAL RODS—when extended these measure 9 ft. but they can be cut quite easily, and as they are ½ in. dia (at the thick end) they make ideal television aerials. Price 7/6 each.
TELEVISION AERIAL. Indoor type, designed for erecting in loft or could be fixed behind the door in a bedroom, attic, etc. Price complete with fixings and instructions, 15/-.
WHITE PLASTIC MASK. Of correct design for 6in. tube. Will make your finished televisor look much more professional. Price 7/6 each.
MAGNIFIER. Best quality, guaranteed not to discolour. Price 39/6.

EKCO TELEVISION PARTS

We were fortunate last month in being able to obtain a set of T.V.parts which were made by the famous 'EKCO' Company for a small manufacturer who unfortunately came "unstuck." These parts which are suitable for a 9", 10" or 12" magnetic tube are offered to you at approximately half of the present-day prices. The units concerned are:—(1) The tube assembly which comprises a cradle on which are mounted the frame and line deflection coils, and the focus coils. (2) An E.H.T Transformer to give 4KV. (3) A line output transformer. (4) A diagram showing the wiring of a suitable circuit. A very interesting point about this circuit is that most of the valves used are the Mazda type SP41, which are available from us at the very low price of 2/9 each per doz. Of course, you don't have to stick to the "EKCO" circuit—we tried the items in a T.V. made according to other circuits, and have had very good results.
The price of the complete set is only £3/10/- and as a limited number only are available, we suggest that you order by return.
We will supply the circuit data separately at 2/6 per copy and we will allow this 2/6 to be credited if you purchase the complete kit within 2 weeks.

VALVES AT BARGAIN PRICES

MISCELLANEOUS TYPES (SURPLUS)

VR91 (EF50)	5/-	VR78 (D1)	2/3	VR65 (SP61)	4/9
VU39 (MU12)	7/6	VR55 (EBC33)	5/-	VR65A (SP41)	3/9
VU111	7/6	VR136 (EF54)	7/6	EK32	5/6
VR56 (EF36)	5/-	9D2	5/9	EL32	4/6
VR53 (EF39)	5/-	8D2	5/9	SP4	7/6
VR54 (EB34)	3/3	VR92	4/9	Magic eye	6/6
PEN 25	7/6	HL23DD	6/6	2vH.F. pentodes	7/6
TP25	8/6	2v triodes	3/9	Hivac XH	6/6
TP23	7/6	2v screen grids	4/9	XP	6/6

AMERICAN TYPES

OZ4	13/6	6B4	9/6	6L7	9/6	12SH7	7/-
IR5	7/6	6B7	10/2	6N7	10/-	12SK7	8/-
IS4	7/6	6B8	6/-	6Q7	6/6	12SQ7	8/6
IS5	5/-	6C6	9/6	6SH7	6/-	12SR7	6/6
IT4	6/-	6D6	6/6	6SJ7	6/6	14F6	9/6
2A7	10/2	6F5	6/6	6SK7	6/6	25L6GT	7/6
5T4	6/-	6G6G	6/6	6SL7	13/3	25Y5	10/-
5U4	7/6	6H6	3/6	6SN7	6/-	25Z6GT	7/6
5V4	13/6	6J5	6/6	6SQ7	7/6	80	10/-
5Z3	13/6	6J6	12/6	6SG7	6/6	83	8/-
5Z4	7/6	6J7	7/6	6SA7	7/6	89	8/-
6A3	10/6	6K7G	7/6	6V6	7/6	807	7/6
6AC7	6/-	6K7GT	9/6	6X5	6/6	866A	15/-
6AG5	6/-	6K7 MET	7/6	7C7	7/6	84/6Z4	8/-
6AG7	6/6	6K2MET	7/6	12A6	6/-	1299A	9/4
		6L6G	10/-	12K7	8/6	9001	8/-
				12K8	8/6	9002	8/-

ELECTROLYTIC CONDENSERS (only new stock from best manufacturers)

T.C.C. HUNTS, DUBILIER, B.I., B.E.C., etc.

2 mfd. 450v	.. ..	1/2	8 mfd. 350v		1/6
8 mfd. 450v	.. ..	1/11	16 mfd. 350v	..	1/11
16 mfd. 450v	.. ..	2/8	32 mfd. 350v	..	1/11
8×8 mfd. 450v	..	3/4	25×25 mfd. 200v	..	3/11
8×16 mfd. 450v	..	3/4	8 mfd. 150v	..	1/3
16×16 mfd. 450v	..	3/9	25 mfd. 25v	..	1/-
16×8×24 mfd. 450v		4/9	25 mfd. 50v	..	1/6
			50 mfd. 12v	..	10d.
			10 mfd. 25v	..	10d.

PHILLIPS wet electrolytics, standard type, can size 3" high, 1¼" dia. complete with locking screw for single-hole fixing with bottom plate, 32 mfd. 320v, 3/8; 14 mfd. 450v, 2/9.
MIDGET TUNING CONDENSERS. 2-gang ·00035, fitted with trimmers, and complete with perspex dust cover. These condensers made by "PLESSEY" are of the type used for tuning personnel receivers. Price is 6/6, plus 8d. postage.
4-GANG TUNING CONDENSERS. ·0005 each section—fitted trimmers—ceramic insulation. These are complete in a very useful chassis, and are fitted with a drive. Government Surplus equipment but new and perfect. Price 2/9, plus 1/3 postage. Case of six units, 17/6, carriage paid.
2-GANG ·0005 CONDENSER. Standard size—ceramic insulation. Price 4/9, plus 9d. post.
CHOKES, IRON CORES, L.F. (Surplus). 250 m.a., 9/6; 200 m.a., 6/-; 70 m.a., 4/6; 50 m.a., 3/9.

TU5B TUNING UNIT

American-made precision temperature compensated coils and condensers. This can be turned into a v.f.o. which is really stable. The A.R.R.L. gave details of the alterations, and we will supply a copy of the details with every unit. Alternatively the TU5B can easily become a transmitter and this Magazine has given details of at least three other units. Price only 19/6 plus 3/6 carriage.

12" P.M. SPEAKER "TRUVOX." 10,000 lines flux density—handle 10 watts—2-3 ohm voice coil. Price 42/6, plus 2/6 packing and insurance.
10" P.M. SPEAKER "PLESSEY." Price 28/-, plus 1/6 postage.
8" P.M. SPEAKER R. & A., less trans. Price 13/6, with trans. 15/3 post free.
6½" P.M. SPEAKER Celestion, with transformer. 15/3, post free.
5" P.M. SPEAKER "ROLA," with transformer, 10/6, post 9d.
3½" P.M. SPEAKER "ROLA," less transformer, 8/-, post 9d.
P.V.C. INSULATED COPPER CONNECTING WIRE, really fine for chassis wiring or as a throw-out aerial, etc., 250 yds. coil, £1.
MAINS TRANSFORMER. "PARMEKO." input 200-230v 50 C.P.S., output 350-0-350 at 80 m.a., 6·3 at 3 amp., 5v at 2 amps, half shrouded drop-through type. Price 14/6, plus 1/-.
MAINS TRANSFORMER. 60-70m.a. at 260-0-260, made by E.T.S., otherwise the same as the "PARMEKO," at 13/9, plus 1/3 postage.
Ditto, but 4v 2 amp. and 4v 3 amp., 13/9, plus 1/-.
TOGGLE SWITCH (Surplus). Bulgin S.P. S.T., 1/3 each. D.P.S.T., 1/6; S.P.S.T., 1/6; D.P.D.T., 2/6.
SET OF BROWN KNOBS. 1 large 2 small. Price 1/6.
CROCODILE CLIPS, small instrument type, made by Bulgin. Price 3/6 per dozen.
FILAMENT TRANSFORMER, ordinary mains input, 6·3v 2 amp. output. Price 6/9.
OUTPUT TRANSFORMERS, midget, 3/6; standard, 3/9; multi-ratio, 4/6.
MAINS DROPPER. ·2 amp. vitreous enamel covered, with taps marked 200, 220, 240v, total resistance 820 ohms. Price 1/6 each.
METAL RECTIFIER. Selenium, 250v 80 m.a. Price 3/6 each.

Postage where especially mentioned must be included—otherwise orders over £3 are post free, under £3 add 9d.

PRECISION ELECTRONIC EQUIPMENT

3 ELECTRON HOUSE, WINDMILL HILL, RUISLIP MANOR, MIDDLESEX

INDEX TO ADVERTISERS

SHORT WAVE MAGAZINE

FOR THE RADIO AMATEUR & AMATEUR RADIO

Vol. VII **AUGUST 1949** **No. 73**

CONTENTS

Editor: AUSTIN FORSYTH, O.B.E. (G6FO)

Advertisement Manager: P. H. FALKNER

Assistant Editor: L. H. THOMAS, M.B.E. (G6QB)

Published the first Wednesday each month at 49 Victoria Street, London, S.W.1
Telephone: Abbey 2384. Annual Subscription: Inland 20s. Abroad 22s. post paid

AUTHORS' MSS

Articles submitted for editorial consideration must be typed double-spaced with wide margins, on one side only of quarto sheets, with diagrams shown separately. Photographs should be clearly identified on the back. Payment is made for all material used, and a figure quoted in the letter of acceptance. It is a condition of acceptance that copyright of all material used passes to the Short Wave Magazine, Ltd., on publication.

THE *SHORT WAVE LISTENER* ASSOCIATED WITH THIS MAGAZINE IS SPECIALLY FOR THE RECEIVING ENTHUSIAST

EDITORIAL

Evolution

We would draw the attention of all readers to the remarkable results now being obtained by the leading British VHF operators on our two-metre band—and, to a lesser degree but with the same promise, on 70 cm.

In 1939—when those of us who were on Five certainly thought we knew something about VHF operation—the possibility of such results would have been considered fanciful and remote. Even two years ago it was quite seriously suggested by some that VHF interest and activity would be killed stone-dead if we lost Five, because Two held no such promise for GDX working. For, as we all know, it is by two-way communication in the DX sense (whether the Antipodes on 14 mc or 250-mile contacts on 145 mc) that Amateur Radio lives.

The new distance records now being painstakingly established on the most difficult communication band open to us are at once a great tribute to the enthusiasm and technical ability of the operators concerned and, what is perhaps more important, a happy augury for the future well-being of Amateur Radio itself.

There can be few thoughtful amateurs who do not foresee that there may come a time when Amateur Radio finds itself with 28 mc as the *lowest* frequency band upon which operation is permitted. It is for this reason, apart from the practical interest and scientific value of successful VHF working, that the present results on Two are so important.

Fortunately, the accepted valve techniques can be applied right up to 1,000 mc—this means that we can expect some equally encouraging amateur results on 420 mc, the seventy-centimetre band, when it receives the full attention of all our more advanced VHF workers. Always, the object must be to solve the problem of point-to-point communication on these frequencies—that is, working from the home location rather than having to go portable on high ground in order to make distant contacts.

Austin Forsyth G6FO

It is fairly generally accepted that for the utmost on Ten, a transmitter, receiver and aerial system designed specially for that band should be used—even if it does involve a separate installation. In terms of frequency, the change from Twenty to Ten is greater than the change from Twenty to the Top Band! The receiver is usually the main problem, so that our contributor's ideas will be of great interest to those who are striving for the best possible results on 28 mc. He describes in detail the design, construction and setting up of a double superhet, built mainly from surplus material, which should out-perform any commercial receiver designed for general coverage.—Ed.

Double Superhet for Ten

Converter Design with Adapted 1196 Unit, forming a Sensitive, Low-Cost Receiver

PART I

By **A. B. WRIGHT (G6FW)**

MOST amateurs find that the average communications receiver, while giving an excellent account of itself on the lower frequencies, falls off rather badly when used on the 10-metre band.

The reason is, of course, that it is difficult to design a receiver which will cover with equal efficiency the whole range of amateur frequencies from 1·8 to 30 megacycles. While circuits and components which give excellent performance on the bands from 20 metres upwards will still give reception on the higher frequency bands, the performance of the receiver usually falls a good deal short of that of a set designed solely for optimum results on Ten. On the higher frequencies the losses introduced by such components as valve-holders, coil formers and variable condensers can be considerable if they are not specially designed for high frequency operation.

The choice of suitable valves having reasonably low inter-electrode capacity and low noise factor is also a matter of considerable importance if maximum efficiency is to be obtained at 28 mc. While some apparent increase of sensitivity is usually noticeable when valves such as the EF50 or 6AC7 are substituted for the usual 6SK7 found in the HF stages of the cheaper type of communications receiver, it is also found that, unless these stages are completely redesigned, other troubles such as instability, cross-modulation and an increase in second channel interference manifest themselves.

Only too often one hears the proud owner of a commercial receiver demonstrating the S9 reception of some DX signal, when in point of fact 6 or 7 S-points consist largely of receiver noise!

Signal to Noise Ratio

To obtain maximum performance on the ten-metre band many amateurs add a one- or two-stage preselector ahead of their existing communications receiver. This procedure does, of course, bring up signal strength considerably if the pre-selector is well designed, but it may also bring up the noise level to an extent dependent upon circuit design and the valves used in the preselector.

Thus, while the QRK of those elusive, weak DX signals is increased according to the S-meter, only too often the accompanying background noises are brought up also, *and on a weak signal it is the accompanying noise* which will make all the difference between an R5 and an R3 signal.

It follows, therefore, that the first requirement of an efficient receiver for Ten is a high signal-to-noise ratio. This statement necessarily applies also to reception on other bands, but the average communications receiver usually fulfils these requirements on the lower frequency bands without alteration or adaptation.

There is also the question of second-channel image interference, which becomes increasingly troublesome on a normal communications receiver having an IF in the region of 460 kc as the frequency is raised.

In a well-designed receiver images usually only cause trouble on the 20- and 10-metre bands. A preselector ahead of the main receiver helps considerably, but on 10 metres the advantages are often off-set by an increase in noise.

Converters

The best solution to the problem of images

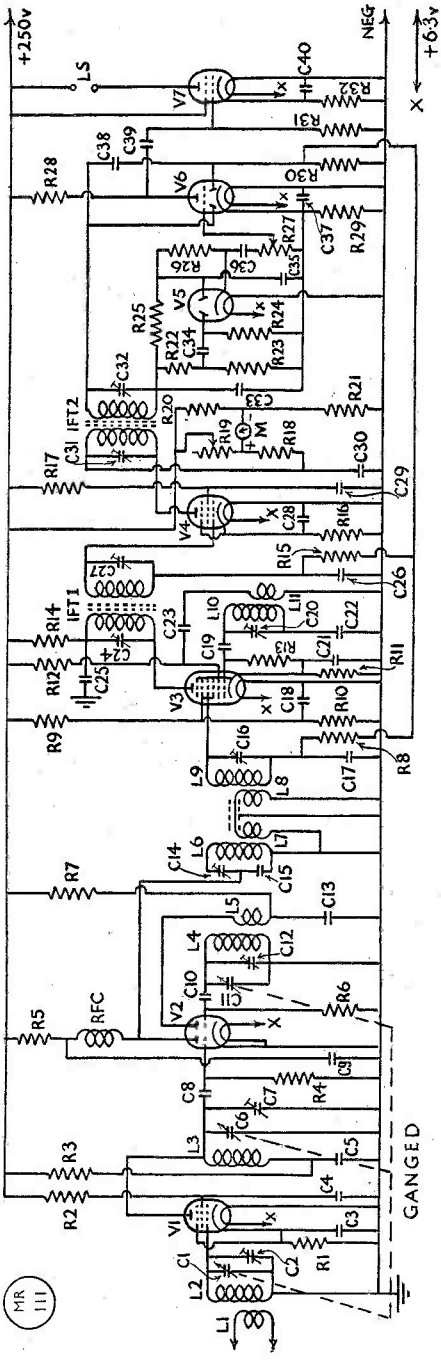
Table of Values

Circuit of G6FW's Double-Super for Ten

C1, C6 = 15 $\mu\mu$F variable (see text)
C2, C7 = 25 $\mu\mu$F air trimmers
C3, C4, C5, C9, C13 = ·005 μF mica
C8 = 15 $\mu\mu$F ceramic
C10 = 25 $\mu\mu$F ceramic
C11 = 35 $\mu\mu$F variable (see text)
C12, C14 = 100 $\mu\mu$F air trimmers
C15 = 300 $\mu\mu$F mica
C16, C20 = 3-30 $\mu\mu$F mica trimmers
C17, C21, C22, C25, C26, C28, C29, C30, C35, C36, C39 = 0·1 μF paper
C18, C34 = ·01 μF paper
C19 = 100 $\mu\mu$F mica
C23 = ·002 μF mica
C24, C27, C31, C32 = IFT trimmers, part of 1196 IF transformers
C33 = 200 $\mu\mu$F mica
C37, C40 = 10 μF electrolytic, 25v wkg.
C38 = 180 $\mu\mu$F mica
R1 = 500 ohms
R2 = 68,000 ohms
R3, R16 = 300 ohms
R4, R9, R10, R17, R22 = 100,000 ohms
R5 = 22,000 ohms, 1 watt
R6 = 47,000 ohms
R7 = 33,000 ohms, 2 watts
R8, R25, R26, R30 = 1 megohm
R11 = 400 ohms
R12, R13 = 50,000 ohms
R14, R18 = 2,000 ohms (in IFT cans)
R15 = 2 megohms
R19 = 2,000 ohm wirewound potentiometer
R20 = 2,500 ohms, 2 watts
R21 = 82,000 ohms, 5 watts
R23, R24 = 470,000 ohms
R27 = ·5 megohm potentiometer
R28 = 200,000 ohms
R29 = 1,200 ohms
R31 = ·5 megohms
R32 = 300 ohms, 1 watt
IFT 1, 2 = 465 kc IF transformers (part of 1196)
RFC = 2·5 mH HF Choke
M = 0-500 Micro-ammeter, for S-meter
V1 = 6AG5
V2 = 6J6
V3 = EK32 (VR57)
V4 = EF36 (VR56)
V5 = 6H6
V6 = EBC33 (VR55)
V7 = 6V6

Coil Table

L1 = 7 turns thin flexible over cold end of L2
L2 = 15 turns No. 12g. $\frac{1}{2}$ in. diameter, spaced 2 in.
L3 = As L2
L4 = 7 turns No. 14 on $\frac{5}{8}$ in. diameter former, spaced 1 in.
L5 = 3 turns thin flexible, spaced $\frac{1}{4}$ in. from cold end of L4
L6 = 100 turns No. 30g. enamelled, closewound on 1 in. former
L7 = *See text*—10 turns if L8 is low impedance, 70 turns if high, wound over cold end of L6
L8, L9, L10, L11 = Wearite P coils or similar, to tune to 1,500 kc



Circuit of the receiver designed by G6FW. It consists essentially of a ten-metre converter feeding into an adapted TR.1196 receiver.

is, of course, to run a converter ahead of the receiver, using a first IF frequency sufficiently high to prevent their appearance. This procedure effectively does away with images, and, as most of the inherent noise in a receiver emanates from its first stage, we can, by suitable choice of valves and circuit, design a "front end" which will raise our signal-to-noise ratio as well.

The first consideration then will be the choice of a suitable valve for the HF stage which is to precede the first mixer stage. We need here a valve which will give us the highest amplification and which generates the least noise.

After much perusal of current literature the writer came to the conclusion that one of the miniature valves, a 6AK5 or 6AG5, would fit the bill admirably, and experiments with these valves certainly justified the choice.

Apart from the valve itself, a certain amount of unwanted noise can result from the use of components not designed to operate at high frequencies, and wherever possible the use of ceramic valve holders, condensers and high-grade resistors is recommended.

The aerial coupling circuit should also receive close consideration, and in order to present the largest possible signal to the input grid the tuned input circuit must be of high Q and high impedance, and be correctly coupled to the aerial. With this end in view, it was found advantageous to use air-spaced coils of heavy gauge wire, and to experiment with the number of turns on the aerial coupling coil.

The First Mixer Stage

With the question of signal-to-noise ratio still in mind, it is as well also to give some consideration to the choice of mixer and oscillator valves.

A number of converters have been built by the writer using conventional mixer valves such as the 6L7, 6K8 and 6SA7 with a triodes such as the 6J5 or 6C5 as oscillator, but despite much juggling with the applied voltages and circuit constants nothing in the way of any outstanding converter resulted, and the feeling was always there that something a little better was required.

Having a number of war-surplus 6J6's about, and bearing in mind the fact that, from the point of view of inherent noise, a triode amplifier usually results in much quieter operation, it was decided to give the triode mixer a trial.

One triode section of the 6J6 was used as a mixer, the other as oscillator, dependance being placed upon inter-electrode and stray circuit capacities for oscillator voltage injection.

Results far exceeded expectations, and it was decided forthwith to build up a special receiver for use on ten metres only, which would incorporate the 6J6 mixer/oscillator and 6AG5 amplifier combination.

A Ten-Metre Double Superhet

The resulting double conversion superhet described here has proved extremely efficient in operation, and its sensitivity and signal-to-noise ratio exceed that of all commercial communications receivers which the writer has handled on the 28 mc band.

The receiver, as the photographs show, actually consists of the 6AG5/6J6 converter fed into a modified 1196 receiver. During recent months, this last piece of equipment has been advertised in the *Short Wave Magazine* by many firms at almost give-away prices.

The complete circuit of the double superhet is given in Fig. 1, together with values. It consists of one stage of tuned RF amplification using the 6AG5. Alternatively, a 6AK5 could be tried in this position with little or no change in performance, although it should be borne in mind that the maximum plate voltage for the 6AK5 is only 180, while that for the 6AG5 is 250 volts.

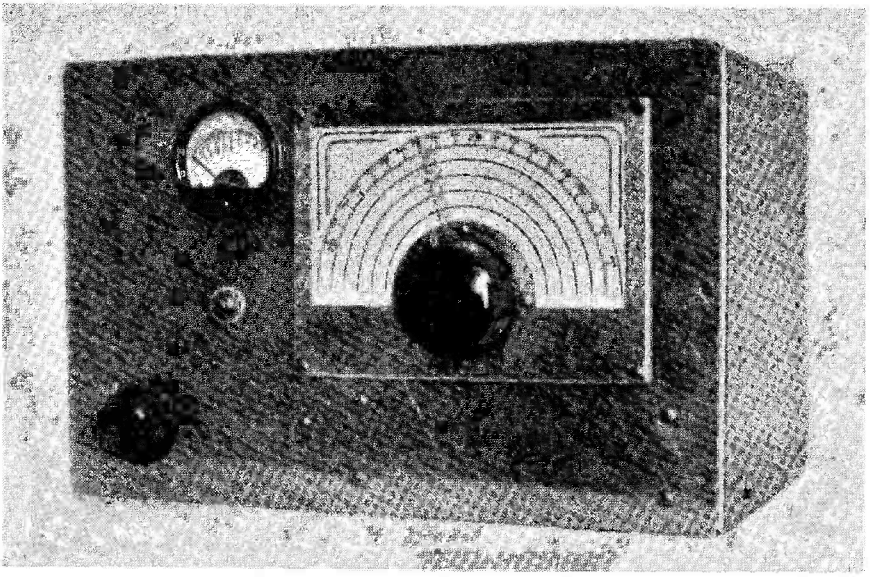
The HF stage is run at maximum gain at all times, there being no HF gain control, thus enabling the strongest possible signal to be passed on to the mixer grid. No blocking or overloading effect has been noticed even on the strongest signals, and omission of an HF gain control has the slight added advantage that one may zero the S-meter with the assurance that it will stay put for some considerable time.

The aerial coil L1 should be coupled quite tightly to L2, and it may prove advantageous to experiment with the number of turns on L1, as there is a definite optimum for the coupling which results in maximum signal and minimum noise. At the same time it will be found that the degree of coupling has a pronounced effect upon the tracking of the HF stage tuning condenser—if the coupling is not tight enough difficulty will be found in obtaining a setting of the HF trimmer condenser C2 to hold over the entire tuning range. More will be said on this point at a later stage.

Double Triode Mixer

The mixer is, of course, the 6J6, one half of the valve being used as oscillator and the other as mixer. The number of turns specified for L5 should be adhered to, as also should the voltage applied to the oscillator plate *via* R7 if smooth oscillation is to be obtained.

No provision has been made for external injection of the oscillator voltage into the mixer section of the valve, as the coupling provided by the valve inter-electrode capacities and the wiring seems to do the job quite efficiently.



Front view of G6FW's double-superhet for Ten ; S-meter to left of the tuning dial.

Various methods of coupling the output of the 6J6 mixer into the second mixer grid were tried out. The circuit shown gave maximum gain, and peaked up much more sharply than when the conventional tuned circuit was placed in the 6J6 anode. L6 is tuned by the condensers C14 and C15 to the first IF of 1,500 kc. The size of L7 depends upon the impedance of L8, which in the original set is part of a Wearite "P" Type coil which has a primary of fairly high impedance.

Second IF Channel

The 1196 comprises the second IF channel of the receiver, converted as a straight superhet, the input of which is fix-tuned to the first IF of 1,500 kc. An EK32 (VR57) is used as second frequency changer, as in the original circuit, and a pair of Wearite coils are substituted in the mixer and oscillator tuned circuits. (Circuit round V3),

A single stage of 460 kc amplification follows, using either the original IF valve, an EF39 (VR53), in this position, or alternatively an EF36 (VR56). The second detector is an EBC33 (VR55), as used in the original set, but re-wired in the more usual manner to serve as a diode detector, AVC rectifier and first AF stage, the latter being resistance-capacity coupled to a 6V6 output stage. (V6, V7).

Noise Limiter

On the ten-metre band some form of noise limiter was considered essential, and the circuit incorporated in this receiver is of the series type, being automatic in action, so that it is equally effective on weak as well as strong signals. There is very little loss in audio gain when the limiter is in action and no distortion is at all evident on speech, so that no provision is made for switching the noise limiter in and out, as this extra control was felt to be unnecessary. (Circuit round V5).

The loud popping noise produced by a passing car is reduced to a slight buzz, and in a noisy location the limiter will make all the difference in the readability of weak signals. For optimum results the values of resistance and condenser shown in the circuit diagram should be closely followed.

This particular circuit is the most effective the writer has yet encountered, and signals which have been unreadable on a comparison communications receiver owing to ignition QRN have been read with ease on this receiver.

S-Meter

An 0-500 micro-ammeter is used as an S-meter in a bridge type circuit, in the anode circuit of the IF amplifier. The values of resistor shown will be correct for an EF36, but if the EF39 is used as an IF amplifier the 82,000 ohm resistor may need replacing by one of a different value. The use of an EF36 results, however, in a more linear scale on the

meter and is recommended for this reason. In any case it will probably be found in practice that some experimenting will need to be carried out with the values of R20 and R21 before the S-meter will read satisfactorily.

No attempt was made to produce a scientific instrument of the S-meter, which was, in fact, calibrated arbitrarily before installation. As the deflection is almost linear, S points 1 to 9 are made equal, with S9 just below centre scale. The remainder of the scale is calibrated in steps of 10 dB so that maximum deflection of the meter represents 40 dB over S9, each 10 dB division being made equal to two S points. R21 and R20 are then adjusted so that an S9 local signal indicates S9 on the meter.

This method of calibration may be open to criticism but in practice it works out remarkably well, as, having adjusted the meter to coincide with the operator's own personal idea of S9, he need no longer apologise for a "Scotch" S-meter when a rather low report is given !

AVC is applied only to two stages, the second frequency changer and the IF stage. This has proved entirely satisfactory in action, and no special comment is felt to be necessary.

(Part II follows next month)

Beam Design and Adjustment

Back-to-Front Ratio *vs.* Forward Gain

By **W. A. SPARKS (G3DGJ)** *and* **S. S. LEIGH (G2FCV)**

This article discusses certain aspects of beam design from what for many amateurs will be a new standpoint. Once again, it is shown that the getting of the best possible results is not just a matter of putting up a beam the way the book says and letting it go at that. —Ed.

ROTARY parasitic arrays have come into common use in the post-war era and are now accepted as standard equipment for DX work on the higher frequency bands. These arrays have many advantages since they offer considerable gain in the forward direction over the usual standard of reference, the half-wave dipole, together with comparative ease of rotation in a relatively confined space. Beams of many types are in operation at amateur stations throughout the world, but in the following notes certain peculiar aspects of the Yagi array will be examined. The Yagi array is probably the most popular type in regular use at present, although the Quad is achieving certain popularity in the U.S.A. and may eventually supersede the Yagi.

The Yagi array may be tuned for one of two particular conditions ; that is, either for maximum forward gain or for maximum back-to-front ratio. Actual operation in either of these modes will show very little difference, except in isolated instances, since tropospheric variations will prevent any slight difference from showing itself with any degree of reliability in the observation. The only major noticeable difference would be if a British station wished to work Africa and India regularly and then the additional discrimination offered by tuning for maximum back-to-front ratio would assist in rejecting American signals. However, as the 10-metre band is in effect split into two phone areas, 28·1-28·5 mc DX and non-U.S.A. and 28·5-30 mc for the W's, such discrimination is not usually required. A more important consideration is the effective forward radiation angle and it is hoped to give information on the point which may clear the air a little on this important characteristic.

Angle of Radiation

It is generally accepted that a low angle of radiation is a necessity when working DX stations and a greater concentration of power in the lower of the two lobes characteristic of the Yagi array (in the forward direction) is also a feature which is often sought after. But the most effective angle is not constant since the height of the reflecting layer is subject to considerable daily and seasonal variation. It can be shown that the required angle of radiation for single hops over a given path is variable and is related to seasonal and hourly changes. In considering a desired path and taking F2 layer reflection only (independent of frequency) experiments have shown that over a path of 3,000 miles the layer height varied sufficiently to alter the required angle between the limits of 9 and 12 deg. during spring and between 10 and 17 deg. during summer. However, the above are average figures and taking as an illustration one particular day (March 20, 1949), on 10 metres during that afternoon signals from the W6 and W7 call areas were at a maximum, and

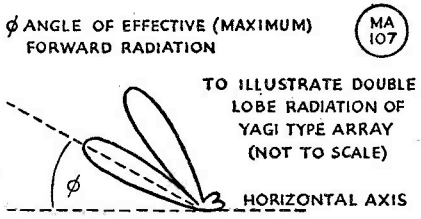


Fig. 1. Vertical lobe structure for a 3-element array.

S9 signals from these areas were very common. The East Coast W's did not appear at anything like their usual strength. Consequently, one could assume that the layer height was sufficient to produce single or possibly double-hop signals over the great circle path, whereas the other signals from the East Coast were not radiated with sufficient power at the required angle of radiation.

Lobe Analysis

Recent experiments by Ohio State University have shown that on the two possible modes of operation—with the beam one wavelength in height and over a theoretically perfect ground—by tuning for best back-to-front ratio an angle of maximum forward radiation of 13 deg. is obtained with a relative power figure of 37 in the lower lobe (see Fig. 1), and a radiation angle of 44 deg. and respective power figure of 33 in the upper lobe. Comparative figures for a beam tuned for maximum forward gain are 17 deg. and power figure of 40 for the lower lobe and 46 deg. and power figure of 33 in the upper lobe. These figures are shown graphically in Fig. 1.

Fig. 2 shows the distribution of power over the lobes at varying vertical angles from the horizontal axis of the aerial. Apparently, tuning for maximum forward gain offers the advantage of increased power, but the effective power gain over tuning for maximum back-to-front ratio is only in the region of 3 dB, hardly one-half S-point. The benefits of tuning for maximum back-to-front ratio are to be observed in the lower angle of radiation, with consequent improvement in the DX performance. But this mode suffers from the disadvantage of lower efficiency since more power is spent in cloud warming with the upper lobe.

Adding a further director to the three-element beam at the same spacing tends to increase the available forward gain since the ratio of power distribution improves in favour of the lower lobe. The effective forward angle is also reduced but the bandwidth of the beam is curtailed and VFO operation is more confined.

The Ohio State University experiments also show that it is possible to tune a beam to give a discrimination of 30 dB whilst a beam tuned for maximum forward gain can still have a rejection figure of 20 dB and an improved forward performance for general DX working.

Beam Elevation

The height of an array has considerable effect on its performance and in this case it is *not* a matter of "the higher the better." Experiments have shown that an optimum height is in the region of 0·8 to 1·25 wavelength or above 1·8 wavelengths. Ground effects are such as to upset the pattern of radiation in the vertical plane when outside

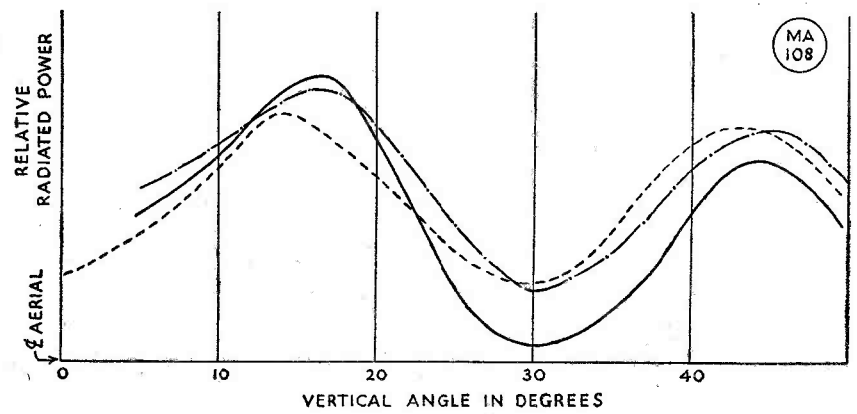


Fig. 2. Showing power distribution pattern (vertical plane in forward direction) for beam arrays adjusted as follows: 3-ele. close-spaced, maximum front-to-back ratio, dotted line ; 3-ele. close-spaced, maximum forward gain, chain dotted ; 4-ele. close-spaced, adjusted for maximum forward gain, solid line. In each case the height above ground is one wavelength and the element spacing 0·1 wavelength.

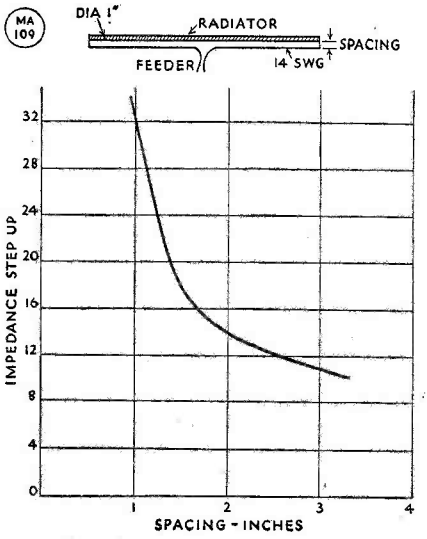


Fig. 3. Design data for folded dipole used as a radiator. As an example, for 1½-in. spacing between tube and wire the feeder impedance divided by the radiator impedance is 18, representing an impedance step-up of 18 times over a plain dipole in the same position.

these limits and it is suggested that for optimum low-angle requirements the height should be between the limits quoted.

Ferrel (*CQ*, April 1948) published a set of curves which illustrated the effective angle of radiation over a path of about 1,500 miles. The figures were taken over a yearly perio d and useful angles for 10 and 20 metres were estimated from published information on F2 layer heights. It is shown that angles greater than 17 deg. were optimum for only 1 per cent. of the observations, angles greater than 10 deg. for 50 per cent. and angles greater than 8 deg. for 80 per cent. of the time. This would appear to indicate that a beam having an angle of radiation (maximum) of about 12-13 deg. would be satisfactory for general use since the shape of the pattern gives considerable radiation down to about 7° and up to 15 deg. This is suggested where a tiltable array would not be feasible.

The writer would suggest that a three-element array tuned for maximum back-to-front ratio with a height of 1·0 wavelength would be the most satisfactory for general amateur operation, although the purpose of these notes is to present a new approach to beam design in general.

Practical Tests

In accordance with the foregoing considerations, a beam was constructed to the following dimensions :—

Driven Element	16·22 ft.
Reflector	17·42 ft.
Director	15·63 ft.
Spacing	3·42 ft.

These dimensions are approximately correct for 28·2 mc. The height of the beam was varied and checks taken on performance. The results so far obtained are not conclusive but tend to confirm that the foregoing arguments are correct.

Fig. 3 shows certain data which may be of value. Table 1 shows the various design data to be used in constructing beams (3-element). Fig. 3 shows the design. details in graphical form for folded dipole radiators using 12 SWG wire and 1-in. dural or copper tubing.

TABLE I

DESIGN OF TEN-METRE BEAMS

Aerial Type	Driven Element	Reflector Length	First Director	Second Director	Third Director	Spacing	Approx. Gain dB	Approx. Rad. Res. ohms
2 EL. (REF)	462/F	480/F	Maximum Forward Gain			0·15	5·3	24
2 EL. (REF)	462/F	495/F	Maximum Back-to-Front			0·15	4·3	30
2 EL. (DIR)	462/F	—	462/F	Maximum Gain		0·1	5·5	14
2 EL. (DIR)	462/F	—	445/F	Max. Back-to-Front		0·1	4·6	26
3 ELEMENT	462/F	495/F	444/F	—	—	0·1	7·0	5
3 ELEMENT	462/F	498/F	450/F	—	—	0·2	9·0	18
3 ELEMENT	462/F	495/F	450/F	—	—	0·25	9·0	30
4 ELEMENT	462/F	490/F	442/F	438/F	—	0·2	10·0	13
5 ELEMENT	462/F	490/F	442/F	438/F	434/F	0·2	11·0	10

Practical SSB Driver

Further Design Details

PART II

By **H. C. WOODHEAD (G2NX)**

This is the second of a short series of articles on the practical aspects of single sideband working—the first appeared in the July issue. SSBSC operation opens an entirely new field of interest on the communication bands, and offers much scope for useful experimental work.—Ed.

IT will be clear from the preceding article that it is quite a practicable proposition to construct a drive unit to produce a single-sideband suppressed carrier signal, suitable for operation in the amateur bands, by using a balanced modulator to remove the carrier and a filter of the crystal gate type to remove the unwanted sideband.

A transmission of this kind will show all the advantages of SSBSC such as the 6 dB gain over DSB, since only a quarter of the power necessary on DSB is required to convey the same audio level in using SSBSC. This factor of an apparent increase in power of four times is certainly well worth while, especially since it brings with it decreased liability to BCI and means that the 150 watts permitted input can be used more effectively with less likelihood of interference with BCL than before, quite apart from the improvement due to the reduction in width of channel required.

There is plenty of latitude in the manner of construction to permit the individual to suit his own particular methods. Some may prefer to purchase a meat tray from the local chain store, turn it upside down and mount the components on the surface so presented, leaving the space underneath for wiring and tag-boards. Others may run to sheets of polished aluminium, steel frames and such, and make a very nice thing that can be regarded almost as an ornament for the living-room. Others again (like the author) may prefer to take some choice piece of ex-Service equipment, acquired at a knock-down price from the advertisement pages of the *Short Wave Magazine*, and convert it into something more useful. For this latter group there is plenty of scope and a unit should be selected, for preference, which has a number of IF cans containing single or double tuned circuits which can be rewound to suit requirements. The most difficult part of the construction and final adjustment is involved in obtaining the correct type of filter response, and here a cathode-ray wobbulator would be a distinct advantage. However, the would-be constructor need not be discouraged by the lack of this accessory since the author has so far managed without it.

It is also essential to have accurate control of the frequency of the carrier oscillator so that it can be placed exactly half-way up the steep side of the filter response. This is accomplished by using a crystal of the same nominal frequency as those used in the filter, and trimming it with a series or shunt condenser, with or without added inductance, to the exact frequency to suit the filter.

General Schematic

The general layout of the units is shown in Fig. 10 and the mode of operation is as follows: The audio, from which all frequencies below 200 cycles and all above 3,000 cycles have been removed, is applied to the balanced modulator. The output, consisting of the sidebands only, is applied to the crystal gate filter where one sideband is suppressed leaving the other one with a nominal frequency of 5·655555 mc, since this is the frequency of the crystal chosen.

By closing S1 the full carrier may be restored to the transmission for calling purposes. This will be necessary initially, for the average amateur will not be able to receive SSBSC signals without first being told how to adjust his receiver.

The SSB signal is passed to FC1, where it is mixed with the output of Osc. 2, which is variable between 1·8 and 2·2 mc. The resulting difference frequency provides a signal directly in the 80-metre band, which can be adjusted by varying Osc. 2.

For operation on 20 metres, the sum frequency from FC1 between 7·45 and 7·85 mc is selected, and the output of a suitable crystal oscillator Osc. 3 is added in FC2 to produce any frequency required in the 20-metre band. For 10-metre operation, the third harmonic of a 7 mc crystal in Osc. 4 is added to this same sideband to give any frequency in the 10-metre band.

The number of components may at first sight appear somewhat formidable, but it has been necessary in Fig. 10 to show a number of them as separate entities the more clearly to indicate their particular functions. In practice, many of them are combined in one component and the whole unit has only eight valves; though there are three output positions, only one of them is in use at any given time. When operated on 80 metres, only five valves are used.

The unit selected as most suitable for

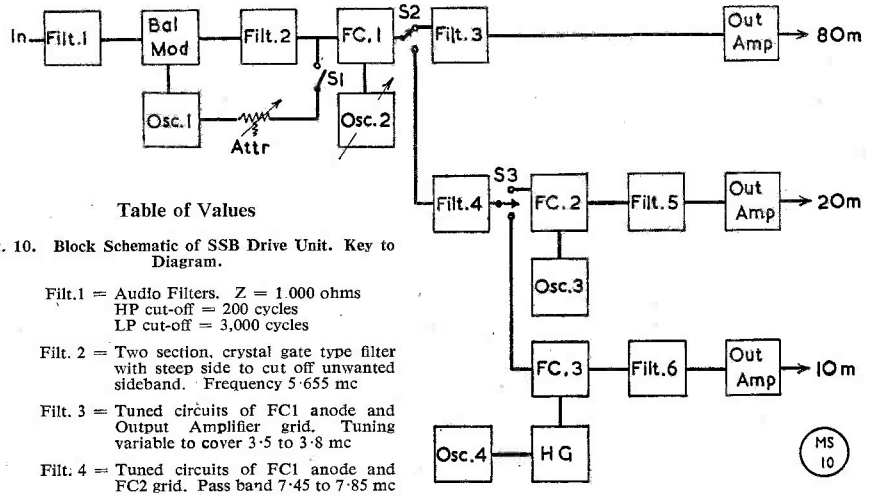


Table of Values

Fig. 10. Block Schematic of SSB Drive Unit. Key to Diagram.

Filt.1 = Audio Filters. Z = 1,000 ohms
HP cut-off = 200 cycles
LP cut-off = 3,000 cycles

Filt. 2 = Two section, crystal gate type filter with steep side to cut off unwanted sideband. Frequency 5·655 mc

Filt. 3 = Tuned circuits of FC1 anode and Output Amplifier grid. Tuning variable to cover 3·5 to 3·8 mc

Filt. 4 = Tuned circuits of FC1 anode and FC2 grid. Pass band 7·45 to 7·85 mc

Filt. 5 = Tuned circuits of FC2 anode and Output Amplifier grid. Tuned to pass 14 to 14·4 mc

Filt. 6 = Tuned circuits of FC3 anode and Output Amplifier grid. Tuned to pass 28 to 30 mc

Bal. Mod. = Balanced Modulator. 6SN7.
Input : Audio, 300 to 3,000 cycles
Output : Balanced and tuned to 5·655 mc

Osc. 1 = Crystal in EF50 circuit. Frequency = 5·655 mc (nominal)

Osc. 2 = Stable VFO. Range 1·8 to 2·2 mc. Valve 6SH7.

Osc. 3 = Crystal in EF50 circuit. Frequency 6·55 mc

Osc. 4 = Crystal in EF50 circuit. Frequency between 6·85 and 7·38 mc

FC 1 = Frequency changer, EF50
Input : 5·655 mc (Osc. 1) and 1·8-2·2 mc (Osc. 2)
Output : 3·5-3·8 mc or 7·45-7·85 mc, according to S2

FC 2 = Frequency changer, EF50
Input: SSB between 7·45 and 7·85 mc
Osc. 3 at 6·55 mc
Output: SSB between 14 and 14·4 mc

FC 3 = Frequency changer, EF50
Input: SSB between 7·45 and 7·85 mc
Carrier from HG between 20·55 and 22·15 mc
Output : SSB between 28 and 30 mc

HG = Harmonic Generator
Input between 6·85 and 7·38 mc from Osc. 4
Output between 20·55 and 22·15 mc to FC 3

Attr. = Attenuator for adjustment of re-inserted carrier

Out. Amp. = Output Amplifier 6AG7,1 watt output

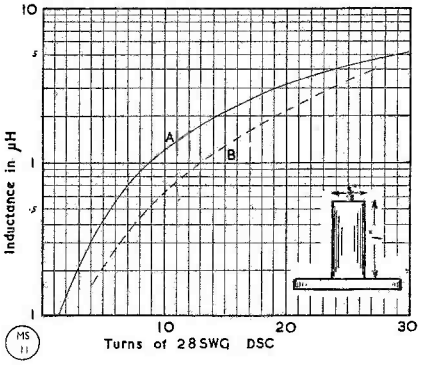


Fig. 11. Inductance wound on ex-Service type formers : A, close wound ; B, turns spaced to maintain coil length 1·5 centimetres.

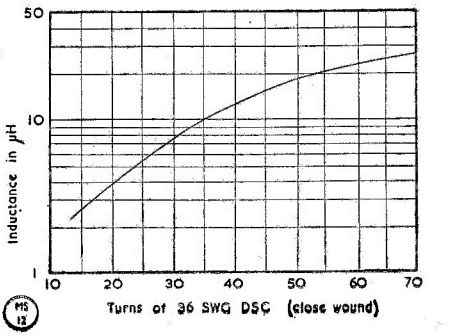


Fig. 12. Inductance on ex-Service type formers.

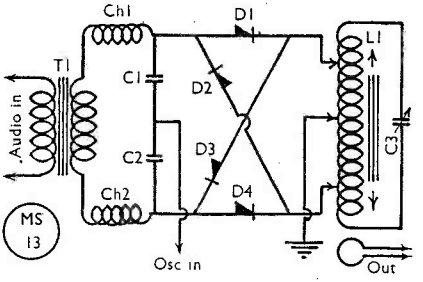


Table of Values

Fig. 13. The Ring Modulator as used for producing a Double Sideband with Suppressed Carrier

T1 = Audio Transformer to match input impedance to diodes
Ch1, Ch2 = HF Chokes
C1, C2 = 100 $\mu\mu$F mica
D1,D2,D3,D4 = Crystal Diodes 1N22
L1, C3 = Output Circuit tuned to Sideband frequency

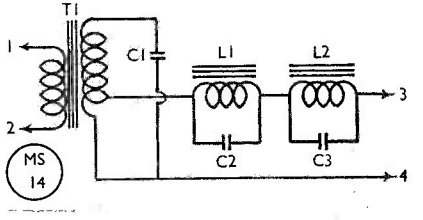


Table of Values

Fig. 14. Circuit of BC733D 95 cycle Filter

T1 = Pri : ·53 H, 160 ohms. Sec : 26 H. 2,800 ohms
L1 = 185 H, 6,000 ohms
L2 = 50 H, 2.000 ohms
C1 = ·04 μF mica
C2 = ·06 μF mica
C3 = ·016 μF mica

adaptation was the R3170 radar receiver. All parts were first removed to the store cupboard for future stock and a start made with the SSB filter using the formers out of the original set for winding the inductances and the original screening boxes for shielding the circuits.

Small Inductances

These coil formers are frequently to be found in ex-Service equipment and are readily adaptable for tuned circuits in the range 5 mc to 100 mc, though they are also used for much lower frequencies in the R1155 and the CNY-1 receivers. Two curves are shown in Figs. 11 and 12 which enable one to wind a given

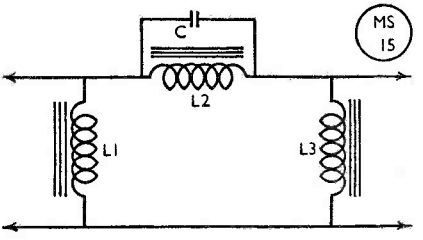


Table of Values

Fig. 15. High Pass Audio Filter with 200 cycle cut-off for 1,000 ohm unbalanced line

L1, L3 = 1·33 H
L2 = 1·5 H
C = 0·67 μF paper

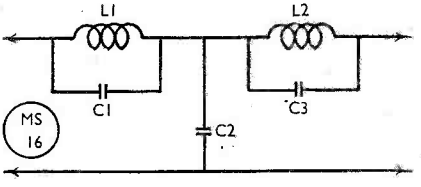


Table of Values

Fig. 16. Low Pass Audio Filter with 3,000 cycle cut-off for 1,000 ohm unbalanced line

L1 & L2 = ·032 H
C1 & C3 = ·056 μF
C2 = ·064 μF

inductance on these formers suitable for use in the above range. The figures given are for an empty former. A dust-core slug will increase the inductance to about double, while a brass slug will reduce it to approximately half. These formers have been used for practically all the tuned circuits in the unit except the anode circuits of the output stages. They will usually be found to be covered in wax, which should be removed together with the old winding, and the former cleaned in petrol or carbon tetrachloride. The new winding, when complete, should be painted over with a solution of polystyrene in carbon tetrachloride to hold it in place.

Balanced Modulator

The original modulator used was of the ring type, as shown in Fig. 13, using 1N22 type crystal valves. It was subsequently replaced by a 6SN7 in the more conventional type of balanced modulator circuit in order to obtain more input to FC1. There are some advantages in using crystal valves in a ring

modulator at this point, but if further gain is required this is the most suitable place to add it since no additional tuned circuits are needed.

The high-pass filter was constructed from the parts of the 95-cycle filter from an BC733A Glide Path Receiver. These filters consist of two transformers and one choke, on identical cores, and three condensers. The circuit is given in Fig. 14, with values as measured. With the existing mica gap in the core, the values of 1·5 and 1·33 H, required in Fig. 15, are given by 1,600 turns of 36 SWG and 1,500 turns of 36 SWG respectively. The cut-off for the values given in the filter is 200 cycles and its impedance is 1,000 ohms, to suit the input transformer to the modulator and the output impedance of the preceding LF circuits. The circuit for the low-pass section of Filt. 1 with a cut-off at 3,000 cycles is shown in Fig. 16.

Table of Values

Fig. 17. Circuit Diagram of Balanced Modulator and Crystal Filter as used for producing a single sideband with suppressed carrier

T1 = Audio Input Transformer. Step-up 5 : 1
T1 = Pri : 35 turns 28 SWG C/T
Sec : 12 turns 28 SWG C/T and 1 turn 18 SWG
RAF former, adjustable dust core
T3 = Pri : 12 turns 28 SWG C/T
Sec : 35 turns 28 SWG and 5 turns 36 SWG
RAF former, adjustable dust core
R1 = 12,000 ohms ½-watt
R2 = 12,000 ohms ½-watt
R3 = 10,000 ohms ½-watt
R4 = 1,500 ohms ½-watt
C1, C2, C7 = 1,000 μμF mica
C3, C4 = 50 μμF mica
C5 = ·01 μF mica
C6 = 100 μμF variable ceramic
C8, C9, C10,
C11 = 60 μμF variable air-trimmer
C12 = 100 μμF variable ceramic
Ch = Twin Choke of 160 turns of 46 SWG on ⅜ in. dia. paxolin tube
V1 = 6SN7
V2 = EF50

The circuit of the balanced modulator is given in Fig. 17. The audio is applied to the grids of V1 in push-pull through Ch., while the carrier is applied in parallel through the two condensers C3 and C4. The primary winding of T2 is tuned to the carrier frequency and the carrier is balanced out by adjustment of the slug core in T2 to the central position. It is possible that an improved balance may be obtained by adding a measure of resistance balance to this circuit though it has not so far been found necessary.

The single turn on T2 leading to a co-axial socket marked " Test" will be found extremely useful for injecting the output from a signal generator into the filter during the line-up operations.

Two crystals are used in the filter, to give a total attenuation of some 40 dB to the unwanted sideband, and they have each a nominal frequency of 5·655555 mc and were used in the aforementioned BC-733A unit. The carrier is reinserted, when required, by a relay S1 of Fig. 10, operated from the front of the panel, which supplies some of the output from Osc. 1 direct to T3 in the output from the filter.

Frequency Changers and Oscillators

FC1 is an EF50 with the signal applied to its control grid by T3 and the output from Osc. 2 applied to its suppressor grid. Oscillator 2, which is variable from 1·8 to 2·2 mc, needs careful construction since any frequency fluctuations in the output from the whole unit are more likely to come from this than any other source, all other oscillators being stable crystals. The circuit chosen was the usual ECO, coupled down the tuning inductance as shown in Fig. 18, and a double winding to prevent the heater-cathode capacity from being a part of the tuned circuit. No special claims are made for this circuit, but it is at least as

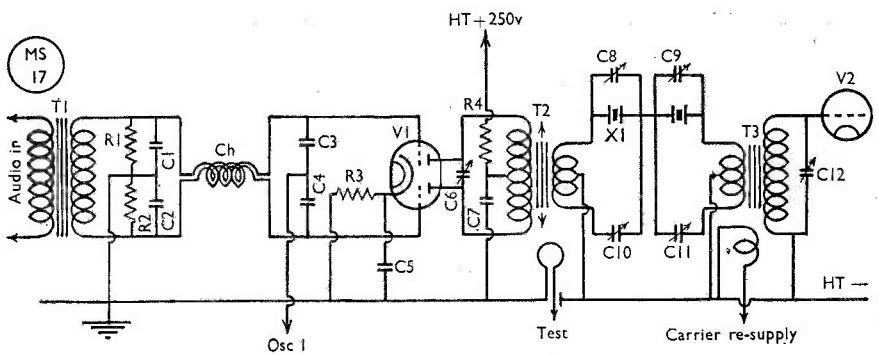


Fig. 17. Circuit of the balanced modulator—see text for discussion.

Table of Values

Fig. 18. Variable Oscillator (Osc. 2) Range 1·8 to 2 mc

C1 = 50 $\mu\mu$F ceramic trimmer
C2 = 150 $\mu\mu$F ceramic
C3 = 50 $\mu\mu$F air-spaced variable
C4 = 50 $\mu\mu$F ceramic
C5 = ·001 μF mica
C6. C7 = ·01 μF mica
C8 = 50 $\mu\mu$F air-trimmer
R1 = 220,000 ohms ½-watt
R2 = 1,500 ohms ½-watt
R3 = 27,000 ohms 1-watt
L1 = 40 turns 28 SWG enamelled on 1¼ in. dia. First six turns double wound. Tapped at 30 turns for grid
L2 = 100-turn coil on RAF former
RFC = RF choke

stable as the temperature characteristics of its reactance components. Adherents of the Clapp and Franklin will no doubt substitute their own favourite circuits. In the present case the range 1·8 to 2·2 mc was chosen to be as low as possible and to produce frequencies in the 80-metre band directly by selecting the lower sideband from FC1, or the difference frequency between Osc. 1 and Osc. 2. Only one drawback to this choice has been discovered up to date in that when using higher frequencies in the 80-metre band, the second harmonic of Osc. 2 is very close to the wanted signal and may be difficult to separate from it in Filt. 3. The two are identical for a radiated frequency of 3·77 mc when the frequency of Osc. 2 will be 1·885 mc giving a second harmonic of 3·77 mc. For this reason it is not very satisfactory for working between 3·6 and 3·8 mc, and it would, as it happens. have been better to have chosen a higher frequency for the crystal filter. For example, if the filter frequency were 5·8 mc, the range of Osc. 2

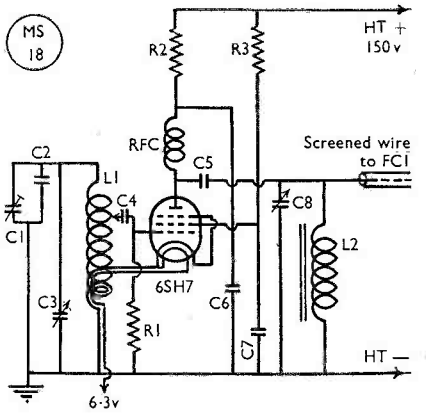
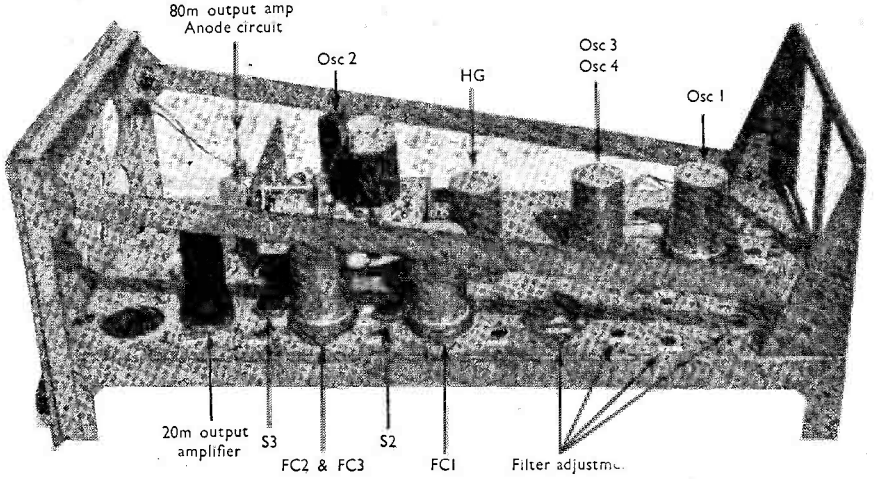


Fig. 18. ECO circu t for Osc. 2, covering 1·8-2·2 mc. Any suitable oscillator can be employed for this position

would be 2 to 2·4 mc, bringing its second harmonic clear of the working band.

Filt. 3 consists of two separate tuned circuits, one in the anode of FC1 and the other in the grid circuit of the 80-metre output amplifier, with link coupling between them. The output amplifier is a 6AG7 with a tuned circuit in its anode stepping down to 75 ohms co-axial and giving an output of 1 watt of SSB power for 100 mW of audio input to the unit.

(Part III of this article will follow)



Showing general layout of G2NX's SSB Driver, in the early stages of construction on an adapted R.3170 chassis. The Schematic at Fig. 10 keys this photograph

Case Against the NBFM Mode

Some Critical Comments, and an Analysis

By P. F. CUNDY, A.M.I.E.E. (G2MQ)

All operators interested in the mechanics of modulation will find this article a useful discussion on the practical aspects of NBFM *versus* AM. Though the author reaches convincing conclusions, the protagonists for NBFM will go on with their work of test and experiment —which is as it should be.—Ed.

THE use of narrow-band frequency or phase-modulated telephony is a post-war innovation which has achieved considerable popularity. For reasons to be discussed later, the author is of the opinion that such popularity is undeserved and that NBFM is basically unsuited to amateur requirements. That the possibilities of this method should be explored by amateurs is fully agreed, but the writer's submission is that since it has been given a fair trial and has been found less satisfactory than amplitude modulation, its further use should be discouraged.

Characteristics of Frequency Modulation

The main attraction of NBFM is the use of very low modulating power at an early stage in the transmitter, with high-efficiency Class-C multiplier and power-amplifier stages subsequent to the modulation. It is necessary to consider the actual side-band power rather than carrier power in assessing the value of the signal as a means of conveying intelligence by telephony, and it is on this feature that true narrow-band FM is so unsatisfactory. It is directly tied up with the band-width, since side-band power can be increased only by increasing the deviation. If the highest audio frequency used for speech transmission is 3 kc, then a deviation of 1·5 kc corresponds to a modulation index of 0·5, and a deviation of 3·0 kc corresponds to a modulation index of 1·0. These cases are examined and the results are shown in the Table appearing herewith ; the abbreviation AF stands for the modulating audio frequency, and CF for the unmodulated carrier frequency.

The FM transmission does offer the possibility of using an amplitude limiter in the receiver which can prevent amplitude-modulated interference from reaching the demodulator. The limiter certainly reduces the background noise on strong signals, but on weak signals the advantage is not very apparent. It seems that an AM signal, received on an AM receiver with a post-detector noise limiter, is always as easy to read and very often much easier.

There is considerably less broadcast and television interference of the break-through type caused by FM transmission than by AM; since these receivers are usually fitted with detectors that respond to amplitude variations only, an interfering signal of constant amplitude will cause no audible output. Heterodyne or second-channel types of interference may not, however, be appreciably reduced by the use of FM. It is always possible to eliminate interference caused by AM signals even if it does turn out to be a long and tedious job ; it is quite possible to visualise the case where the station is located in a heavily populated area such that elimination of all cases of AM interference would take an unreasonably long time. In such instances great relief may sometimes be obtained by use of NBFM and is, in the author's view, the only case where its employment is justified.

Comparison with AM

Assume a NBFM transmitter is contemplated, using the maximum allowable input of 150 watts and that the 150 watts smoothed output from the power pack is a limiting factor. Then comparisons may fairly be made with various types of AM transmissions ; these are shown in lines 3 and 4 of the table. For this, the grid modulated power amplifier is assumed to have an efficiency of 37·5 per cent., the plate modulated power amplifier 75 per cent. and the modulators 50 per cent.

It will be noted that the grid-modulated stage requires a larger power amplifier valve than the FM transmitter, but the modulators are comparable. The plate-modulated stage requires a smaller power amplifier, but two additional modulator valves and a modulation transformer. Both AM arrangements are superior to the NBFM transmitter in respect of side-band power at comparable band-widths. The FM signal shows higher side-band power at larger deviations, but the increase is then more difficult to utilise ; full benefit from increased side-band power can only be realised when it is fed into a discriminator designed specifically for that deviation. The total band-width is excessive and could not be employed in practice without causing considerable interference to other users of the band in question.

Line 5 of the table is included so that comparison between AM and FM can be made on the basis of the legal maximum input to the power amplifier.

Observations

The author's observations have generally been in accordance with that which would have been expected from the foregoing analysis, but some additional points, based wholly on experience, are worthy of note. Selective fading causes a much greater loss of intelligibility on FM transmissions than on AM signals and the FM transmission is much more difficult to follow through heavy interference, particularly if fading is present.

It is admitted that these opinions have been formed largely from listening to NBFM transmissions on an AM receiver, but actually, for very narrow band transmissions, the detuned AM receiver is a more sensitive converter than the conventional discriminator. The reason for this is that the slope (volts per cycle) on the edge of the pass band of a conventional IF amplifier is higher than can be achieved with a discriminator. This arises from the fact that in the IF amplifier all the tuned circuits are playing a part in the frequency-to-amplitude conversion, while in the limiter-discriminator arrangement, only one pair of circuits is engaged in this task. The detuned AM receiver will not of course handle wide-band frequency modulation, but this should in any case never be employed on any amateur band.

Some operators, acutely aware of the troubles that arise from excessive deviation, employ automatic volume compression, speech-clipping or deviation limitation to control the band width. Such signals, although they may only have 16 per cent. side-band power, are 16 per cent. nearly all the time because of the compression. It is quite possible for this to be easier to read than an AM signal which achieves 50 per cent. peak side power on odd occasions only. Comparisons should therefore be made only when the AM signal is similarly restricted by speech clipping or volume compression.

Conclusion

It is hoped that the side-band spread and power analysis given in the table will be a clear indication of the responsibilities one incurs in regard to restriction of deviation when the decision is made to adopt frequency modulation. Responsibility also rests with the AM user, since over-modulation can be as troublesome as excessive deviation. But when both systems are correctly restricted and operated the increased side-band power achieved with AM makes the use of NBFM a very poor second choice. In turn, AM, when compared to single-side band suppressed carrier telephony, is equally unsatisfactory !

SYSTEM	TOTAL POWER AVAILABLE	POWER INPUT TO FINAL AMPLIFIER	POWER INPUT TO MODULATOR	MODULATING POWER OUTPUT	CARRIER POWER OUTPUT UNMODULATED	CARRIER POWER OUTPUT MODULATED	DISSIPATION IN FINAL AMPLIFIER	POWER IN SIDE BANDS CF + AF CF − AF	POWER IN SIDE BANDS CF + 2AF CF − 2AF	POWER IN SIDE BANDS CF + 3AF CF − 3AF
	WATTS	WATTS	WATTS	WATTS	WATTS	WATTS	WATTS	WATTS	WATTS	WATTS
NBFM Modulation Index 0·5	150	150	—	—	112	96	38	15·5	0·5	—
NBFM Modulation Index 1·0	150	150	—	—	112	65	38	42·5	4·0	0·5
Grid Modulated AM	150	150	—	—	56	56	94	28	—	—
Plate Modulated AM	150	75	75	37·5	56	56	19	28	—	—
Plate Modulated AM (Maximum Input)	300	150	150	75	112	112	38	56	—	—

DX COMMENTARY

CALLS HEARD, WORKED & QSL'd

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

All bands except 28 mc have shown a marked improvement on last month's conditions, and those of the DX fraternity who still find time to take a look round occasionally have been well rewarded.

But this month we must give pride of place to the 3·5 mc news—not in any sense because we happen to figure in it ourselves in a quiet way, but because it is the hottest news as such. To the intense surprise of those who thought 80-metre DX a winter phenomenon, all sorts of things started breaking through in June and July.

To cut a long story short, G3EIZ (Liverpool) was the first G station to work LU3EL, which he did four times with his 25 watts, starting on June 19 (3508 kc, 2320 GMT). Later he also worked LU7AZ. DL1FF apparently started this off by persuading the LU's to come up from 14 mc.

DL1FF was also heard late in June working our old friend VK5KO, and intensive listening revealed the said '5KO after a few days. At any rate on July 7 he worked G6QB (Bexhill) and heard G5DQ.

Then, on July 9, G6QB worked ZS5YF, giving him his first (and, at the time of writing, his only) G contact. ZS5YF also had previously been heard working DL1FF, and in his letter which has just arrived, confirming these contacts, ZS5YF adds that he has been hearing G8AX at RST 579 and has been getting 589 reports from VK5KO.

On July 10 VK5KO worked G6QB again with 569 signals both ways.

Yes, all these *are* genuine this time ; we have got the trick of coping with the pirate situation now!

Future Plans

ZS5YF (who, by the way, also worked EI9J for his first EI contact) now says that he is going to QRX every Wednesday evening from 2030 to 2200 GMT on 3520 kc. So look for him at that time, and let us have no unseemly brawling!

VK5KO is on regularly and at present peaks at about 2200 GMT. Others on the way are CE4AD, LU4BA, LU6BM, LU8EN, CX1FB and (hold it !) JA3AA.

So far the only stations known to have worked the LU's are G3EIZ and G3DKZ, EI9J, SM3ATL and FA8BG—apart from DL1FF, who seems to have worked everything that has appeared so far. LU3EL uses 350 watts and LU7AZ a kilowatt.

ZS6AM, ZS6HO and ZS1M are also appearing on the band—although we haven't heard them yet. The latter proposes to come on 3500·25 kc at three minutes past the hour !

Representing Asia, HZ1VP (G2AVP away from home) has been operating with a T.1154 on 3650 kc in the early mornings, but we haven't yet heard him, although we did work him on 14 mc to confirm the times and frequencies.

G8VB (London, W.5) still holds his parties with the VO's on 3755 kc phone, and tells us that VO2CO is now in Bermuda and hopes to be coming up with a VP9 call soon. CR4AA is also expected to arrive on 3755 kc. F9QU is operating 3·5 mc 'phone in Martinique, of all places, and is of course swamped by the W kilowatts. PY4ZI runs a net on 3755/3800 kc, and KP4ES another on 3925 kc.

Well, so much for the 80-metre news up to date, but there may well be a flash or two before we finish talking !

Competitive Stuff

We were sorry to receive a letter from ON4JW (Brussels) asking us to remove him from the DX tables. He, of course, was at the head of the Zones Worked table, and also in the lead for 14 mc scores in the Four Band DX. Jules hastens to add that this has nothing to do with his recent marriage ; his wife, who has always spurred him on, is very disappointed at his enforced inactivity for a while. His trouble is his new job, which doesn't leave him enough time or energy for DX-chasing.

As luck would have it, G4CP (Dudley) would have passed ON4JW this month, for the addition of five new ones, all on 14 mc, give him the colossal 14 mc score of 191, which is also his total. So, for the present, G4CP is king of the Zones Worked list, with G2FSR (Chingford) a close second and sundry Old Crocks panting behind.

The Four Band Table is set out in 7 mc

This is *not* a case of error crep' in! ZC8PM was housed in the trailer-truck, and the Arab guard was officially provided by the Iraqi authorities. Usually, it was necessary to protect the equipment from the sentries, whose one idea it was to sneak inside and start those buzzing noises.

order, which gives pride of place to G6BS (Cambridge) with G5GK (Burnley) second. These scores are getting perilously near the century on 7 mc, and we foresee a terrific race between these two when the real DX becomes plentiful again.

DX of the Month

Several regular correspondents report working FP8AB (St. Pierre-et-Miquelon) during the past few weeks, but the W6 crowd, who generally have pretty good noses for this sort of thing, remark that he is "about as good as the other FP's"—which means no good at all. So if no one can produce a QSL from FP8AB in less than six months, we shall have to strike him off again.

Other quite interesting pieces have been around during the month. In 25 years on the air we had never worked YN, YS or ZP, but we managed them all in four days during early July, with ZP2AC (2200), YS1RA (0820) and YN1FTB (0825). Now we are searching for HH's, HI's and VP2's—none of which have *ever* come our way, not even pre-war!

G3FGT (Birmingham), who recently broke into the Four-Band Table with his 133-ft. long wire, 9 ft. high, now boasts a wire twice as long and nearly three times as high. He is working out nicely and contacted HZ1KE (yes! it's Ken Ellis again) on 28 mc CW. VQ4ALF and 4KRL on 14 mc have also fallen victims to 'FGT's 25 watts.

G8OJ (Manchester) reports raising HP1BR, KZ5IP, CR6AN, ZD2S, VS2BX, OX3MG, CR7BN and MD7HV. He also worked the Dutch weather ship PIJLS on 14 mc 'phone. G2BJY (West Bromwich) found things rather erratic, but bagged two new ones on 28 mc (ZD1BD and 4X4ES) and two on 14 (EA6EG and EA8AL).

G3DCC (London, N.8), working with 75 watts on 14 mc 'phone, collected VS2BS, TA3BS, YS1JR, HK4DF, CE1BE, XE1A, TI2HP, YK1AC and HZ1KE. He also tells us that MP4BAC is now on his way home and won't be heard any more, although another station may be operating from there in the near future.

Further interesting comment from G3DCC (you must have noticed the ominous absence of I1's lately): It appears that the silence from Italy is due to a police round-up which resulted in some 70 per cent. of the transmitters on the

FOUR BAND DX

Station	Countries Worked					Power
	7 mc	3·5 mc	28 mc	14 mc	Total	
G6BS	93	28	4	154	168	150
G5GK	88	11	29	123	185	150
G5FA	83	17	55	118	134	35/150
G6QB	67	34	115	165	186	150
G3ATU	60	26	81	158	166	10/150
G8IH	57	14	30	179	186	7/150
G2AVP	55	28	32	156	163	25/120
G2VD	50	26	84	159	164	150
G5WC	50	1	12	115	116	45
G4CP	45	3	64	191	191	150
G3AKU	45	29	21	130	138	30/70
G8VB	44	50	59	119	140	120
G3CBN	44	13	26	107	118	50/150
ZB1AR	38	29	40	87	100	25
G3DO	37	21	97	147	177	150
G3ABG/A	36	21	3	76	79	45
G6BB	35	19	28	99	114	10/70
G8IP	34	13	62	111	127	3/150
G2HKU	32	1	7	83	91	4/25
G3BDQ	26	18	9	107	109	25/150
G3FNJ	26	19	42	100	113	150
G4QK	26	19	3	93	97	150
G8KU	24	9	47	117	127	120
G2YS	23	21	25	110	121	150
G3EIZ	23	33	15	37	52	25
G3FGT	21	19	11	45	54	25
G2DHV	20	18	4	78	81	25/60
GW3CBY	20	13	4	37	48	15/30
G8QX	18	12	70	107	129	150 Phone
G3ACC	13	20	5	101	110	150
G2HIF	9	6	44	42	71	150 Phone
G6CB	5	1	81	21	89	20/150 Ph.

air being confiscated and an awful lot of fines imposed. It seems that calls were issued by the Government, by two different club organisations (which don't recognise one another) and by a number of "private individuals," too. All except the Government-issued calls are now (for the time being) off the air. This news was passed to G3DCC by MF2AC, who is practically on the spot and should know the answers !

Some 7 mc Items

G3AGQ (Benson) is hurt by the lack of attention given to "good old Forty." He was on the band during seven mornings recently and raised UQ2AL, XE1SA, ZL4HI, ZL4GH and a bundle of W's. PY2AFS and CM7RA were also on. The W2's and 3's, says 'AGQ, "come back delightedly when called."

G4RZ (Harrow), who used to be G5TD many years ago, has moved to 7 mc, where he has worked loads of W's, plus VE and PY2RT. He remarks that 7 mc DX is quite possible with QRP even at this time of the year—if you don't mind getting on between 0400 and 0530 !

14 mc Again

G5BZ (Croydon) suggests that conditions have been quite abnormal for the West Coast of America and Canada, compared with the pre-war years. He has worked W6 and W7 or VE7 at practically all times between 0450 and 2145, and says that he never remembers even having heard them during the midday or afternoon periods at this time of year before.

'BZ has been finding 14 mc conditions extremely good and has raised 110 countries this year.

G2DHV (London, S.E.13) has been on the band at all sorts of times and has cleaned up on HS1SS, UJ8AF, CT3AB, EA8MC, FQ3AT, KH6IJ and many others. G2FSR (Chingford) has had bad luck during the month and says that a list of Calls Heard would be far more impressive than a statement of DX worked. Fancy hearing, calling and missing TI8RB, KB6AJ, ZM6AL and FK8AC—all in one morning ! 'FSR says the only way to work the rare Pacific islands nowadays is to "ride on the back of a W6." Then, to add to his chagrin, a local friend of his, not very keen on DX, told him he had worked "another VS9"—which turned out to be VS9BU in the Maldive Islands ! This seems the right time to turn it up and go for a holiday, which is precisely what 'FSR has done.

TVI and BCI have restricted activity at G8PL (London, N.W.3), but he has managed to raise FP8AB, VP1AA, HP1BR, EA6EG, CO2BM and some TI's—all on his indoor aerial. 'PL wants a W3 in Delaware for his WAS, and, finding them extremely rare, asked a W3 in Pennsylvania about it—only to find that he, too, wanted Delaware for his WAS. . . . A recent surprise was the receipt of a card from UP2KBB, with a letter, by *direct air mail*. Quite a new experience, tnat.

Talking of QSL's, G8IH (London, W.5) tells

us that he now has them from VP8AI, 8AK, 8AD and 8AP—lucky fellow !

G5GK (Burnley) seems to have been very active on 14 mc, and turns in AC4RF, ZP2AC, UAØKGA, EA8AL (all CW) and a long list of 'phone QSO's including KP6AA, EL3A, ZD4, HP, HI, M1B and other useful customers. G3ATU (Sunderland) describes conditions as "unhot," but collected MS4UU for one new country. He adds that this station has two operators, one of whom makes the call sound like "74 UU"—so don't be foozled. And he also worked a station signing "3V8AG," who told him that 3V was the new prefix for Tunisia—but there are still some FT4's working.

Last month G6BB (Streatham) asked how to raise EL3A. Apparently this came to EL3A's notice, for, after coming back to G5HB (Swindon) on the first call, he told him that he is packing up and leaving for Paris, and that he will keep a sharp look-out for G6BB when he gets there !

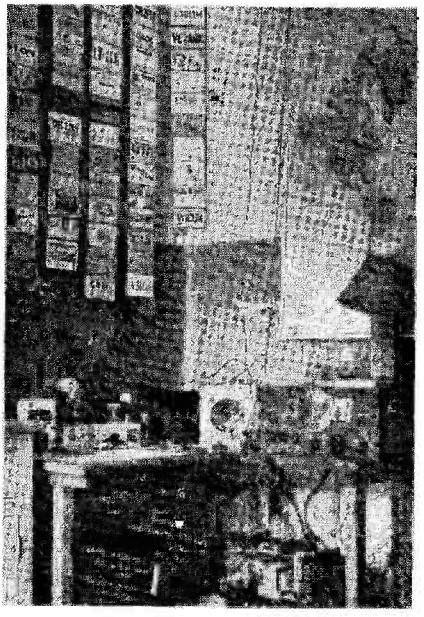
G2FFO (Burnley) was told by a W4 that he had recently worked GR2../MM (he forgot the full call) who gave his QTH as 185 miles from Midway Island. Had anyone else heard this curious call ? Who, or what, is he ?

G2AVC (Hanworth), referring to G3ATU's plaint about not raising AR8AB, writes to say that the latter came back to a lone CQ on 28 mc recently—and the said CQ was G2AVC's first 28 mc transmission for six months.

G3AKU (St. Ives) managed to polish off AC4RF and now joins the select band of "40's" in the Zones Worked Table. He is awaiting confirmation from AC4RF and VK1VU for his WAZ, and adds that 116 of his 138 countries are confirmed. 'AKU says that our recent tirades on 7 mc might well be extended to 3·5, where he listened one night to a "multi-way" in which all the stations kept trying to keep the channel clear and telling everyone who came near it what so-and-so's they were, but at the end of three hours no one seemed to have said anythng interesting or done anything useful. Perhaps they are still at it.

Behaviour Again

This brings us to a few more cases reported on the 3·5 mc band. G3BFC (Ferndown), who, by the way, will soon be MT2BFC, asks whether nothing can be done to stop "Those dreadful people who chip into QSO's with rude things to say." He says it's awful to hear this sort of thing after nine months of ten-metre phone. Funnily enough, by the same post came a letter from an SWL in Aberystwyth, expressing admiration at the self-control of G3BFC, G4JG and a GI station, whose three-way was being deliberately busted up by someone playing gramophone records and then pausing to listen. He hopes that the gentlemanly attitude of the stations concerned has shamed the offender into a state of mind in which he will not repeat his "disgusting performance." Ah, well—as we said before, there's another one born every minute.



The outfit at ZBIAR, Malta, a 25-watt station. Tx, at left, is VFO-Tritet, into a pair of 807's in push-pull or push-push for the 7, 14 and 28 mc bands.

Have You WAWCL ?

G2EC (London, W.1) prescribes yet another exercise for jaded DX-chasers. Describing it as "slightly useless but very fascinating," he outlines the scheme for "Working All W Call Letters." Quite simple—you try to work a W1A, W1B, W1C and so on right through to WØZ. Some areas have no calls beginning with X, and you're up against it when you look for Y's in the 1st, 3rd, 5th and 7th districts, but the possible total is about 252. G2EC wants 30 more to complete, and it would be interesting to see how others have fared. Highly recommended for those who can't find any new countries, and those who like to mix a certain number of *QSO's* with their DX-snaring tactics.

Overseas News

ZD4AB (Koforidua, Gold Coast) writes to say that he still holds his G licence as G2TH

(London, S.W.18), and as he is returning to the U.K. for a few month's leave he might even get his old rig on the air for a while.

G2AVP (Mildenhall) is in HZ and MD5 and may possibly be heard with the T2-T4 note associated with an 1154 in the wilds !

ZD4AM (Tafo) is still hearing quite a number of G's on 7 mc, and logged 2DN/P, 5VQ/P, 5YY/P and 6NU/P on NFD. New ones for him recently on 14 mc have been HP1BR, UL7AB, VS6AC and XZ2FK. The latter, by the way, is G2FK in Burma.

Dave Mitchell of ZL1MP is proceeding apace with his shack and house, and when he gets his super-aerial system up he should produce a noteworthy signal over here. He encloses a most interesting story about a pirate in New Zealand. This station, operated by a youth of 17, for some days caused total disruption of all services using the Parapa-raumu airfield. He lived half a mile from the control tower, and operated a ZC1 transceiver both on the control frequencies and on the amateur bands. He even issued instructions to aircraft about to land !

In the end it was an amateur who helped to catch the fellow, by keeping him talking while the Post and Telegraph Department closed the net round the suspected area. When the radio inspectors and police finally entered a garage adjacent to a house they found the culprit actually in QSO with ZL2IN, using "efficiently-installed equip-ment."

Quite a thrilling chase preceded the actual location of the offender, which was made more difficult by the fact that his transmissions were spasmodic and of very short duration.

OQ5CF (Nizi, Belgian Congo) sends a short description of his outfit—with an 813 in the PA run at 180 watts—and remarks that he always QSL's 100 per cent ; to date he has worked 153 different G stations, who have between them only managed to produce 49 cards. This seems hardly good enough, so if you owe him one, get it off your conscience !

An old friend, who used to be a regular correspondent to the *Magazine* in pre-war days, is now 4X4CJ in Tel-Aviv. He writes feelingly on the subject of QRP, as he runs a 6F6-6V6 outfit with all of 6 watts to the PA. Between April 5 and June 28, he stacked up 45 countries, and with only a two-stage receiver at that. As Reuben remarks "QRP men can take heart"—but he would probably agree that his somewhat unusual callsign may give him an advantage !

SVØAL (ex-G3BWX, Salonika) in an interesting letter discusses his experiences out there—again with 6 watts of QRP on 14 mc, from 210-volt DC mains with poor regulation, and a very uninspiring aerial ; though three half-waves end-fed, it is low and surrounded by electrical obstacles of every conceivable description. At any rate, on this rig SVØAL has brought in 25 countries, including JA and OQ5. This is in spite of a high local noise-level, and a BC610 200 yards away operated quite unofficially by some types who know nothing of amateur procedure ; but they seem to get a huge kick out of working near-Europeans on 350 watts with a 45 w.p.m. bug scattering dots all round the band, and everything spelt out in full ! The only official SVØ calls are in the sequence SVØAA-AZ (British) and SVØWA-WZ (American), with a total of no more than seven genuine stations on the air. SVØAL himself intends to QSL 100 per cent., and with that laudable object has ordered 1,000 cards from home. He is always keen to work G's—so look out for him, and remember his 6 watts and that BC610 a few hundred feet away !

MS4UU (Mogadishu, Somalia) writes to assure us that his is a genuine civilian call in ex-Italian Somaliland, now known as Somalia, that he was on 14084 kc CW from June 20 to July 5, and that with 25 watts to a very surplus 807 he has been knocking off the DX in no ordinary fashion. MS4UU is MI3UU when in Eritrea, and will be back in Somalia as MS4UU about the time this appears. He also remarks that all QSL cards due from him have

ZONES WORKED LISTING

POST WAR

Station	Z	C	Station	Z	C
Phone and CW			Phone and CW		
G4CP	40	191	G2YS	35	116
G2FSR	40	189			
G6QB	40	186	G3CVG	34	111
G2IH	40	186			
G5GK	40	185	G3ACC	34	110
G3DO	40	177			
G3ATU	40	166	G2FYT	33	100
G2VD	40	164			
G2AVP	40	163	G4QK	32	97
G3AKU	40	138	ZD4AM	32	92
G8IP	40	128			
			G2DHV	31	81
GM3CSM	39	119			
G5MR	39	118	G2SO	30	82
G6PJ	39	87			
			Phone only		
G8VB	38	140			
G5FA	38	134			
G8KU	38	127	G2ZB	39	160
			G2XK	38	126
G2BJY	37	120			
G6BB	37	114	G3DO	37	142
G3FNJ	37	113			
G3BNE	37	104			
GM6IZ	37	98	G6QX	35	129
			G2ALN	35	120
G5WC	36	116			
ZB1AR	36	97	G6CB	32	89

". . . . Put out a short CQ on Forty, will you please, Fotheringay . . . ."

been posted—but that to send them airmail (as some G's have asked) costs 1s. each !

On the matter of totals of VK's worked by G's, VK3NC (Casterton, Victoria)—yet another QRP station doing it all with 6 watts to a 6V6—writes on the subject of G's worked by VK's. His own log shows no less than 316 separate G calls QSO'd, all post-war on 14 mc; and to these can be added 31 EI, GD, GC, GI, GM and GW stations, with 263 Continental Europeans ; he only needs five more cards for DXCC. VK3NC remarks that his 20-metre diamond is very sharply directional. This mighty aerial, aimed on London on the South American path, has 3 wavelengths in each leg and is built on the side of a hill, with 200-ft. feeders. VK3NC adds that he "lifts his battered old hat and bares his poor old bald head" to the /P G's recently who were putting excellent signals into VK on a very poor band with only 5 watts input.

Another Contest

The first DX Contest organised by Indian amateurs will come up in September next. Run on the familiar lines, with exchanges of RST plus serial number, this will take place on the 14 and 28 mc bands only, with India, Burma, Ceylon and Pakistan counting as "locals" and the rest of the world (but only between Long. 10 deg. E. and 180 deg. E.) as "DX." So the whole of America, as well as Great Britain and some of the Western European countries, are excluded.

One of the unusual features is the statement (in Rule 14) that "Proofs of all contacts are required." DX stations will be asked to send their cards direct to Box 6666, Bombay, where they will be checked by the A.R.C.I. before being forwarded to the stations concerned. (Perhaps this gives a clue to the exclusion of America and the U.K.!)

In case it still interests you, the duration is from 1130 GMT on September 17 until 1830 GMT on September 18, and again a week later. Phone and CW all mixed up, and "mixed" contacts permitted. At any rate we in G are allowed to listen!

Top Band Stuff

So many readers have suggested that they would like to see a "Top Band Counties Worked" ladder that we have just had to give way ! So, you users of 1·7 mc, start from the date on which you read this (we will call the deadline August 1) and log your contacts. Then send in your claims for (*a*) Counties and (*b*) Countries worked on the band. We are not publishing a list of counties ; suffice it to mention that Monmouth (whether signing

DX QTH's

CE5AW	Box 560, Conception, Chile.
CR4AC	Box 61, Praia, Cape Verde Islands.
EA6EG	Box 324, Palma, Majorca.
KH6VX/KB6	c/o C.A.A., Canton Island.
MI3UU	Box 222, Asmara, Eritrea.
PK6XZ	Swortlaan 3, Macassar, Celebes.
SVØAL	Major A. L. Fayerman, 45 Nikis Street, Salonika, Greece.
VK2ACC	Farm 54, Fivebough, Leeton, N.S.W.
VK4SI/VR1	Ren Foster, Navy Base, c/o 3234, Box M.33, c/o Fleet P.O., San Francisco.
VP2AJ	APO 855, c/o PM, Miami, Fla.
VQ3SS	P.O. Box 457, Dar-es-Salaam, Tanganyika.
W6AZA/KW6	c/o C.A.A., Wake Island.
YN1FTB	Francis T. Brown, U.S. Embassy, Managua, Nicaragua.
YS1RA	U.S. Embassy, San Salvador.
ZB1AJX	18 Bugeja Buildings, Prince of Wales Road, Sliema, Malta, G.C.
ZP2AC	Box 512, Asuncion, Paraguay.

G or GW) will count as an English county, and that Yorkshire counts as one county and *not* as three Ridings. The Channel Islands each count as one county (also collectively as a country); likewise the Isle of Man. The Isle of Wight can count as a county. Counties of Northern Ireland, Wales and Scotland are duly added on—but *not* those of Eire. EI, of course, counts as a separate country.

So, without getting too involved, start pegging your claims for Counties and Countries worked on Top Band. If, one year from now, there is any discussion about the winner of this Marathon, we shall simply put both feet down and demand QSL cards, so you'd better see about those, too. Don't rely on the Call Book too much for QTH's—ask the other chap at the time. Duration, August 1, 1949, to July 31, 1950. Power, 10 watts ! Let's have your first claims next month.

Stop Press

G3FEH (Morden) reports that FZ2NU is a station aboard ship in the Port of Dakar, works on 7086 kc with 200 watts, and would like G contacts.

Two nice new phoneys recently heard mid-July): HS5C (14050, T7) and VR5Z (14020, T6). A better one (we hope)—W6ATB/KC6 (14100, T9), who has all the appearance of being genuine.

The world's worst QTH to send, when you're a weak signal, must be that of OX3WC, who lives at Kangerdlugssuak !

From G3CYX *via* G2MI we get it that HB9HK will be on one of his Liechtenstein trips during the period August 13-15, and will be operating on 14 mc as HB1HK—so he will no doubt stir up a little excitement . . . GM6IZ (Aberdeen) turns in a short report which shows that he has worked 98C in 37Z in 89 days—not too bad for an OT who has little time for radio these days ; the list includes quite a number of fruity ones, too.

And that just about runs us dry, so we must get back to the shack and see where Arabackle has swished that VFO to. Closing time for next month's issue is first post on August 15. Please keep the news separate from the DX claims—and, if you're Top-Band-minded, don't forget to count up some counties and countries before then. In twelve days you should work, roughly, 20 and 4 (or are we optimistic ?).

Until next month, then, Good Hunting. 73 and BCNU.

THE ARRL FIELD DAY

Peter Lovelock (ex-G2AIS, and now of New York) writes that he joined the Westchester Amateur Radio Association for the recent ARRL Field Day. The camp was on a Connecticut hillside and the experience was "very similar to the British equivalent," with the same after effects as 48 hours of /P working in this country. One difference, however, is that the W's can use the full gallon on their Field Day events. Though we *have* heard it said . . . enough !

CARDS IN THE BOX

If your call appears below, please send a large stamped addressed envelope, with name and callsign, to BCM/QSL, London, W.C.1, when card(s) held for you will be forwarded. If you want your address to appear in "New QTH's," please mention that at the same time ; it will ensure eventual publication in the *Radio Amateur Call Book*.

G2AIU, 2CNU, 3BJH, 3CLT, 3CRS, 3DPA, 3DSP, 3EDK, 3EEQ, 3EQO, 3EVO, 3EVX, 3EXK, 3FIC, 3FJT, 3FRA, 3FXL, 3OD, 5CH, 5PI, 6SP, 6XH, GI3FJX, GM3BZI, 3DBX, GW3EPF, 3WI.

Joe's YL

Takes Up Amateur Radio

By **MURIEL COOKSON**

Every YL, and most XYL's, should read this. All we shall say about it is that Joe, a G3-plus-3, is a lucky chap.—Ed.

I AM a YL. Nothing unusual in that you may say, but to *me* it has been a revelation. Before I knew Joe, I'd never even heard of Amateur Radio so, when he first mentioned his hobby, I just said "Oh yes," very politely—then dismissed it from my mind. To me it was just a craze that didn't affect me in the slightest.

I soon learnt, however, that I just couldn't take that attitude. As we got to know each other better, this radio business cropped up more and more, till finally it became to me a rival which would have to be considered.

Then I visited his shack and at once it was obvious that this was no mere flash-in-the-pan hobby, but a serious business. I tried hard to take an interest in it but as he was only on CW at that time I found it very hard going.

Awakening

At the beginning of this year, he came on 'phone and when that great event occurred my interest was slowly awakened—unintentionally, I must admit—but as I visited the shack three evenings a week, I just had to listen to his QSO's.

I would sit there for hours knitting furiously (and often with furious thoughts) whilst Joe talked away in some practically foreign language. A lot of his contacts were with locals, so I soon got to know their callsigns and names and when they knew I was there they would say something to me. For a long time I was "mike shy" and wouldn't even say goodnight, but now I welcome the chance to say a few words. If I don't get it I cough loudly, rattle cups and anything else to attract attention till I hear a voice saying, "By the way, Joe, is there anyone in the shack with you ?", and there is my cue.

I have progressed even more rapidly of late, and in consequence my knitting is suffering rather badly. I now do QSL cards, or hunt manfully through the log when Joe is on the air and can't recall someone's name or QTH. I have also helped with tests, and after the latest one I got some rather flattering reports on my microphone personality !

Solo Turn

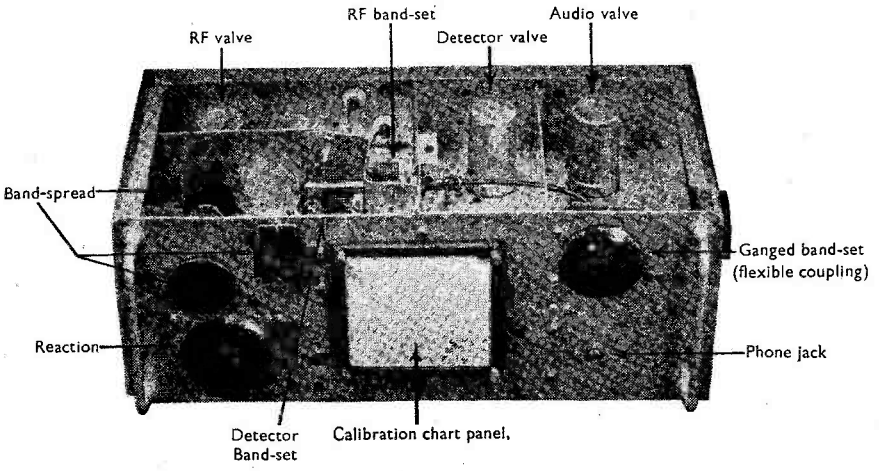
My biggest thrill was last week when I had a QSO all on my own, more out of bravado than anything. I called CQ and to my utter amazement an Italian came back. For a few moments I was panic-stricken, my mind went a complete blank and all I could do was sit there and gaze at the rig in terror. However, with a few gentle proddings from Joe I managed to pull myself together and carried on fairly well. No doubt all my feverish whispers aside were heard but I don't suppose the Italian minded that.

After that experience it is going to be harder than ever to keep me off the air—the best thing for me to do now is to teach Joe to knit.

Judging from what I have heard, very few XYL's take an interest in Amateur Radio, which I think is a big mistake. Before anything is hurled at me, let me hasten to explain that I fully realise an ex-YL hasn't the free time I have, with a house and family to look after ; their day doesn't start at 9 a.m. and finish at 5 p.m. like mine does at the moment.

I still think, though, that some wives could co-operate a little more ; many a time I have heard an amateur remark that his wife won't come near the shack, and he really has sounded disappointed.

Anyway, here is one YL who is Amateur Radio conscious, and who knows but one of these days I might go in for a licence of my own. No, I don't regret my interest in it ; I no longer feel neglected when I'm in the shack and as for Joe—well he thinks it marvellous, which more than repays me for any mental effort I have had to make.



Ideas for the TU7B

By **N. P. SPOONER (G2NS)**

MOST amateurs will know how best to adapt to their own particular requirements certain of the GEC transmitter tuning units used by the U.S. Army Signal Corps. Unless duplicating the original *QST* VFO conversion circuit or that of the Trai sitron described by G5RZ in the June 1948 issue of the *Short Wave Magazine*, as few alterations as possible will probably be made in order to preserve the temperature compensators housed inside the ceramic coil-formers.

The units most likely to come the way of amateurs are the TU5B, TU6B and the TU8B—tuning respectively 1500-3000 kc, 3000-4500 kc, and 6200 -7700kc.

The TU7B is, however, a different proposition from the amateur point of view as it covers from 4500 to 6200 kc. Should one be acquired for breaking-up, several useful items will be found with it, including a cabinet, chassis, six-position switch, high voltage tuning and fixed condensers, slow-motion dials and RF chokes. Acetone or amyl acetate (from the chemist) will loosen any fixing dope and the special grub-screws can be shifted with an Allan key (usually costing about twopence at a large ironmonger's, or one might be borrowed from the nearest AR88 owner who should have a key of this size in the receiver trimming-tool kit).

The old panel will serve as a template and one good use at least for the despised TU7B is shown by the photograph—it makes an excellent housing for the EF50 TRF Receiver described by G5UM in the August and December 1946, and July 1947, issues of the *Magazine*.

Noise Limiter Circuit

Suggested by **E. J. WILLIAMS (G2AKY)**

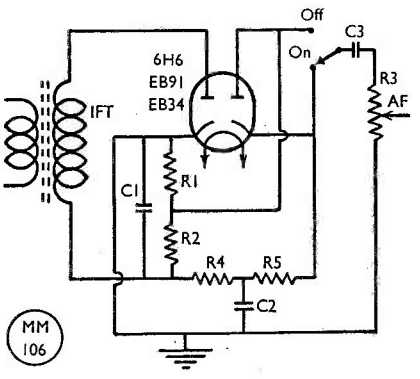
DOUBTLESS there are many amateurs who have at some time or other tried the several noise limiter circuits there are "on the market." The writer was no exception and after many experiments finally adopted the one described here, this giving the best results for simplicity of circuit design.

Referring to the circuit, it will be seen that one half of the double-diode (which may be an EB34, 6H6, EB91 or similar type of valve) is used as a detector in the conventional manner, the diode load being made up from two ½-megohm resistors in series ; the audio component is taken from the junction of these two resistors.

Action of the Circuit

When the noise limiter is switched in circuit the signal reaches the audio stage through the second diode section which is connected in opposition to the first diode, as far as polarity is concerned. Under these conditions, the second diode will pass signals so long as its cathode is maintained at a greater potential than its plate.

If it is assumed that the full voltage developed across the load at one instant be



Circuit incorporating G2AKY's ideas for an effective noise limiter ; details are given in the text.

Table of Values

Noise Limiter Circuit

C1 = ·0001 μF
C2 = ·01 μF
C3 = ·02 μF
R1, R2 = 0·25 megohm
R3 = 0·5 megohm
R4, R5 = 1 megohm

10, then the potential from the junction of the split diode load will be 5 volts and the standing bias applied to the limiter cathode will be approximately 5 volts.

An audio filter consisting of two 1-megohm resistors and a ·01 μF condenser is incorporated to ensure that no signals reach the limiter cathode whilst permitting the DC developed to be employed in a manner similar to that in an AVC circuit.

It will be apparent, therefore, that any signals or noise in excess of 5 volts will not pass through the limiter diode. Peaks of noise may quite easily attain values considerably higher than this but will not be passed on to the audio stages.

Results

This 2-to-1 ratio of voltages will, however, permit modulation depths to approximately 100 per cent. to be accommodated, although in actual practice the percentages will be less than this figure. As in similar systems, some slight distortion of the modulation peaks may be observed, but these should be quite insufficient to spoil intelligibility. The fact that the limiter standing bias is derived from the detector diode load means that the limiter action is approximately the same irrespective of signal strength.

When tried, the circuit was found to behave excellently even with an electric vacuum cleaner running a few feet away from the receiver aerial.

XTAL XCHANGE

This is a free service for readers, but is for exchanges of crystals only—buy-or-sell notices can *not* be accepted for this space. With the exception of 100-1,000 kc bars, the fundamental frequency of any crystal offered must be within one of the amateur communication bands, *or* suitable for harmonic operation at VHF ; 100-1,000 kc bars should be of certified accuracy, and in the case of other crystals it should be stated whether calibration certificates accompany them. Notices, headed "Xtal Xchange—Free Insertion" should be set out on a separate slip in the form shown below, and all negotiations conducted direct.

G2DUD, 8 Hall Grove, Cheadle, Cheshire.

Has Bliley 7028 kc crystal in American Eidson holder, ¾-in. pin spacing. Wants ·1820-1860 kc crystal, holdered, ¾-in. mounting.

G2HII, 73 Elvaston Road, Nottingham.

Has QCC Type P5 1888 kc crystal, certificated. Wants similar crystal 3550-3650 kc.

G3CED, 17 Ethel Road, Broadstairs, Kent.

Has several "dead" 7000 kc crystals. Wants frequencies at CW end 3·5 and 14 mc bands.

G3DJD, 2 Canfield Road, Brighton 7, Sussex.

Has RCA 100 kc bar in American 3-pin holder, with base. Wants 250 or 500 kc bar, mounted.

G3DLD, Upways, Viewlands Rise, Chevin End, Menston-in-Wharfedale, Yorks.

Has QCC Type P5 7060 and 7063 kc crystals, certificated, also 100/1000 kc bar in 3-pin holder. Wants certificated crystals in 1·7 mc band.

G3DNX, 15 Roosevelt Road, Long Handborough, Oxon.

Has ex-Service 3500 kc crystal, ¾-in. pin spacing Wants frequency 7010-7045 kc, either ½-in. or ¾-in. mounting.

G3DSA, 2 Nunmill Street, York.

Has QCC Type P5 7124 kc crystal. Wants frequency 1800-1900 kc.

G6FB, 311 South Lane, New Malden, Surrey.

Has 100 kc and 8001 kc ex-A.M. crystals, ¾-in. pin spacing. Wants frequencies 3500-3595 kc.

SWL, 19 Darnley Avenue, Wakefield, Yorks.

Has 465 and 500 kc crystals, ¾-in. pin spacing, also 8000 kc octal based. Wants frequencies for CW end 3·5 mc band, or in 1·7 mc band.

Triode Converter for Two

Design using 6J6's, with Performance limited only by Aerial Noise

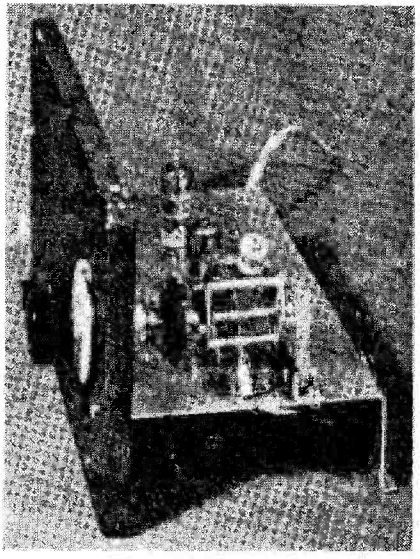
By W. J. CRAWLEY (G2IQ)

The author has already made a number of very useful contributions to these pages. Since the receiver is still one of the main considerations at every VHF station, we are glad to present here details of his latest converter for the 145 mc band—and the quest for better converters must go on unceasingly. This one is giving exceptional results and can be recommended as an extremely effective practical design.—Ed.

IN an article describing a method of measuring signal-to-noise ratio in VHF receivers ("Comparing Receiver Performance," *Short Wave Magazine*, June 1949), the author referred to an all-triode converter with the extremely low noise factor of 4 dB. The following is a description of this converter, the performance of which may justly be claimed as being well in the forefront at the present stage of VHF technique.

Simplicity and Stability of the Push-pull Converter

For purposes of comparison about half a dozen different versions of this receiver have now been constructed, and without exception every one worked first time without the slightest sign of trouble. Indeed, despite the rather complicated appearance of its circuitry, this converter is simpler to construct and to get working than any other type. Its perfect balance makes it inherently stable ; the only possibly tricky adjustment is that of neutralising the RF stage, but if the instructions are carefully followed, this will present no difficulty. Compared with receivers using a pentode RF stage such as the 6AK5, this converter is as docile as a lamb, gives slightly higher gain, and much better signal-to-noise ratio !



Top side of the converter built up on the locally fabricated chassis, using surplus parts. The oscillator coil and tuning condenser are right in the foreground.

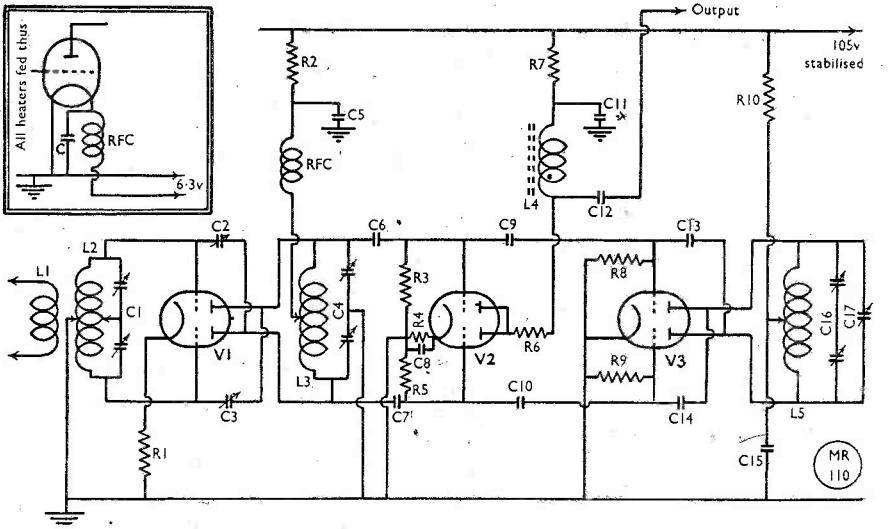
Some Advantages of the Push-pull Triode

The main advantage of the triode over the pentode in VHF RF amplifiers is that it has no screen. The noise energy in pentodes is higher than in triodes of similar characteristics because of the added noise caused by the screen current. A pentode is usually between three to five times as noisy as a triode producing equivalent amplification. For example, the Equivalent Noise Resistance of a 6AK5 is approximately 1,500 ohms, whereas that of the 6J6 is only about 400 ohms. However, in single-ended circuits, full advantage of the triode superiority cannot usually be taken. In the push-pull mode, however, the triode demonstrates its superiority because of the following factors : The push-pull connection halves the input capacity (it becomes here only 1 $\mu\mu$F), making it possible to use a comparatively large inductance in the grid circuit, a step-up aerial transformer and a truly balanced input circuit. In addition, the

Table of Values

Circuit of the G2IQ 145 mc Converter using 6J6's

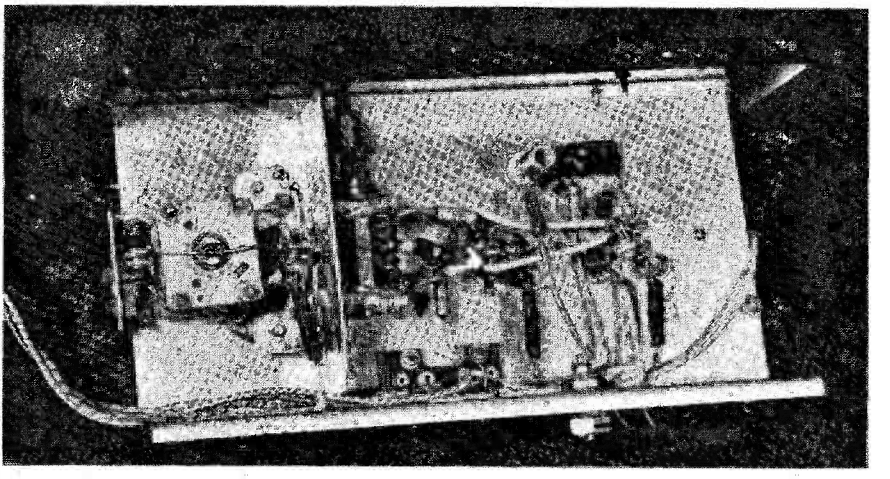
C1	= 8 × 8 $\mu\mu$F "Butterfly"
C4	= 15 × 15 $\mu\mu$F "Butterfly"
C2, C3	= 1/4 $\mu\mu$F trimmers (*see text*)
C5, C8, C15	= 500 $\mu\mu$F mica
C6, C7	= 30 $\mu\mu$F Ceramicon
C9, C10	= *See text*
C11	= ·01 μF mica
C12	= 50 $\mu\mu$F mica
C13, C14	= 10 $\mu\mu$F Ceramicon
C16	= 5 × 5 $\mu\mu$F split-stator
C17	= 30 $\mu\mu$F trimmer (Philips)
R1	= 56 ohms ½ watt
R2, R7, R10	= 2,000 ohms ½ watt
R3, R5	= 100,000 ohms ½ watt
R4	= 470 ohms ½ watt
R6	= 56 ohms ½ watt
R8, R9	= 15,000 ohms ½ watt
All RFC	= 20 in. of 26 SWG enamelled on ½-watt resistor or ⅛ in former
L2, L3	= 6 turns ¼ in. diam. centre tap
L1	= 2 turns over centre of L1
L4	= 7 mc IF coil
L5	= 4 turns ¼ in. C.T.



The circuit complete of G2IQ's two-metre converter, using 6J6's and with a neutralised RF section. It is a low-noise high-gain job, easy to build, and should give exceptional results on Two. The by-pass condenser C in the sketch inset can be 500 $\mu\mu$F.

input resistance is doubled so that the damping of the grid coil is halved with consequent improvement in the gain. In point of fact, the input resistance of a properly neutralised 6J6 is better-than 10,000 ohms at 145 mc, whereas that of the 6AK5 is as low as 3,000 ohms. One further big advantage of the push-pull 6J6 is that this valve has only one cathode, common to both triodes. In the push-pull Class-A mode no RF current flows in the cathode lead ; in other words, the cathode is cold to RF and consequently the evil effects of cathode lead inductance are eliminated.

When added together the foregoing advan-



Underneath the converter constructed from surplus components. The grid coil is across the butterfly condenser, and the screen divides the grid and plate sections of the push-pull RF stage. The mixer injection condensers are the two parallel wires in the centre (white sleeving).

tages make a properly designed push-pull 6J6 RF amplifier approximately 5 to 6 dB better than a well-designed 6AK5 stage on the score of signal-to-noise alone. This may not look much on paper, but consider to what lengths we are willing to go to get another 6 dB gain from our beam aerials ! Moreover, the gain we are getting from the 6J6 is better than that we could get by increasing the beam gain by 6 dB because it represents pure signal gain without any additional noise. Increasing the beam gain also increases the noise component to some extent !

Further Design Considerations

Having decided on the balanced RF amplifier stage it is as well to carry the symmetry throughout the converter and use a balanced mixer and balanced oscillator. A push-pull mixer has the disadvantage of requiring balanced output, and as the single-ended output coil was easier to construct a push-push mixer was decided upon with plates strapped. A crystal controlled oscillator was regarded as an unnecessary complication as stability at 144 mc is easily attainable with self-excited oscillators *when carefully designed.* Balanced injection to each side of the mixer is essential, and for this reason the oscillatory circuit shown was chosen. With stabilised power supply this oscillator has no tendency to drift after the initial warming up period and gives a pure DC tone, a most desirable but not often encountered characteristic of oscillators at VHF.

Construction of Two Units

The photographs illustrate two versions of the same circuit. One is the logical development of a study of the circuit diagram and the components are spaced across the chassis in "chronological order," starting with the RF grid circuit and ending with the oscillator plate tank. This type of construction has the necessary symmetry and is, perhaps, easier than the second type. Both converters, however, have identical noise factors. The first was constructed almost entirely of surplus components on a home-made chassis : the second (also photographed) uses well-known types of components, and a commercially made cabinet and chassis. In order to get everything into the commercial chassis it was necessary to use a different layout, but the balance has not been impaired.

The input circuit in both converters uses a pre-set butterfly type condenser. The input circuit is sufficiently broad-band to allow the grid condenser to be tuned to the middle of the band and left there. The neutralising condensers lie on each side of the tuning condenser, making the grid leads as short as possible. The neutralising condensers are midget 30 $\mu\mu$F air-spaced trimmers with all the plates removed except one rotor and one stator. Neutralising is fairly tricky and experiment with various types of neutralising condensers led to the adoption of these as the best for this application. It should be remembered that everything connected with the tuned circuits should be of as small dimensions as possible so as to reduce inductance external to the tuned circuit and capacity to earth. These tiny condensers, when modified as suggested, provide the required capacity variation (2 to 3 $\mu\mu$F) with least circuit losses.

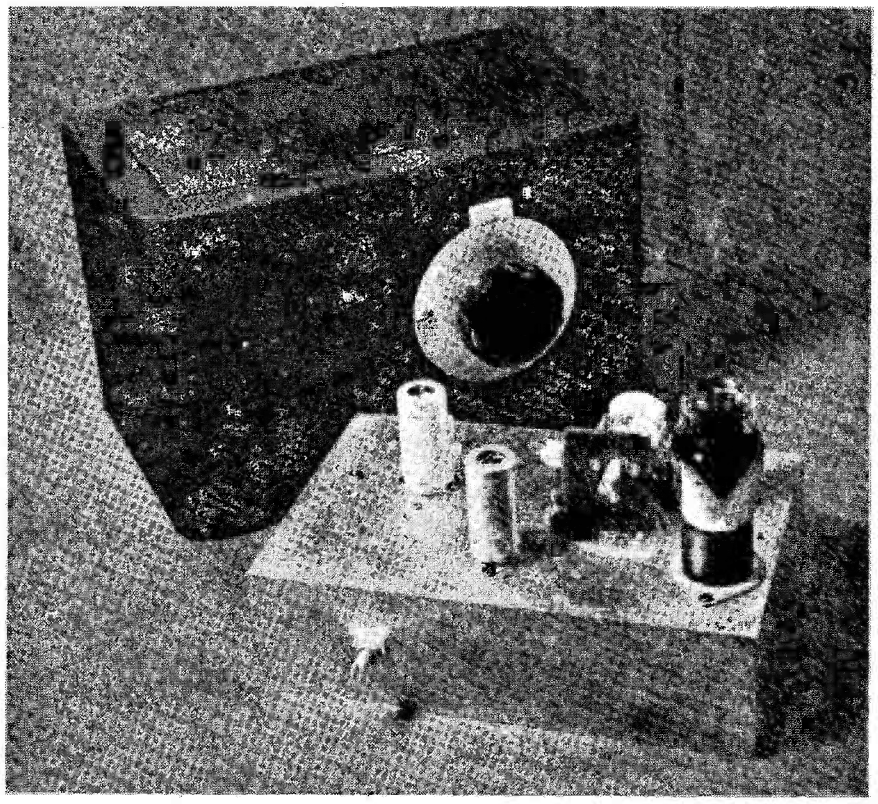
The grid leads to the tuning condenser are crossed over at the valve socket so that the plate neutralising leads may come straight across to the neutralising condensers. A metal shield screens the input and output circuits with a cut-out for the valve socket. Keep all leads as short as possible ; cup type mica by-pass condensers are an advantage in keeping down lead inductance. The cathode resistor is not by-passed for the reasons enumerated above. The grid coil is mounted direct on to the tuning condenser.

All earth returns are taken to a tag secured to the chassis by the valve socket bolt. The plate tank is similar to that of the grid, with HT fed to the centre tap of the coil through an RF choke. Condensers from each side of the coil feed to each mixer grid, which has no tuned circuit. The mixer grid resistors are raised about $\frac{1}{4}$-in. from their respective socket pins to allow injection to be obtained by home made condensers. These consist of parallel insulated wires from each oscillator grid pin brought to each mixer grid pin and looped once around the $\frac{1}{4}$-in. of resistor lead. The mixer does not appear to be unduly critical as to oscillator power, and varying amounts of injection have been tried with little or no variation in the noise factor.

There is no need to stress that the oscillator depends for its stability on the mechanical strength of its parts. Short, rigid leads are particularly vital here. The coil should be wound with not less than 18 SWG wire, and its centre should receive added support by a short rigid wire from the centre tap to the by-pass condenser. The tuning condenser requires a rigid supporting bracket and should be connected to the slow-motion drive by a flexible coupling. Use a concentric condenser for trimming the oscillator as this type may be rigidly supported in the wiring. If desired, the VR105/30 stabiliser may be mounted on the same chassis with no ill effects.

Putting the Converter into Operation

There should be no difficulty in getting the converter working satisfactorily in a short time. The first step is to peak up the IF coil, and this may be done by turning up the main



The second (and more "decent") converter referred to in the text. This is built up on an Eddystone chassis and incorporates a voltage regulator.

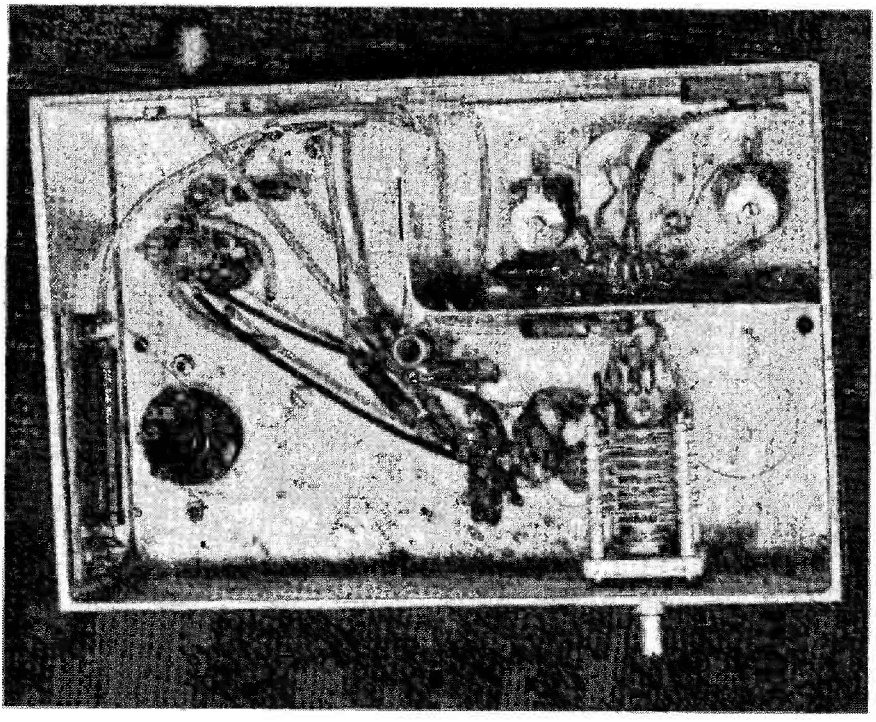
receiver gain and trimming the IF coil for maximum hiss at the frequency chosen. The next step is to trim the oscillator coil to approximately 138 mc—that is, 145 less the intermediate frequency. With the HT to the RF valve temporarily disconnected, rock the RF plate tuning condenser. Two positions of increased hiss in the receiver output will be noticed corresponding to frequencies of 131 mc and 145 mc. The latter is the correct one, that is the one using less capacity. Now apply HT to the RF valve and in all probability (unless you have been very lucky) the receiver will become distinctly unstable ! With the neutralising trimmers at maximum, reduce the capacity of each uniformly, a little at a time, until tuning the grid coil into resonance does not produce self-oscillation in the RF stage. When the receiver is properly neutralised tuning the grid coil should produce a slight increase in hiss at resonance but the tuning should not be sharp, neither should the increase in hiss be pronounced. Pronounced hiss and sharp tuning denote that the receiver is working on the threshold of instability, and whilst the gain will be higher the signal-to-noise ratio will suffer. If this condition exists it is as well to experiment with the neutralising condensers until the RF stage becomes more docile. When properly adjusted, the stage should remain stable even with the aerial disconnected.

The Input Load

The converter works better with a balanced aerial system with an impedance of between 300 and 600 ohms. The use of coaxial cable with one side of the aerial coupling coil earthed upsets the balance somewhat. Many VHF workers are coming to the conclusion that symmetrical feeders are to be preferred to coaxial (asymmetrical) lines, but for those who

are using the latter the following suggestion may be of help: it is not always recognised that when the aerial is used for reception its function is reversed and the receiver becomes the load and the aerial the generator. Therefore matching the aerial to the receiver must be done at the receiver end. In this case the 70-ohm coaxial line may be matched to the 300-ohm input of the converter by means of a quarter-wave matching transformer of 150 ohms impedance, and the need to earth one side of the input coil is obviated. This transformer may take the form of two lengths of 70-ohm coax 13 in. long (*i.e.* 20 in. times the velocity factor) with the outer braid connected together at each end and the inner conductors connected to the aerial feeder and receiver input. Alternatively, two lengths of 300-ohm twinlead, each 16 in. long, may be used in parallel to effect the desired balance. Attention to small points like this are well worth while and will help achieve the near-perfect reception of which this type of converter is capable.

Do not be disappointed, during the first few hours' work with this receiver, at its apparent lack of liveliness. Its abnormal quietness is not due to insensitivity, as it will soon demonstrate when a signal appears on the band.



On the tidy theme, this is looking underneath the converter as constructed on an Eddystone chassis. The RF grid section is almost completely screened from the rest of the set. The mounting of the neutralising condensers is clearly visible.

PULSE TRANSMISSION

In the American radio periodicals, they are beginning to talk about pulse transmission as a possible method of communication on amateur frequencies—it is a large subject, involving new techniques, and offers a wide field for experiment, particularly as a pulse transmission can also be modulated. At the moment, no form of pulse transmission is permitted on any amateur band in this country.

VHF BANDS

By E. J. WILLIAMS, B.Sc. (G2XC)

New Contacts on Two—
Increasing Activity—
The Band Plan, October 1—
Seventy Centimetre Contest—
Calls Heard and Worked

THE month has seen many very fine contacts made on the two-metre band, and space is far from sufficient to list them all. Study of the calls worked and heard in the Activity Report herewith will give an idea of what has been achieved. At the time of writing the GDX record still stands at the figure of 296 miles set by G3BLP and GM3OL on June 20, but some very serious assaults have been made on it. G5BY and G5GX had a 294-mile contact, while both G5BY and G6WT are gunning for GM. Across the waters of the North Sea, the Newcastle group have worked PAØAD at 350 miles, while reports have come in of the reception of DL's in several East Coast areas —the distances involved are approaching 500 miles. DL1CK in Frankfurt was S7-8 at G3COJ in Hull on the evening of June 26, and this fine piece of reception has been indirectly confirmed by a report from PAØLU, who was hearing both DL1CK and G3COJ's abortive calls to him.

Further to the DX in this category, G2QV/G3EBW (Hurst Green, Sussex) report the reception of DL4XS on 145 mc, MCW R5, S6, calling another DL4 on July 17. So there is good evidence of the possibility of some very useful and interesting European DX on Two. *What* a band !

70 cm. News

It is with considerable mortification and some trepidation that your conductor has to confess that much of the Seventy Centimetre news following should actually have appeared in the last issue—it was an error of omission for which due apologies are offered.

The latest achievement on Seventycms is a contact over a distance of about 47 miles between G3BEX/P at Devil's Dyke and G3AHB/A on the roof of the E.M.I. building at Hayes, Middlesex. Signals were R5, S9 at Hayes, and R5, S6 at the Sussex end. The Tx at G3BEX is a pair of 8012's as SEO, with MCW provided by a single 6L6, while the Rx is a R1359. Beams are 24-element for Tx and 16 for Rx, of which we hope to show some photographs next month. At G3AHB the Tx is an 8012 with MCW at 450 c.p.s., and the aerial is eight half-waves stacked, with reflectors ; the Rx is from the APS13 transceiver.

Correspondence shows that there is some controversy arising between various 70 cm. groups as to the use of SEO's on that band. One point is quite certain, namely, that SEO's cannot be received on converters feeding into receivers such as the HRO. These are early days to form a final opinion, but there are many who feel that if consistent DX results comparable with those obtained on Two are to be obtained on 70 cm., then CW technique and narrow-band receivers will be essential—and that implies frequency stabilisation. There would appear to be no reason at all why tropospheric propagation should not be equally good on 70 cm. as on two metres. Rather, the limiting factors appear to be getting sufficient RF into the Tx aerial, and receiver sensitivity. So while not wishing in any way to minimise the excellent work being done by many of the present 70 cm. pioneers, one suggests a different technique must be sought for if the band is ever to be put to any better use than portable operation from hill tops and contact over line-of-sight paths. After all, we *already know* that such working is possible with quite elementary apparatus.

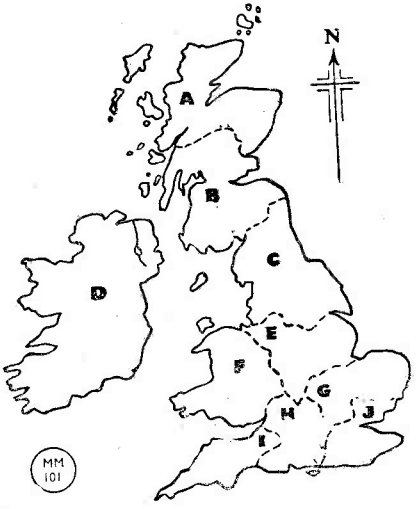
In the Midlands, G3APY (Kirkby-in-Ashfield) and G3ENS and G3KK (Loughborough) are active. The first-named has a 32-element broadside array and a RF105 tripler followed by a similar PA ; the Rx at G3APY is a modified P58 with a 446A as RF and 1N23 mixer, with which a noise factor of only 5·5 dB at 435 mc is achieved. G6TF (Sheffield) has an ASB2 which he thinks might be persuaded to work on 70 cm ; he would be glad to hear from anyone who has tried

TWO-METRE FIRSTS

G/PA	G6DH/PAØPN	September 14, 1949
G/ON	G6DH/ON4FG	September 25, 1948
G/GW	G5MQ/GW5UO	October 22. 1948
G/F	G6DH/F8OL	November 10, 1948
G/GM	G3BW/GM3OL	February 13, 1949
GI/GM	GI2FHN/GM3OL	July 1, 1949
GI/GW	GI2FHN/GW3ELM	July 8, 1949

TWO METRE RECORDS

GDX	G3BLP/GM3OL	296 miles
General	G5BY/PAØZQ	390 miles



This is the map to serve as a guide to the study of the Band Plan.

modifying this particular type of receiver.

G2HKU (Sheerness) is using a corner reflector with a folded dipole made of ¼-in. copper tube fed with 300 ohm line. A new transmitter is under construction using a CV63 parallel-line oscillator, while the single 9002 Rx is being rebuilt. At Romford G2BVN has push-pull 6J6's as a transmitter and a converted ASB8 on the receiving side, with a 16-element vertically polarised aerial in course of construction. G5BY (Bolt Tail) is prepared to arrange 420 mc schedules with anyone, and points out that some good circuits across the water to Cornwall are obvious from his QTH—so perhaps someone will go /P on his holiday in the South-West !

G3BKQ (Leicester) has both Tx and Rx ready for 420 mc, but so far only altimeters have been heard. G4LU (Oswestry) is now CC on 432·6 mc, using an 832 tripler ; power output is about 3 watts into a 12-element beam. The receiver is a modified ASB8, and he also has heard altimeters and cars. G3AHX, also in Oswestry, should be active soon. G4LU is beaming on Birmingham every evening from 2100 to 2110 with MCW, and listening on the band for the following ten minutes.

Some special 420 mc activity is scheduled for the week-end August 20-21, and three stations of the South London VHF Group will be operating portable, as follows : G2FKZ/P, 3 miles west of Wantage, 700-ft. a.s.l. ; G3CU/P, One Tree Hill, Honor Oak ; G3FZL/P, near Hastings, 500-ft. a.s.l. An attempt will be made to work F8OL across the Channel, who is co-operating. We shall, of course, be very interested to have news (and photographs) of the results of this effort, for reporting in the next issue.

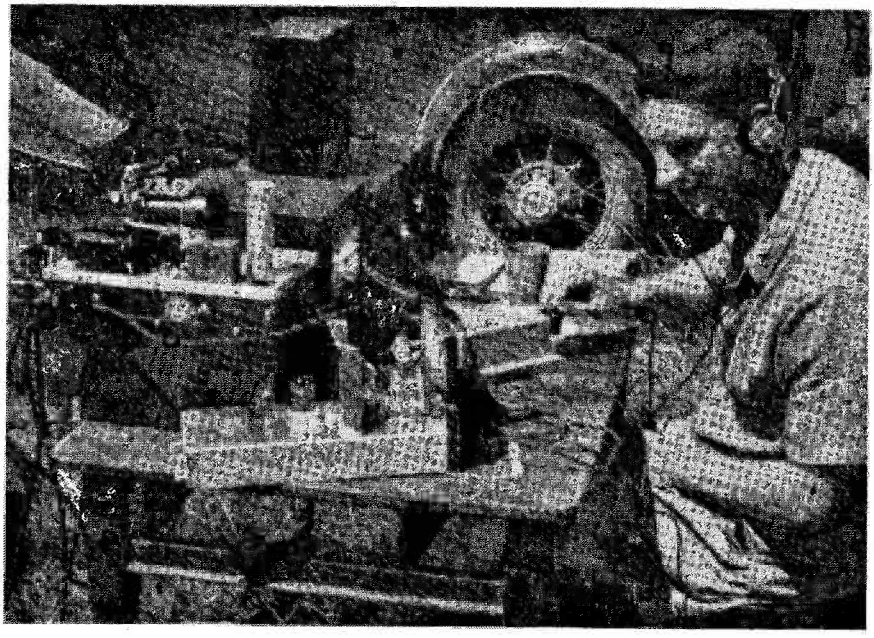
The Zone Plan

The Two Metre Frequency Plan, as amended in the *Short Wave Magazine*, June, 1949, page 293, was fully discussed at the Nottingham meeting of the Fiveband Club, and it was unanimously agreed that it was a Good Idea. One or two slight modifications were suggested, and all present agreed to support the Plan if it was introduced. With this encouragement (and also the support promised by the great majority of correspondents in their letters), it has been decided to advise all two-metre operators to adopt the scheme with effect from October 1. There is, of course, no compulsion whatever about this, but it is hoped that all those who have promised support will operate according to the new Plan from the date given and endeavour to persuade others to do the same. There may be a little confusion just at first, and even after the Plan is in operation, a certain number of stations may not have moved. But if you really do believe in the scheme, *please* do not wait to see what others will do but be ready with *your* crystal on October 1.

In brief the plan is as follows. The country is divided into nine geographical zones (see accompanying map). The Zones A and B of the original scheme have been combined as there was little activity in Zone A. To each area a section of the band has been allocated.

Zone A & B : 144·0 to 144·2 mc	All Scotland.
Zone C : 144·2 to 144·4 mc	All England from Lancs. and Yorks. northward.
Zone D : 145·8 to 146 mc	All Ireland.
Zone E : 144·4 to 144·65 mc	Cheshire, Derby, Notts, Lincs, Rutland, Leics, Warwick and Staffs.
Zone F : 145·65 to 145·8 mc	Flint, Denbigh, Shrops, Worcs, Hereford, Monmouth and westwards.
Zone G : 144·65 to 144·85 mc	Northants, Bucks, Herts, Beds Hunts, Cambs, Norfolk, Suffolk.
Zone H : 145·25 to 145·5 mc	Dorset, Wilts, Glos, Oxon, Berks and Hants.
Zone I : 145·5 to 145·65 mc	Cornwall, Devon and Somerset
Zone J : 144·85 to 145·25 mc	London, Essex, Middlesex, Surrey, Kent and Sussex.

As a result of a proposal made at the Nottingham meeting it was agreed that local contacts could be carried out at the extreme HF and LF ends of the band, *i.e.*, in the first



G5RP himself banging it out when /P near Wantage, Berks, on July 3. Tx in the foreground.

50 kc at either end (144·0 to 144·05 and 145·95 to 146·0). Stations in GM and GI desiring DX contacts are therefore advised to select their frequencies *outside* these portions of their zone allocations. This proposal was made with a view to lessening local interference in congested areas, but it is not intended that *all* local contacts should be made on those frequencies.

Method of Calling

To indicate what part of the band is to be searched after a CQ call, the calling station should follow the CQ by the letter Z and the zone letter, *e.g.*, "CQ ZG" would indicate Zone G stations were desired and searching would be from 144·65 to 144·85 mc. The letter Z is included to avoid any possible misunderstanding of "CQ G" or "CQ F" in Continental circles ! To call two zones, include both letters in the call in the same order in which it is proposed to search the bands.

Crystal Exchanges

Arrangements are being made to effect the necessary crystal exchanges, and all who want to change crystals should notify G2XC of the frequency and type of crystal desired and give full details of the crystal offered in exchange. Do not send the crystal itself to either the *Short Wave Magazine* or G2XC ! Exchanges will be arranged as promptly as possible. Information may be sent as soon as you like, but the actual exchange need not be made until sometime in September, at a date to be mutually arranged between the parties concerned. However, October 1 is target date for the new zones, so the aim must be to have everyone fixed up by that day.

At the Nottingham meeting the following promised full support for the scheme :G2FZU, 2IQ, 2KK, 2MA, 2RI, 2XC, 2XS, 3ABA, 3ALD, 3ALY, 3APY, 3BLP, 3BUR, 3CUJ, 3CZV, 3DBH, 3DCV, 3ENS, 3ENY, 3DRG,

Two-Metre DX Working

Worked	Station
Over 350 miles	G2IQ, G3CYY, G4LX, G5BY
300 to 350 miles	G2ADZ, G2BMZ, G2MA, G3DMU, G4LU, G6WT
250 to 300 miles	G2HDY, G2KG, G2NH, G2XC, G3BLP, G3COJ, G3CUJ, G3EHY, G5GX, G6OS, G8DM, GM3OL
200 to 250 miles	G2CIW, G2OI, G3ABA, G3AGA, G3DAH, G4AP, G5BM, G5MA, G5MQ, G5NF, G5RP, G5TZ, G6DH, G6PG, G6ZQ

3MY, 3WW, 5GX, 5JU, 5PP, 5RW, 6CW, 6FO, 6HY, 6MN, 6OS, 6VX, 8DD, 8JI, 8UZ. In addition, the following are only a few amongst those who have given written promises of support: G2NH, 2OI, 3BW, 3CYY, 3DAH, 3DMU, 3EJL, 3VM, 3WS, 3YH, 4LX, 5MR, 8AO, 8LY, 8WV. During the past two months many other indications of approval have been received, and only five letters of dissent. So it is now up to everyone who has promised support to make the scheme work. G2XC will be back on 145·29 on October 1.

TWO-METRE ACTIVITY BY COUNTIES

The Midlands and North

Cheshire
G3DH, G4OS, G5CP

Cumberland
G3ACY, G3BW

Derby
G3MY/P, G5RW

Durham
G4WB, G8AO, G8IF, G8JO

Lancashire
G2AOA, G2IN, G2OI, G3BY, G3DA, G3ZM, G5KX, G6LC, G6MI. G8FI, G8TD

Leicester
G2RI, G3BKQ, G3ENS

Lincoln
G3DMU, G5BD

Norfolk
G2XS, G3VM, G5UD

Northants
G2AUA, G2HCG, G3BBA

Northumberland
G2DBQ, G3CYY, G4LX

Notts
G3APY, G6CW, G8UZ

Shropshire
G4LU

Staffs.
G3CXD, G3EEZ, G3TF, G6FK, G8KL

Warwick
G2ATK, G2AVQ, G3ABA, G4RK, G5JU, G5LJ, G6SN, G8MZ, G8QY

Yorks
G2IQ, G2MA, G3ALD, G3ALY, G3CC, G3COJ, G3CUJ, G5GX, G6OS, G6YO

SCOTLAND

Airdrie
GM3BDA

Dumfries
GM3OL

Forfar
GM4HR

Lanark
GM5VG

Midlothian
GM3BBW, GM6LS, GM6SR

NORTH WALES

Caernarvon
GW3ELM, GW5UO

Montgomery
GW2ADZ

NORTHERN IRELAND

Antrim
GI2FHN, GI2HML, GI3FKO

Southern Counties next month

Contests

Contest plans were also fully discussed at the Nottingham meeting, and as a result separate two-metre and 70-cm. events are being arranged. The former will be in November, the exact dates to be announced later.

The 70-cm. Contest will be on two week-ends, September 10-11 and October 8-9, the period being from mid-day Saturday to midnight Sunday in each case. Either portable or fixed QTH operation will be permitted, and contacts may be prearranged or made after initial contact on another band, and half-points will be allowed for cross-band operation—420 mc to any other band, and either way. Points will be scored at one per mile, that is, 25 miles make 25 points.

Although this first 420 mc Contest is on a points scoring basis, it is hoped that all competitors will appreciate that the idea behind the event is to *encourage* 70 *cm. activity* and it is therefore urged that everyone with 70 cm. equipment, either Tx or Rx, be active on those week-ends, whatever may be their chances of winning the Contest.

Results of the first week-end should be sent in to us by September 16 so that a brief report can be given in the October *Short Wave Magazine*, and the final score for the two week-ends combined by October 14. Details of equipment and operating sites should also be included.

Beams

Aerials for Two have occupied a prominent place in the correspondence this month. Stacked arrays seem to be gaining favour everywhere. G2KG (Chelmsford) says, "If the average ham would discard his Yagi (unless stacks of 3 or 4), also throw away his low-loss coaxial, there would be plenty of DX about." G5GX (Leven) similarly comments, " One can tell a station using a stacked array by its consistency and its strength." G2KG has a fixed array with a theoretical gain of 17 dB trained on PA, and a similar one, rotary and 70 ft. up, with which he has been putting S9 signals all over the country. An array of stacked rhombics aimed north has also been tried. Regarding coaxial cable, one length of 60 ft. was found to have 6 dB attenuation at 145 mc, with a SWR of only 1·6.

Others with multi-element arrays either up or under construction include G3BKQ Leicester) 24, G3COJ (Hull) 16, G3DMU (Scunthorpe) 16, G5BY (Bolt Tail) 24, G5RP (Abingdon) 16, G6WT (Torquay) 24.

Station News

G2IQ (Sheffield) is considering making a stacked array from ¼-in. dural wire, which is sufficiently rigid to allow of 40-in. being supported at one end only. G3COJ (Hull) has worked PAØAD and G5BY at excellent DX distances. He points out that it was on the first day of the recent air exercises he heard DL1CK, but he does not consider Window had anything to do with it. G3CUJ is another to work G5BY from Hull and also to get across to PA. He comments on the strong and consistent signal he receives from G2CPL (Lowestoft) over a mainly water path.

G2OI (Eccles) logged 79 stations during the recent field day, and complains of QRM in the Manchester area from 'phone stations that spread. He recently received a QSL from F9MZ for a 2-metre QSO which he knows nothing about ; he thinks the Frenchman may have made an error with the callsign, so if it belongs to someone else please send your claim to G2OI. The date was July 3. G8FI (Darwen) is active nightly from 1900 BST.

Further north the Newcastle group have worked PAØAD, but are finding some of these "one-way paths." On June 26 both G3CYY and G4LX heard a station in Flensburg, either DA or DL1KN. G8AO has heard G5BY, and worked G3APY ; he asks for a few more beams to be fired at the North-East. He hears plenty of stations calling GM3OL.

Our congratulations must go to G3BW, who, in one of the loneliest VHF spots in the country (Whitehaven), has achieved associate membership (100 stations worked) of the VHF Century Club. It is also a pleasure to record that by the next post a bundle of 100 cards arrived from GM3OL (Dumfries) to make him the first GM to become VHF CC. This is no mean achievement on the part of both operators concerned, and shows what can be done even from a difficult or DX location. During the past month they have both worked GI2FHN, and both have now reached the Counties Worked list. The Rx at G3BW is a CC converter with two 6AK5 RF stages ; a six-element c.s. beam and a SCR522 with a 829 PA complete the equipment. GM3OL says that July 3 was easily the best VHF day he has experienced.

GI2FHN, who has had contacts with G, GI, GM and GW, is blazing new paths across the Irish Sea and is active most evenings between 1800 and 1900 and again 2300 to 2359 BST. He has a converter with 6J6 RF and mixer stages and 6C4 cathode follower output ; the oscillator is 955. The VFO for the transmitter is a LM10 frequency meter which he claims to be as good as a crystal. The aerial system is two stacked three-element wide-spaced beams; usual frequency 145·2 mc.

On the Field Day G4LU (Oswestry) found the hardest job was to contact the GW portables ! He has recently moved his indoor beam to give better signals to the south. G3ABA (Coventry) is one of those to work GM3OL and he has also heard PAØAD ; he asks where are the Middlesex and Sussex stations ? G3BKQ (Leicester) reports that

TWO METRES
COUNTIES WORKED LIST
Starting Figure, 14
From fixed QTH only

Worked	Station
39	G3BLP (149)
38	G2NH (183), G5MA, G5WP
35	G2IQ, G5GX
33	G3COJ
32	G3ABA, G5BY
31	G2KG (110), G2MR, G2OI, G4LU, G6NB (131)
29	G3DMU, G3EHY
28	G2ADZ, G5BM, G8WV
27	G3DAH, G5JU, G8QX
26	G3BKQ
25	G2AXG, G4AU
24	G2XC (118), G3CUJ
23	G2CIW (110), G3APY
22	G2HDY, G5MI
21	G2XS, G3CCP, G5NF, G6PG
20	G2NM, G3CXD
19	G5RP
18	G4DC (102)
17	G3AUA, GM3OL
16	G2CPL, G8SM
15	G2FLC
14	G3BW, G6LK

Note : *Figures in brackets after call are number of different stations worked. Starting figure,* 100.

signals which are S6 -7 on his 24-element beam are only just audible on the five-element job. In Newcastle, Staffs, G3CXD finds G3BLP the most consistent DX signal. G3CXD is using a modified BC625 with 18 watts, and the Rx is P/P 6J6 RF, 6J6 mixer and 6J6 P/P oscillator.

On the eastern side, G3DMU (Scunthorpe) is running a 6J6-plus-CV53 GG stage in front of a BC639. He recently observed one station to send 74 CQ's with the call made twice only !! This may be an extreme case, but there *are* far too many long calls with no signing. Time after time calls are being lost through just that cause. Sign frequently both when calling CQ or when calling another station. It beats the QSB and the car QRM.

G3VM (Norwich) has been putting out a good signal from Norfolk and has worked PAØLU for what he thinks must be the first PA/G contact between F.O.C. members. He runs a daily schedule with G2CPL and would like to arrange a regular contact with a station in the Hull area. G2CPL (Lowestoft) has

TWO-METRE ACTIVITY REPORT

To maintain the usefulness of this section, please set out your list on a separate sheet and exactly as shown below. That is, with callsigns in numerical and alphabetical sequence, arranged horizontally, repeating the numeral but not the prefix, and divided into "worked" and "heard" listings. And please print all calls clearly!

G3BKQ, Leicester.

WORKED : G2AJ, 2ATK/P, 2AVQ, 2BUJ, 2BVW, 2HCG, 2IQ, 2NH, 2OI, 2RI, 2XC, 3ABA, 3AHT, 3ALD, 3BBA, 3BLP, 3CGQ, 3DEP, 3EHY, 3ENS/A, 4AU, 4CI, 4RK, 5BY, 5GX, 5IB, 5JU, 5LJ, 5RW, 5TP, 6FK, 6SM, 6SN, 6WT, 6XY, 6YO, 6ZQ, 8KZ/P, 8MZ, 8QY, 8SM, 8WV, GW2ADZ. (*June* 14-*July* 12.)

GM3OL, Dumfries, Scotland.

WORKED : G2ATK, 2AVQ, 3ABA, 3ACY, 3AOO, 3APY, 3AYT, 3BLP, 3BW, 3CYY, 3DA, 3DH, 3FFT, 3MY/P, 3UR, 4LX, 4OS, 5BM, 5CP, 5GX, 5JU, 5KX, 5VN, 6DP, 6MI, GM3BDA, 5VG, GI2FHN, GW4OS/P

HEARD : G2ATK/P, 2BUJ, 3BND/P, 3CDX, 3DMU, 3ENS/P, 6SN, GM3AYR. (*June* 17-*July* 11.)

G6WT, Torquay, Devon.

WORKED : G2AOK, 2CPL, 2KG, 2NH, 2NM, 2OI, 2XC, 3ABH, 3AGA, 3AVF, 3AVF/P, 3BKQ, 3BLP, 3CFR, 3CMT, 3DAH, 3DEP, 3EHY, 3EJL, 3FDV, 3LV, 3RI, 3TN, 4AP, 4CI, 4DC, 4GR, 4OZ, 4QL, 5MA, 5PB, 5RP/P, 5TP, 5UF, 5WP, 5XA, 6CJ, 6DT, 6UH, 6VZ, 6XM/P, 8AJ, 8BD, 8SM, 8TS/P, 8WV, GW2ADZ, 5SA.

HEARD : G2ATK/P, 2FZR, 2IQ, 3APY, 3CC/P, 3MY/P, 4RK, 5GX, 5MI, 8UZ.

G6DT, Horndean, Hants.

WORKED : G2JU, 2KG, 3ABH, 3AGA, 3AVF, 3EHY, 3TN, 4CI, 4GR, 5UF, 6CJ, 6WT.

HEARD : G2ANT, 2IQ, 2MV, 2XS, 3BKQ, 3CMT, 4DC, GW2ADZ, 5SA, PAØPN. (*June* 16-*July* 12.)

G3CXD, Newcastle-u-Lyme, Staffs.

WORKED : G2AJ, 2ATK/P, 2AVQ, 2IQ, 2XS, 3ABA, 3APY, 3BBA, 3BLP, 3BND/P, 3BW, C3HY, 3CUJ, 3DA, 3DJQ, 3DMU, 3EHY, 3ELT, 3ENS/P, 3TF, 5BM, 5CP, 5GX, 5RW, 6CW, 6DP, 6LC, 6OS, 6VC, 8KL, 8WV, GW2ADZ, 4OS/P. (*June* 23-*July* 7.)

G3CGQ, Luton, Beds.

WORKED : G2FTD, 2IQ, 2KG, 2PU, 3BWS, 3CJY, 3FD, 3MY/P, 5RP/P, 6CW, 6DH, 6JK/P, 6NB/P, 6VC, 6YO, 8IP, 8KZ/P, 8SK/P, 8SY. (*June* 28-*July* 8.)

HEARD : G2AVQ, 2HCG, 2HDY, 2MA, 2OI, 2RI, 2XC, 2XS, 3ABA, 3ALD, 3APY, 3AVF/P, 3BBA, 3BKQ, 3COJ, 3CXD, 3DA, 3DTK/P, 4DC, 4HT, 5GX, 6UH, 6XM/P, 8QY, 8UZ, GW2ADZ, 4OS/P, 5BM/P, PAØPN.

G3TF, Tettenhall, Staffs.

WORKED : G2ATK, 2AVQ, 3AHT, 3BLP, 3CNY, 3CXD, 3EEZ, 3DA, 3DJQ, 4LU, 5CP 5IQ, 5LJ, 6FK, 6VX, 8KL, 8QX, 8QY, GW2ADZ.

G5QA, Exeter, Devon.

WORKED : G2BMZ, 3AVF, 3AGA, 3CMT, 5BY, 5MA, 6WT, GW2ADZ.

HEARD : G8SM, GW5BM/P.

G2CPL, Lowestoft, Suffolk, NGR 62/910536.

WORKED : G2AJ, 2FJD, 2FJD/A, 2MV, 2NH, 2XC, 2XV, 3AEX, 3ALY, 3BBA, 3BOB, 3CC, 3COJ, 3CUJ, 3DRG, 3GW, 3VM, 3WW, 4CI, 5BD, 5MA, 5TP, 5WP, 6OS, 6UH, 6WT, 8SM, 8QY, PAØAD, ØDT, ØLU, ØPN, ØUHF, ØZQ, ON4IF.

HEARD : G2ATK/P, 2HDY, 2KG, 3ALD, 3APY, 3AUA, 3BKQ, 3BWS, 3DAH, 5GX, 5JO, 5NF, 6DH, 6NB, 6VC, 8DM/A, 8SM/P, 8VR, 8WV, GW4OS/P. ON4FG. (*Month ending July* 13.)

G3VM, Norwich, Norfolk.

WORKED : G2AJ, 2CMK, 2CPL 2FJD, 2IQ, 2KG, 2NH, 2XC, 2XS 2XV, 3ALY, 3COJ, 3CFK, 3DAH, 3FIJ, D4C, 5BD, 5JO, 5MA, 5PI/P, 5WP, PAØAD, ØDT, ØLU.

HEARD : G2MV, 2PU, 2TK, 3ALD, 3AUA, 3AVF/P, 3BKQ, 3BLP, 3BOB, 3CUJ, 3WW, 4AU, 5GX, 5RP/P, 5TP, 6NB/P, 6OS, 6PG, 6VC, 6WT, 6YO, 8KZ/P, 8SM/P, GW4OS/P, PAØUN, ØZQ. (*June* 19-*July* 9.)

G5BY, Bolt Tail, Devon.

WORKED : G2ATK/P, 2IQ, 2MA, 2OI, 2XC, 3ABA, 3ABH, 3APY, 3BBA, 3BKQ, 3BY, 3CHY, 3CMT, 3COJ, 3CUJ, 3DA, 3DMU, 3EEZ, 3EJL, 3MY/P, 4DC, 4LU, 4OZ, 5BD, 5BM, 5GX, 5XA, 6OS, 6UH, 8AJ, 8QY, 8SM, 8UZ, GW2ADZ, 5SA.

HEARD : G2AJ, 2AVQ, 2BUJ, 2KG, 2NH, 2NM, 2PU, 2WJ, 3AEX, 3BOB, 3CCP, 3DEP, 3RI, 4CI, 5GR, 5MA, 5NF, 5PB, 6CJ, 6VX, 8BD, 8MZ, 8WV.

G3DAH, Herne Bay, Kent.

WORKED : G2FJD/A, 2FMF, 2IQ, 2KG, 2MA, 2NH, 2UJ, 2WS/P, 2XC, 3ABA, 3ALD, 3ALY, 3AVF/P, 3KBQ, 3BLP, 3BTL, 3BWS, 3CC, 3COJ, 3CUJ, 3DA, 3DEP, 3DG, 3DMU, 3EHY, 3FIJ, 3GW, 3RI, 3VM, 4AU, 4CI, 4DC, 5BD, 5IB, 5XA, 6JK/P, 6OT, 6UH, 6VC, 6YO, 6YP, 8KZ/P, 8VR/P, 8VR, 8WV, GW2ADZ, 4OS/P, PAØAD, PAØPN.

HEARD : G2AJ, 2CPL, 2MV, 2PU, 3MY/P, 5GX, 5JU, 5PI/IP, 5RP, 6NB/P, 6OT, 6VZ, 6XM/P, GW5BM/P. (*June* 18-*July* 10, *week-ends only.*)

GI2FHN, Belfast, Co. Antrim.

WORKED : G2OI, 3BW, 3DA, GI2HML, 3FKO, GM3BDA, 3OL, 5VG, GW3ELM.
HEARD : G5CP, 5LJ, GW4OS/P. (*June* 21-*July* 13.)

maintained his daily contacts with G2NH, and has worked G6WT over a 263-mile path for an excellent GDX QSO.

Good news for the county hunters is that G5RL and G3AKU in St. Ives, Hunts, hope to be active soon. They ought to be popular ! Now what about Rutland ?

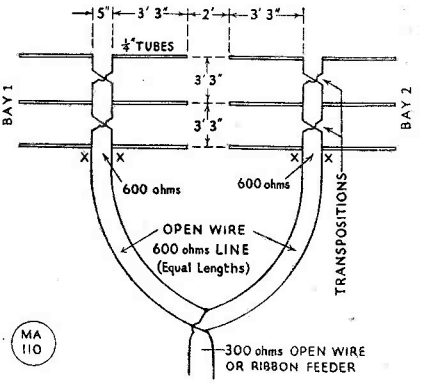
G8WV (Hanslope) finds Cambridge a difficult place to work, in spite of its proximity. In the same county of Bucks, G6JK (High Wycombe) has been active after some initial bad luck with 832's. He has a very fine converter consisting of two 6J6 GG RF stages, 6AK5 triode mixer and 6C4 cathode follower output. G6FO (Buckingham) also threatens preparations for two metre activity !

G2CIW (Romford) has started up at his new QTH, but the beam is at present only 13 ft. high. G3DAH (Herne Bay) congratulates the /P operators on the recent field-day on their generally high standard of operating. He is running a regular schedule with G3CC (Hull) to compare day and night conditions. Another to have started operations at his new QTH is G5MR (Hythe), who has had several contacts, including F8OL.

G3BLP (Selsdon) logged GM3OL almost every night for over a week, after his record contact with him on June 20 ; he has also heard G3BW at good strength. G2NH (New Malden) says he feels it is going to be hard work raising the counties totals much further as several of the Surrey group have almost exhausted the list of possibles. Also, he has worked numerous ON and PA stations during the month, and found PAØPN the outstanding signal from that direction. His schedules with G3EHY and G2CPL continue with uninterrupted success. G4CI (New Malden) has an 832 in the Tx, while the converter uses 6J6 and 6AK5 RF stages and a 6J6 mixer/osc.

G8VR (Upper Abbey Wood) is one of the newcomers to the band in the London area. He has operated /P and hopes to be on 145 mc from his home QTH very soon ; a 6J6 converter is under way. G2HDY (Roehampton) has been getting excellent results to the North, but is screened to the South ; he has managed to hear G8AO and has worked PAØAD. G2ANT (Godalming) has made a welcome appearance on the band, using 18 watts to an 832. G6VC (Northfleet) is getting some of the DX but is experiencing trouble in working it ; he suspects his beam. G4AU (Grove Park, S.E.12) is using 6J6 RF and another as mixer/osc. into an AR88 on 7 mc, with a four-element w.s. beam.

At Horndean. G6DT badly screened to the North by the South Downs, has been very successful to the South-West and West, and should soon be appearing in the Counties Table. In the Bournemouth area activity is on the increase, with G2NS, G3CFR, G5PB, G5SP and G8AJ all on regularly, and just over



GW3ZV suggests this "Three-by-Three" for 145 mc. All elements are 39-in. of ¼-in. tubing, stacked 39-in. A single bay could be used separately and fed by 600-ohm open line. Note the transposition points, also using open wire line and with connections between elements kept as short as possible. The array as dimensioned is two-way looking, giving a clover-leaf pattern broadside to the plan of the elements, and the lobes are approximat ly 60 deg. wide at half-power points.

70 Cm. ACTIVITY LIST

Birmingham
G3EMY, G3LN, G5JU, G8JI

Bolt Tail, Devon
G5BY

Crowborough
G2WS/A

Kirkby-in-Ashfield
G3APY

Leicester
G3BKQ

Loughborough
G2KK, G3ENS

London
G2FKS, G2WS, G3AHB, G3BDV, G3BOB, G3CU, G3DSV, G3FZL, G5PY, G6HD

Luton
G3CGQ

Oswestry
G4LU

Portsmouth
G3LV

Romford
G2BVN

Sheerness
G2HKU

Southampton
G3EJL

Southwick, Sussex
G3BFX

the border in Dorset G3ABH has been doing well with his corner reflector.

G5BM (Cheltenham) has raised GM3OL no less than 14 times out of a possible maximum of 20 on their schedule, and on July 11 worked the GM for 35 minutes on 'phone. G5BM fails to hear any signals from the E.N.E. and asks stations in that direction to look for him from 2200 to 2230. The Cheltenham and District Radio Society helped G5BM to go /P on July 3 on Clyro Hill in Radnor 1,241 ft. a.s.l. G8QX has been having some success from Malvern. When he worked GW5BM/P he had to point his beam S.S.E., whereas it should have been due West. He thinks this due to reflection from the Cotswolds. A hint from G8QX—come on when there is a nice red sunset ! It means there should be some good strong ducts forming.

G5RP (Abingdon) is expecting to get up a 16-element job soon, to replace the four element. He built a new 2-metre portable Tx with an 832 final, while his Rx is 6J6 RF, 6J6 mixer, 9002 osc., 9002 cathode follower into an HRO. G3EHY (Banwell) has at last worked the elusive Hampshire, G6DT being able to break the spell for him one lunch hour. Several contacts G3EHY-GM3OL have been made. Regular schedules from G3EHY are : 1300 G2NH ; 1755 GW2ADZ ; 2130 G2NH (if conditions poor) ; 2200 GM3OL. All these times are GMT. He thinks conditions on Two have proved more consistent than on Five. On the other hand, G5BY (Bolt Tail) has pointed out that, as far as he is concerned, two metres is following five metres very closely, and it is undoubtedly true that over *land* the DX records on Two are almost identical with Five.

Others reporting active in Devon include G5QA and G6WT. The former has worked G5MA in spite of a poor location, while G6WT has been getting excellent results with his 24-element array, including a 263-mile contact with G2CPL in Lowestoft. G2AAN (Bushey Heath) has been obtaining some encouraging results on a BC639 using only a 15-ft. wire as aerial. He says it is much superior to the SCR522 Rx. G3CCP (Shrivenham) is on 144·72 mc with an indoor three-element beam ; some DX, including G2OI (Manchester), has been worked.

An interesting letter from PAØLU confirms the excellent conditions existing between G and PA in June. He bemoans the scarcity and price of 6J6's in PA, and says most of them are using 9003, 6AK5, EF54, 955 and 954. Best results were achieved by those using the 6J6's, for example, PAØPN, ØAD and ØUN. PAØAD is running 80 watts and a 12-element beam, while PAØUN has 100 watts with a similar array.

The Fiveband Club

Space will not permit a detailed report on the excellent VHF meeting at Nottingham on July 9, arranged by G3APY but it must be recorded that like its predecessors at London and Oxford, it was very well attended and an undoubted success. The Zone Plan and Contests were discussed at length, and a number of items of VHF equipment were on view and very thoroughly examined. The Club membership continues to grow and it is hoped to complete the distribution of the Frequency Lists to all members very soon.

In Conclusion

Once again your conductor must express his thanks for your support, as shown by the large number of letters and reports to hand this month. This is in itself ample evidence of the increasing interest in VHF work all over the country.

Some of the lists of Calls Heard received this time have not actually reached the Activity List due to space considerations, but as far as possible the unusual lists have been included. Do not let the omission of your list this time cause you to hesitate to send one next month. It is suggested, however, that local calls (except where the call is a new one on the band) should be omitted. The latest date for next month's reports is August 17, and the address is E. J. Williams, G2XC, *Short Wave Magazine*, 49 Victoria Street, S.W.1. We shall be with you again on September 7.

N.P.L. APPOINTMENT

The Department of Scientific and Industrial Research announces that Professor E. C. Bullard, M.A., Ph.D., F.R.S., Professor of Physics in the University of Toronto, is to be the new Director of our National Physical Laboratory, from January next. The N.P.L. is of course closely concerned with radio research, and over the years has made a very large contribution to progress in this field. Professor Ballard, who is 41, was educated and trained in England, and is himself a well-known geophysicist.

GIFT SUBSCRIPTIONS

If you have a transmitting friend overseas to whom you would like to make a useful present, why not buy him a year's subscription of the *Short Wave Magazine* ? It costs but 20s. and would be a constant reminder of your thoughtfulness. And if you have an SWL contact in distant parts, he would be sure to appreciate the regular appearance of the *Short Wave Listener* (16s., post free). Write the Circulation Manager, Short Wave Magazine, Ltd., 49 Victoria Street, London, S.W.1.

Food for VHF Thinking

Analysing Results and Improving Performance

By **M. D. MASON (G6VX)**

In this article, one of our foremost VHF workers shows how progress on Two can only be maintained by constant attention to the equipment, particularly the aerial installation. From his own very recent experience in overcoming a particular problem, he is able to give some practical advice and show results which prove his points. Everyone active on the VHF's will find this article of the greatest value and interest.—Ed.

THE following experiences may be of some assistance to those who are not entirely happy with their VHF aerial installations.

Ever since the 2-metre band came into use, the main aerial at this station has been a wide-spaced four-element beam, mounted at least 56 ft. up and fed by a 150-ft. length of BA4 cable.

This beam was built on the same lines as the previous 5-metre effort, which under all possible conditions held its own very well.

When the 2-metre band was performing so nicely last November, it was felt that a four-element array should be adequate for obtaining the maximum results from the new band. This deduction was based on results obtained at that time.

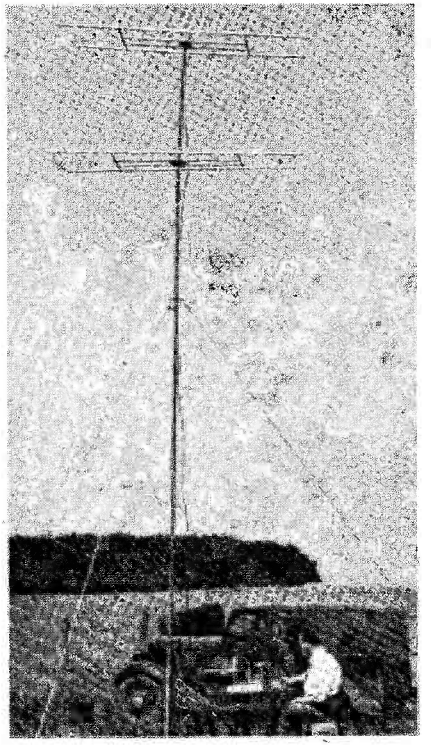
However, constant evidence of stations being active on Two, but never a sound of them, meant one of two things. Either through lack of experience it was difficult to assess conditions exactly, or the equipment angle needed much more study. The only way to tackle the former is by constant operation on the two-metre band, year in and year out, at the same time reviewing results obtained under all operating conditions. Thus, one will get the true "feel" of the band, as was more or less the case on 58 mc, and thereby judge whether or not the stations should be coming through. Then it might be possible by careful study of weather forecasts and a survey of past results to predict what might be expected from time to time. Since this aspect of the subject will obviously take time, the immediate alternative is to study the problem of equipment very carefully.

Constant Improvement

It is fatal to become satisfied with the gear, since new ideas are always turning up for improving the art, especially aerials and receivers. Realising that most of us hooked up what we could to have a crack at Two, installations in many cases were pretty ribby. If conditions had not been as good as providentially they were last November one feels that a number of operators would have been very disappointed in our newly-released band. Many contacts would never have been made and possibly interest would have died early and there would not have been the same activity as there is at the present time.

One point that is of no little concern is this : How many of us, after having a taste of those remarkable November conditions, take it for granted that that is how the two-metre band is going to perform—therefore, why worry much if the band sounds dead most of the time ? All that seems necessary is to sit back and wait until next November, or hope for foggy conditions once again.

All this is another way of saying that perhaps



General impression of G5RP/P on July 3. The beam consists of two sets of two half-waves in phase.

we got off to rather *too* good a start. If the going had been harder a lot more effort would have been put into getting better equipment in hand at the beginning. Certainly, a few stations would have reported long-distance contacts and that would have been enough to keep the keener two-metre operators at it until they too could be in at the kill. This last point is proved by the good contacts made under really shocking conditions compared with last November. The most striking feature of these regular contacts is the fact that they are between stations who are using better-than-average aerials, although the locations would not normally be classed as good VHF sites.

Location Factors

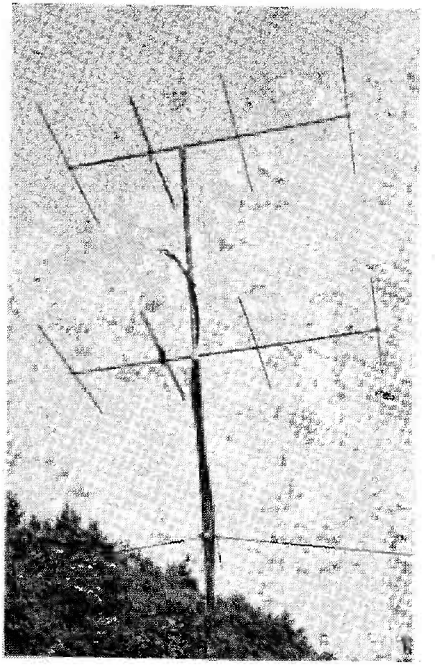
This raises the question of what is a good or bad VHF QTH? When things are going badly, then it is that the QTH takes the can back for practically everything. The location, every hill you can lay your eyes on, the nearest gasometers and even the most distant buildings that happen to be in line of sight come in for criticism. There is no doubt about it that these factors *do* influence results, but do not necessarily condemn a QTH for Two. The point is that if we have another "last November" most of these obstructions are forgotten in the rush to rake in that S7 GM !

To anyone who complains about his poor location the advice is to check that the receiver is as good as the one being used by the operator who *is* working the DX. Be certain, too, that the aerial is tuned up and really performing. The way to make sure of these two points is to take your converter along to the station getting the results and do a live comparison. Several well-known VHF men are always doing this. Often as not, it is just to see what the other fellow uses and make sure he has not something unique tucked away and is pulling a fast one. Nothing like it for progress !

About the aerial ; make a Chinese copy of a beam you know works well. When both these points have been settled and tests with a DX station have been made in conjunction with your successful neighbour, you are now in a good position truly to assess your QTH. If you show an improvement over somebody who is already doing well and appears to have a better location, the whole field is wide open for even greater improvements and original experiments. However, should your equipment check and exhaustive tests show no promise then truly your operating results on Two will be limited either to super conditions or local QSO's.

G2NH/G6VX Comparative Tests

To illustrate this point, a concrete case may be of interest. About Easter G2NH (New Malden, Surrey) was running successful



Dual 4-element wide-spaced beam stacked and fed in phase, G4CI, New Malden, Surrey. Radiators are arranged to present 100 ohms at their feed points, individually. The ½-wave section joining them has a surge impedance of 155 ohms ; this operates as two independent ¼-wave sections giving an impedance rise up to 200 ohms at the point where the feeder is connected.

schedules with G3EHY (Banwell, Somerset) and G2CPL (Lowestoft). Both stations are close on 100 miles away and in opposite directions. I looked for these stations very carefully and I mean by that the amount of searching required was held to within *plus* or *minus* 5 kc. Occasionally a squeak or maybe a callsign was identified, but that would be all at a time when G2NH would be handing out R5 S5 reports. This was a very interesting situation to me and there should be an explanation somewhere. Checking up on the G2NH hide-out, a double 4-element beam came to light, 4-above-4 with half-wave spacing. Now this did not worry me unduly as it would only account for about 3 dB or half an S-point. But there were 4-5 S points losing themselves somewhere between Malden and Hayes—15 miles apart. On closer examination it turned out that G2NH had raised his beam to 60 ft. and at the same time had gone in for a length of really useful twin cable. The change of cable, there is no question

about it, quite definitely picked up 3-4 dB improvement for him. The additional height must also have contributed quite a lot, but difficult to access in conjunction with a brand new aerial and feeder. But a complete spring-clean had put him on the map in no mean manner, even to the extent of conducted tours to see "what was what" at 75 Woodlands Avenue !

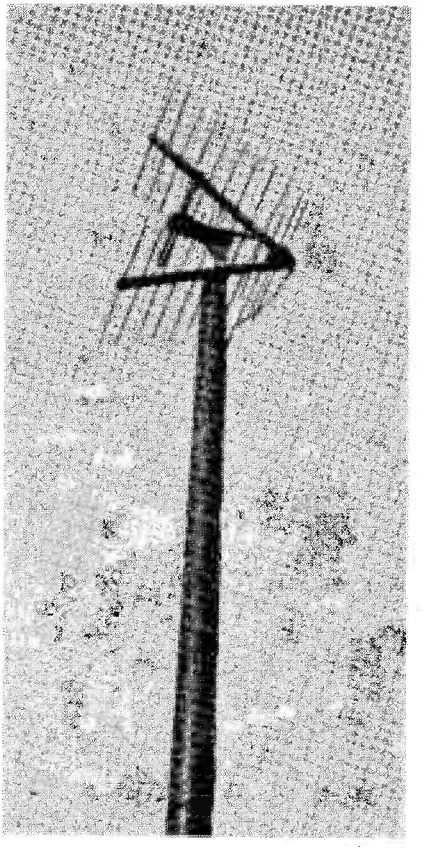
Now this is where regular schedules are so much of a boon to the operator who wants to improve his equipment. He has a two-way circuit passing along reports. The first thing to do is to carry on experimenting until the station you think should be audible is heard at last. Now it is possible to compare your own estimate of signal strength with the reports exchanged. Estimates of signal strength are always somewhat a matter of opinion, but those who take the trouble to run regular schedules are not the kind to deceive each other, themselves or the listener.

Aerial Checks

What all this did mean was that something had to be done about hearing G2CPL at G6VX (let alone work him), so the four-element beam was taken down and re-measured for gain—in this case using about 20 ft. of feeder. The gain appeared to be satisfactory, around 8 dB when compared with a half-wave dipole. The 150 ft. of feeder was then examined and a power transfer measurement made. This was done by measuring the current through a 100-ohm non-inductive resistor at the transmitter, and then through the whole 150 ft. of cable. The measured loss was 3 dB—not too bad for this length. When the 150 ft. of cable was reconnected to the beam and a second measurement made, the difference between the first short cable and the second measurement was near enough to 6 dB. This meant that the 4-element beam 56 ft. high was no better than say a very efficient but highly directional dipole. This loss was thought due to a very bad mismatch which was not very apparent by the easy method of cable feeder pruning and as far as the transmitter and converter were concerned no ill effects were noticed.

Results

The next step was to construct one 4-element section of G2NH's beam. This was easy because both had previously bought a supply of identical tubing. The G2NH beam had been carefully pruned and from all normal checks matches his feeder system very nicely. The folded element in the G6VX version was altered slightly to match a 300-ohm open feeder. The resulting beam was now erected 25 ft. high with about 30 ft. of 300-ohm line. The first beam was run up again to 56 ft. for



The 70 cm (420 mc) folded dipole-and-corner reflector array at G2HKU, Sheerness.

comparison. The first comparison check on G2CPL found him on the lower beam at R3, S3 and out, but only an occasional squeak on the higher beam. At this time, G2NH was reporting G2CPL at 5-3-6. The next night G2CPL was actually worked by G3NH, asking him to listen for me. The reports both ways were 4-2-4 and out ; G2NH was receiving 5-3-7. From these tests it showed that the lower beam *with a more efficient feeder* was a vast improvement. Still, 31 ft. odd of available height was going to waste at G6VX, but that could not be utilised without running a long feeder. It was therefore decided to look over some of the proven stacked co-linear arrays plus reflectors, which might lend themselves nicely to open-wire feeder systems.

A 16-element arrangement proved to be a fair compromise. It only occupies 10 ft. by 7 ft.

by 1 ft. 6 in. and weighs around 12 lb. complete. This beam was constructed and erected with the bottom element 20 ft. high and the top 30 ft. high. On a local test it showed a gain of 3 dB over the 4-element 25 ft. high. Testing around locally, up to 20 miles, there is very little between the two. The surprise comes on stations over 100 miles or more away. With the 16-element run up so that the top is just 60 ft., tests were made on G2CPL and G3EHY. The difference between the 4-element giving an S3 signal is a genuine S7 on the 16-element. This is apparently due to the greatly increased low angle radiation and the more efficient and larger pick-up area, *plus* a better feed system. The feeder, by the way, is 300 ohms 70 ft. long and matched into a 150-ohm point with Q bars. The open line was much easier to match for the smallest standing wave ratio.

The result of all this testing and reconstruction is to give me confidence that if G2CPL is to be heard at all I shall hear him. What does happen now is that I will be giving G2CPL much stronger reports at certain times than G2NH and *vice versa*—but this is quite a common phenomena in the South London area where DX signals definitely vary in signal strength from minute to minute in different locations. This is borne out by the gap in a QSO being filled in by someone else who has made solid copy. It is also true that one operator may be copying solid where another is suffering from QSB, but he does at least hear what is going on.

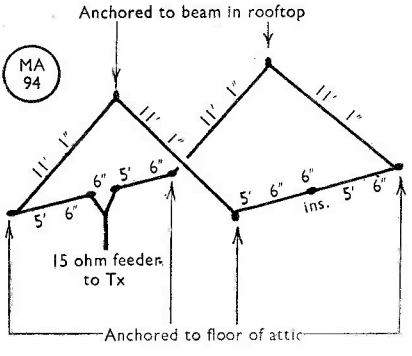
The Attic Ambler

Indoor Aerial for 7 mc

By **P. F. LUCAS (G3BQJ)**

BEING somewhat cramped for aerial space, the writer was very interested in the article by G8PL on "Indoor Aerials," in the April 1948 issue of the *Short Wave Magazine*.

With a reasonably efficient outdoor aerial for 20-metre work already available, it was decided to concentrate on a 40-metre indoor arrangement in the attic. This simply meant climbing into that realm of dust and cobwebs, armed with 66-ft. 4-in. of ordinary stranded aerial wire, a pair of side-cutters and a dozen or so egg insulators.



Physical layout of the indoor aerial system for 7 mc, devised by G3BQJ.

Having hooked the aerial up to each corner of the attic, it was found that a lot of slack still remained ; this was pulled up to the apex of the roof, and in this manner the required length of wire for 7 mc operation was just accommodated, as shown in the accompanying sketch.

The writer does not pretend to know what is the radiation pattern of the "G3BQJ Attic Ambler Aerial"—though it *seems* to fire North, South, East and West with equal aptitude—but some field patterns are being plotted. The point is, however, that with an input of 50 watts on Forty, the following results were obtained as at November, 1948 : UA1, UB5, UO5, VE1, VE2, W1, W2, and Europeans on CW ; on phone, F, I and LA have been worked. Reports on these contacts varied from 559 (VE and W) to R5, S8 for the European phone QSO's. The whole G area has been covered on both CW and phone.

It is hoped that these notes will enthuse and encourage others who may feel themselves handicapped and at a disadvantage by reason of lack of aerial space ; the writer will be pleased to hear from those who may try something on the lines of the Attic Ambler. In the meantime, he is designing an indoor system for 3·5 mc operation !

Footnote.—*Round about* 1935, *very successful tests were carried out using a quarter-wave system, entirely indoors, on the* 1·7 *mc band.* —Ed.

DENCO DCR-19 RECEIVER

We hope to carry a full Test Report on the Denco DCR-19 in the next (September) issue of the *Short Wave Magazine*. A production model has been on regular test for some time now.

Here and There

Army Amateur Reserve

Tentative plans are being made under the *aegis* of the War Office for the eventual formation of an Amateur Reserve for the Army, limited in the first instance to operators with an amateur transmitting licence.

As it is necessary to estimate the support that can be expected, those interested are asked to send a postcard with name, address, callsign, and Service rank and trade (if any), to Capt. D. W. J. Haylock, G3ADZ, 230 Devonshire Avenue, Southsea, Hants. It is emphasised that this is by way of preliminary enquiry only, and at this stage G3ADZ cannot answer queries or enter into correspondence on the project. Since he is anxious to compile a list without delay, if you are interested, please respond as soon as possible. Club secretaries are also asked to bring this scheme to the notice of their membership.

Panel Marking Transfers

We have had several enquiries as to a possible source of supply for these—the sort of transfer which will "take" well on a metal panel and is available in the range of markings suitable for Amateur Radio purposes. Any firm or individual able to meet this need is asked to get in touch with us, with a few samples, for mention in this space.

Advice for Settlers

David Mitchell, ZL1MP (ex-GW6AA), writes to say that he has had a large number of letters from amateurs in this country relative to the possibilities of settling in New Zealand. As he is to be in England on a short business visit for six weeks during the period August 27-October 14, David has informed us that while he is over here he would be very pleased to meet amateurs who want to know more about conditions and prospects in ZL—a very generous suggestion on his part. Those who wish to take advantage of his offer should write to him in the first instance c/o *Short Wave Magazine.*

Landline DX

Strolling casually into the offices of a daily newspaper during an exhibition just recently, G6HU found an open line to Nairobi. He sent a free message asking if there were any amateurs on duty at the other end. Two minutes later back came "Yes, Stan G. Crow VQ4SGC that's a genuine answer." So G6HU asked him to keep a schedule on Ten, to which VQ4SGC replied that he was not on that band yet. As G6HU remarks, "What is all this talk about DX heard and worked!"

A Mullard Name Change

The title of the old transmitting valve division of Mullard Electronic Products, Ltd., has been changed to the Communications and Industrial Valve Department. This change makes the name of the department more expressive of the scope of its activities. What used to be thought of as transmitting valves exclusively in the radio sense now have a number of applications in no way connected with wireless working.

The New Call Book

The latest (Summer) edition of the *Radio Amateur Call Book* is again a very complete issue and, in the G section, includes all entries in "New QTH's" up to and including the May, 1949, *Short Wave Magazine.* The G's occupy some 45 columns in 16 pages—this compares with 43 columns of VE's and 21 of VK's, so that on a population basis, the proportion of licensed amateurs in Australia and Canada is much higher than it is in this country. The ratio in the States is, of course, also more favourable, with some 70,000 licensed amateurs in a population of 122 million. On this basis, the amateurs in this country would be about 20,000—so there is plenty of scope yet, though at the present rate of licensing it will take nine years to achieve that figure. Enough of statistics !

F.O.C. Election Notice

In accordance with the Rules of the Club, the following have been elected, to active membership of the F.O.C. :

R. W. Madigan, EI9Q (Waterford) ; A. W. Jones, G3CRF (Plymouth) ; G. Houbaert, ON4IE (De Panne) ; Rev. L. C. Hodge, G6LH (Boston) ; A. Campbell, G3DGO (Leafield) ; and C. S. S. Lyon, G3EIZ (Liverpool).

To avoid delay in notifying elections, a list of new F.O.C. members will appear in this space every alternate month.

Tail Bit

G6QB will be active with QRO on 200 kc again at 5.15 p.m. on August 6, when he will be modulating rather more than 200 kW with the BBC Theatre Organ.

NEW QTH's

This space is available for the publication of the addresses of all holders of new callsigns, or changes of address of transmitters already licensed. All addresses published here are automatically included in the quarterly issue of the Call Book in preparation. QTH's are inserted as they are received, up to the limit of the space allowance. Please *write clearly* and address on a separate slip to QTH Section.

DL2NN Sgt. V. P. Moore, c/o Sergeants' Mess, 3rd The King's Own Hussars, B.A.O.R. 22.

G2ACC C. A. Harley, 124 Greenwood Avenue, Laverstock, Salisbury, Wilts.

GW2ADZ Hafod, Llanymynech, Montgomeryshire, Wales.

G2AHY H. S. Woodhouse, 326 Reading Road, Winnish, Berks.

G2AOP C. H. Nokes, Misida, Ripley, Surrey. (*Tel.:* 3212.)

GW2AXT J. K. Cousins, Melbourne House, Earl Street, Abertillery, Mon, S. Wales.

GW2BBF W. E. G. Bartlett, Midland Bank House, Whitland, Carmarthenshire, S. Wales.

G2BFQ M. E. Edwards, 20 Fernbank Avenue, Wembley, Middlesex.

G2BFT W. T. Bastin, 386 Lugtrout Lane, Catherine De Barnes, Solihull, Birmingham.

G2BKC D. Cameron, 94 Eaton Avenue, Bletchley Bucks.

G2CIW J. F. Moseley, 45 Geoffrey Avenue, Harold Park, Romford, Essex.

G2DNY C. A. Wheaton, Devon Constabulary, Milton Damerel, Holsworthy, Devon.

GI2DTB R. Graham, Fernlea, Drumalis, Larne, Co. Antrim, Northern Ireland.

G2JU E Pearcey, Spindrift, Marine Drive, West Wittering, Sussex.

G3ADT M. M. Ward. 18 Hermon Hill, Wanstead, London, E.11.

G3AJR R. Denman, 161 Sumatra Road London, N.W.6.

G3AKF B. G. Taylor, 33 Orchard Lane, Pilgrim's Hatch, Brentwood, Essex.

G3BKV L. H. Bower, 57 Broughton Crescent, Wyke Regis, Weymouth, Dorset

G3BMQ G. Humphrey, 61 Commonside West, Mitcham, Surrey.

GM3BRF D. Hetherington, Ambleside, Carberry Road, Leven, Fifeshire, Scotland.

G3BYU G. K. Bainbridge, 8 Williams Terrace, Daventry, Northants.

GM3CJN A. Handyside, 3 Chapel Place, Selkirk, Scotland.

G3CVK P. Bolton, 13 Midland Road, Worcester

G3CZZ W. D. Old, 83 Trevenson Road, Carn Brea, Redruth, Cornwall.

GM3DHD/A G. W. D. Brown, 45 George IV Bridge, Edinburgh, Scotland.

G3DIY E. Jones, 4 Treveneth Place, Newlyn, Penzance, Cornwall.

GW3DIZ J. Probert, 156 St. Helens Avenue, Swansea, Glam., Wales.

G3DLS F. J. Rayment, 56 Willes Road, Winson Green, Birmingham, 18.

G3DPW R. L. Knight, 35 Sussex Road, South Croydon, Surrey.

G3DXB R. Gladwell, 183 Perne Road, Cambridge.

G3DXR Mrs. L. Y. Cutter, Spinney Cottage, Melbury Abbas, Shaftesbury, Dorset.

GM3EHI J. Mathieson, 41 Reid Street, Bellshill Lanarkshire, Scotland.

GM3EMM H. Weir, Cauldcoats Farm Cottages, Portobello, Scotland.

G3EMN J. C. Watton, 20 Edencourt Road, London, S.W.16.

G3EOX D. Holdcroft, 73 Argyle Road, Sneyd Green, Stoke-on-Trent, Staffs.

G3EPA D. R. Pentelow, 65 St. John's Road, Slough, Bucks.

G3EPL J. Illingworth, Hampton Place, St. Bees, Cumberland.

GI3EPX P. L. Doherty, 31 Marlborough Avenue, Londonderry, Northern Ireland.

G3EQG L. Ratcliffe, 70 Windsor Road, Great Harwood, Blackburn, Lancs.

G3ERY C. Robertson, 48 Grecian Street, Maidstone, Kent.

G3ESN W. C. Tatham, 7 Arthur Terrace, Netley Abbey, Southampton, Hants.

G3ETC F. Shore, 130 Sough Road, Darwen, Lancs.

G3EUQ D. Blake, 4 Wilton Crescent, Southampton.

G3EVM E. A. Bale, Shangri La, Cheadle Road, Tean, near Stoke on Trent, Staffs.

GM3EWC R. B. Irvine, Post Office Eng. Dept., Lerwick, Shetland, S otland.

G3EXE J. E. Bromley, 20 Hurst Grove, Bedford.

GD3FAC H. Griffith, 6 Queens Road, Onchan, Isle of Man.

G3FAE A. B. Perry, 40 Mary Road, Orrell, Liverpool, 20.

G3FAJ R. Marshall, West Holme, Silkstone Common, Barnsley, Yorks.

G3FCA W. T. McDonald, 239 Southchurch Road, Southend on Sea, Essex. (*Tel.:* 68386.)

G3FCU J. S. Dyer, 42 Grange Road, Ilford, Essex.

G3FCY C. S. Norman, 30 Oldstead Avenue, Inglemire Lane, Hull, Yorks.

G3FDV S. Ledbrooke, 5 Hoopern Terrace, Dawlish, S. Devon.

G3FDW M. Gibbings, Longthorpe Vicarage, near Peterborough, Northants.

G3FEK J. M. Verralls, Dorhn, Linthurst, Blackwell, Worcs. (*Tel.: Hillside* 1578.)

G3FFU D. A. Zealey, 44 Parry Road, London S.E.25.

G3FFW J. H Wood, 74 The Grove, Wheatley Hills, Doncaster, Yorks.

G3FFZ G. E. Stamp, 39 Norwich Road, Wheatley, Doncaster. Yorks.

G3FHV R. K. Green (*ex ZD3B*), Wharley End P.O., Cranfield, Bletchley, Bucks.

G3FII R. S. Head, 9 Dunsford Place, Bathwick Hill, Bath, Somerset. (*Tel.: Bath* 4626).

G3FJL J. Hall, The Ledge, Belton, Uppingham, Rutland.

G3FJN J. A. Barson, 15 Church Street, Eastwood, Notts.

G3FJW R. W. Finch, 36 Bathurst Road, Ilford, Essex.

GI3FKO A. G. Blackmore, 34 Victoria Avenue, Sydenham, Belfast, Ulster, N. Ireland.

G3FKP F. Fell, 53 Orchard Street, Great Harwood, Blackburn, Lancs.

G3FKT J Towneley Davies, Sandown, Kirkway, Wallasey, Cheshire. (*Tel.: Wallasey* 2824.)

G3FLB G. W. Nailor (*ex-D2CX*), 20 Beckhampton Street, Swindon, Wilts.

G3FLD P. F. Ross, 29 Herbert Avenue, Wellington, Shropshire.

GM3FLT B. H. Cartwright, 52 High Street, Galashiels. Selkirkshire, Scotland.

G3FMA T. A Smith. 85 Littleton Road, Pendleton, Salford 6, Lancs.

GM3FMD J. C. Walker, Littleton, Maybole, Ayrshire, Scotland

G3FMI F T. Wilson, Maes Knoll, Long Lane, Upton, Chester. (*Tel. : Chester* 3370)

G3FMK R. D. Parris. 47 Allen Street, Maidstone, Kent.

G3FML H. J. Finch, 46 Fore Street, Sheldon, Teignmouth, Devon.

G3FMN T. W. Dearlove, 138 Coleford Bridge Road, Frimley Green, Surrey. (*Tel.: Farnborough* 641).
G3FMQ G. W. Glover, 15 Burrows Crescent, Beeston, Notts.
G3FMY A. C. Yates, 63 Birley Road, Whetstone, London, N.20. (*Tel.: Hillside* 6994).
G3FMZ B. R. Brown, 10 Nicholson Avenue, Newhill, Wath-upon-Dearne, nr. Rotherham, Yorks.
GM3FNW W. J. Wilson, Wilannan, Woodhall Avenue, Hamilton, Lanarkshire, Scotland.
GD3FOC L. A. Higgins, The Willows, Main Road, Santon, Isle of Man.
G3FOD H. Moxon, 24 Blaker Avenue, Rochester.
G3UZ F. G. Sadler, 63 Newbury Avenue, Enfield, Middlesex.
G6CP J. Cooper, 28 Sherwood Street, Scarborough, Yorks.
G6KY F. J. E. Starkey, Clifton Woodhead, Clifton, Brighouse, Yorks.
G8DI/A H. W. Simpson, B.Sc., West Derby C.E. School, Meadow Lane, Liverpool, 12.
G8SR S. Hemmings, 33 Bull Street, Gornal Wood, nr. Dudley, Worcs.

CHANGE OF ADDRESS

EI6X B. Fogerty, Hillcrest, Ardnacrusha, Co. Clare, Eire.
G2AIQ H. Barnett, 31 Somerset Road, Histon, Cambs.
G2ALA W. P. Smith, 8 Brockworth Crescent, Frome Valley Road, Stapleton, Bristol.
G2DC Major J. M. Drudge-Coates, Royal Sigs., 43 Baghdad Road, Bulford, Wilts.
G2DFR F. N. Shelley, 26 Trent Road, Bitterne Park, Southampton, Hants
G2DOJ D. Godwin, 37 Dollis Hill Avenue, Cricklewood, London, N.W.2.
G2FVD K. C. Caton, 108a Tudor Drive, Morden Park, Surrey.
GM2HDH A. W. Turner, 7 Hermitage Park South, Edinburgh, 6, Scotland.
G2RF H. D. Bramwell, 65 North Linkside Road, Woolton, Liverpool.
G3AHX G. H. Banner, Woodstock, Ardmillan Avenue, Oswestry, Shropshire.
G3APB A. S. C. Mathews, Hillcrest, Batheaston, Bath, Somerset.
G3ATK Dr. E. H. P. Young, M.Sc., A.R.I.C., Gwynfa, Chester Road, Woodford, Cheshire.
G3ATM D. Nasey, 8 Yew Green Avenue, Lockwood, Huddersfield, Yorks.
G3BON W. J. Rawlings, 5 Queen Street, South Molton, Devon.
G3CTY W. J. Holder, 24 Longrove Road, Epsom, Surrey.
G3DBO J. C. Brown, 702 Barking Road, London, E.13.
G3DNY R. G. Partridge, 8 Goldwell Road, Thornton Heath, Surrey.
G3DVD C. Needham, 35 Kingsway, Stainforth, Doncaster, Yorks.
G3TN T. Noblet, 1a Wireless Cottages, Portland Bill, Dorset.
G5MR V. G. Mellor, M.A., Conway, North Road West, Hythe, Kent.
G5SI A. Wood, 236 Dane Road, Sale, Cheshire.

CORRECTION

G3DNP G. H. Pearson, 57 Hilderic Crescent, Holly Hall, Dudley, Worcs.

CHANGE OF NAME

Since the main business of the well-known firm of Rediffusion, Ltd., is not (as might be supposed) wire broadcasting but the manufacture of radio communication equipment, it has been decided to change the name to Redifon, Ltd. The firm trades on a world-wide scale and also produces radio heating plant, audio frequency amplifier systems and other electronic devices. Redifon, Ltd. (*VANdyke* 5691/5), Broomhill Road, Wandsworth, London, S.W.18.

"RADIO AMATEURS' PROGRAMME"

For those who may be interested, we are informed that the U.S. Department of State's *Voice of America* transmitters are putting out a weekly 15-minute programme of "international interest to radio amateurs." This takes the air from 2045 GMT on Saturdays, on the 13, 16, 19 and 25 metre broadcast bands, with relays by the BBC in their 25 and 31 metre services. We had better bend an ear to this and see what goes on! The same programme is being projected to South America and the Far East on Sundays from 1300 GMT, with relays by Honolulu and Manila!

HF PRESELECTOR UNIT

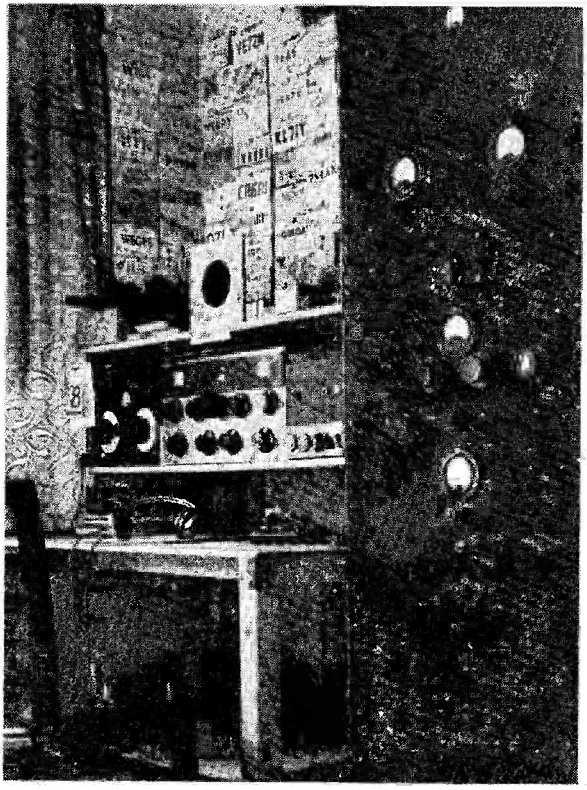
The performance of practically all communication receivers designed for a wide frequency coverage can be improved by the use of a preselector (or additional RF amplifying unit) for the high-frequency end of the tuning range. This is especially so on Ten, and a preselector can also be very helpful on the 14 mc band. A suitable design, easy to build and using standard parts, is described in detail in the August issue of our *Short Wave Listener*, of which a few copies are available at 1s. 4d., post free.

NEW QTH'S

This issue sees an assault on the accumulation of new British amateur station calls and addresses, to such effect that we can promise that all those not appearing this month but received by July 31 last will be in the September issue of the *Magazine*. Incidentally, we only publish an address at the direct request of the holder of the call, and all that are sent in to us appear in the *Radio Amateur Call Book* in due course. And for the information of those who always enquire when we print a note in these terms, we are *not* the publishers of the *Call Book!* It can be obtained as regularly advertised in these pages.

The other man's station

G3BKF



The station shown in the photograph is G3BKF—J. M. Ivison, Braunston, St. Nicholas Road, Witham, Essex—and is completely home-constructed, including the operating desk and bug-key.

Licensed in February 1947, activity commenced on the 1·7 and 3·5 mc bands, using a 1-V-1 receiver and a 10-watt 6V6-6L6 transmitter; from that modest beginning has grown the present layout.

The rack houses a 150-watt CW/Phone transmitter for the 3·5, 7, 14, 21 and 28 mc bands. The two lower panels carry the power supplies for the exciter unit and power amplifier. In the third panel is the modulator, a pair of 807's in Class-AB2 driven, through a suitable transformer, from the cathode of a triode-connected 6V6; the modulator power supply, using SR4GY's, is also in this section of the rack. Above the modulator is the band-switched exciter, which is a 6L6-807-807 arrangement, giving adequate output on all bands from 3·5-28 mc to drive the 813 PA stage in the fifth panel. A 6Y6 is used to prevent the screen voltage of the 813 soaring under no-drive conditions; fixed bias is also applied to the PA. The grid circuit of the 813 is band-switched, but plug-in tank coils are used. The top panel carries the aerial tuning unit, which is provided with variable coupling from the PA by means of a swinging-link operated from the front panel.

The receiver is a 14-valve home-constructed superhet, covering the 1·7 to 30 mc amateur bands. The salient features are switched RF coils, two RF stages, temperature-compensated oscillator, crystal filter, built-in crystal oscillator and multivibrator for calibration and frequency checking, separate AVC amplifier to give improved AVC performance and a noise limiter.

To the left of the receiver is the VFO-*cum*-Top Band transmitter, and to the right of the receiver is the speech-amplifier with its associated peak-clipping and low-pass filter circuits, a keying monitor and the station control

circuits. Above the VFO is the 1·7 mc aerial tuning unit. Power supplies for the receiver and VFO are carried on a shelf under the operating desk.

The whole station is relay-controlled, and change-over from receive to transmit is automatic; immediately the key is pressed HT is applied to the transmitter, the aerial is changed over and the receiver is muted. A suitable delay circuit ensures that the return to the "receive" position does not take place between morse characters; the delay is adjustable from one-half to about five seconds.

Various aerials have been tried, but the 66 ft. centre-fed, with tuned feeders, at present in use, appears to be the best for 7 and 14 mc DX working.

All bands from 1·7 to 28 mc are used, but the main interest is working DX on 7 and 14 mc CW; 109 countries in 36 zones have been worked, with more than 50 on 7 mc and only New Mexico and North Dakota are required for WAS.

We are glad to give space to this description of a very fine station in the G3-plus-3 category; there can be no doubt that G3BKF is representative of the best in modern British Amateur Radio practice, and in particular we congratulate him on a completely home-built installation.

THE MONTH WITH THE CLUBS

FROM REPORTS

Activity reports from 33 Clubs this month indicate that enthusiasm continues and that most of the well-organised clubs are capable of catering for their members at all seasons, including holidays.

Already there are signs of preparation for the annual battle which we call "MCC," and it is to be hoped that this year's entry list will include many newcomers. Club licences have increased considerably since last year's event. The Rules for this Fourth Annual Top Band Contest will be circulated during the coming month to all Clubs on our Active Register.

Incidentally, we have received a letter from an operator who says that last year he put in an appearance on the Top Band specially to work some of the clubs and to give them their points. He worked most of them and sent QSL's to all that he worked, but he has had practically no response. This, he thinks, is "a crack showing in the goodwill of Amateur Radio." And we are rather inclined to agree.

If a club enjoys the facilities of a transmitter, it should be prepared to shoulder the responsibilities—not the least of which is keeping the upper hand of the QSL situation. Did *you* reply to G3DCC's card?

Next month's deadline is first post on August 15. Please address your reports to Club Secretary, *Short Wave Magazine*, 49 Victoria Street, London, S.W.1.

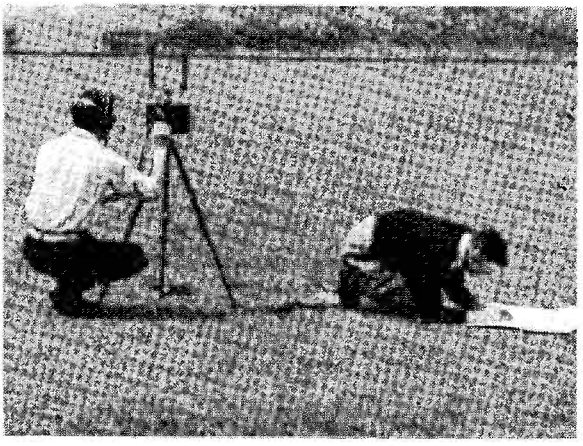
Birmingham & District Short Wave Society.—This club has now acquired permanent headquarters at the Churchill Citizens' Club, Acocks Green, Birmingham—where the garden is more than 200 ft. long! Application has been made for a licence, and work started on a transmitter for the Top Band. General meetings are held at the Colmore Inn, Church Street, Birmingham, on the second Monday of the month. Subscriptions have now been reduced from 15/- to 7/6 per annum.

Brentwood & District Amateur Radio Society.—Meetings are being held fortnightly throughout the summer, and have recently consisted mostly of discussions and junk sales. The club licence has been applied for and details of the equipment will be discussed at future meetings.

Brighton & District Radio Club.—Attendances continue to be good in spite of the many rival attractions at this time of the year. The July programme included further talks on Valves (Mr. Rawley), Transmitting Aerials (G3YY) and Frequency Checking (G3FIY). Visitors to Brighton and Hove are cordially invited to look in at the Club (Eagle Inn, 125 Gloucester Road) any Tuesday evening.

BTH Recreation Club (Rugby)—Radio and Television Section.—The Club's D/F Shield Contest was held at the end of June, and the winning party were Messrs. Prior and Bywater, using a receiver which had not been finished until two days before! Only two other parties located the transmitter before the close-down.

Carlisle Amateur Radio Society.—Meetings are held monthly during the summer, and, at present, membership belongs mostly to the transmitting fraternity, but it is desired to extend this and to



BTH D/F Contest. Two members taking a shot on G3BXF/P. H. Bywater, on the Rx and P. Prior doing the plotting ; they were the winners of the Contest

cater for receiving and junior members. Local support at present is not strong, and more members would be welcomed. Visits are being arranged to the local BBC station and to the GPO ; it is also hoped to fix one to the Electricity Authority's local station.

Chester & District Amateur Radio Society.—A recent visit by 21 members to the Port of Liverpool Radar Station was highly successful, and further visits of the kind are to be organised. Lectures covering a wide variety of subjects have been well attended, and a D/F Contest is being held in August. The next regular meeting is on August 9, 7.30, at the United Services Club, Watergate Street.

Clifton Amateur Radio Society.—Despite the hot weather, meetings have been well attended. Another outdoor visit is being planned, and further gear is being built, including a superhet on the "unit" principle. Prospective members are welcome at the Clubroom, 225 New Cross Road, London, S.E., any Friday evening.

Edgware & District Radio Society. — Twelve members spent an enjoyable evening as the guests of "Grafton" at the end of June. On the 26th a 2-metre D/F Contest was held, and is believed to have been the first of its kind in the country. (No one located the transmitter !) The Club has been asked by the BBC to co-operate on listener research in connection with a series of Science Talks on Friday evenings, and a member of the BBC staff is expected to visit the Club on this matter.

Edinburgh Amateur Radio Club.—This Club is a newcomer, formed only at the end of June, but there are already 25 members, including nine transmitting amateurs. Morse classes are being held on Mondays and Fridays, and the search for a Clubroom is now top priority.

Grafton Radio Society.—Attendances have continued "up to scratch," and plans are being made for a 2-metre station under the guidance of G2AAN. New members swell the ranks of the Morse classes, and a successful junk sale was also held recently (T.1154 for 7/6 !). The Club closes for August and re-opens with the AGM on September 12.

Radio Society of Harrow.—A steady flow of new members is a gratifying feature at Harrow; the station is being completely rebuilt and will be on the air again shortly. Morse classes and technical lessons continue every week, and a Field Day is being arranged for a date in September.

Kingston & District Amateur Radio Society.—Recent meetings have consisted of a junk sale and a rag-chew at G2BN's QTH. Both were well attended. A Field Day for the near future is being discussed. At the August meeting (on the 3rd) there will be a demonstration of Measuring Instruments. The September meeting, on the 1st, will be at 7.45 p.m. at the Kingston Hotel.

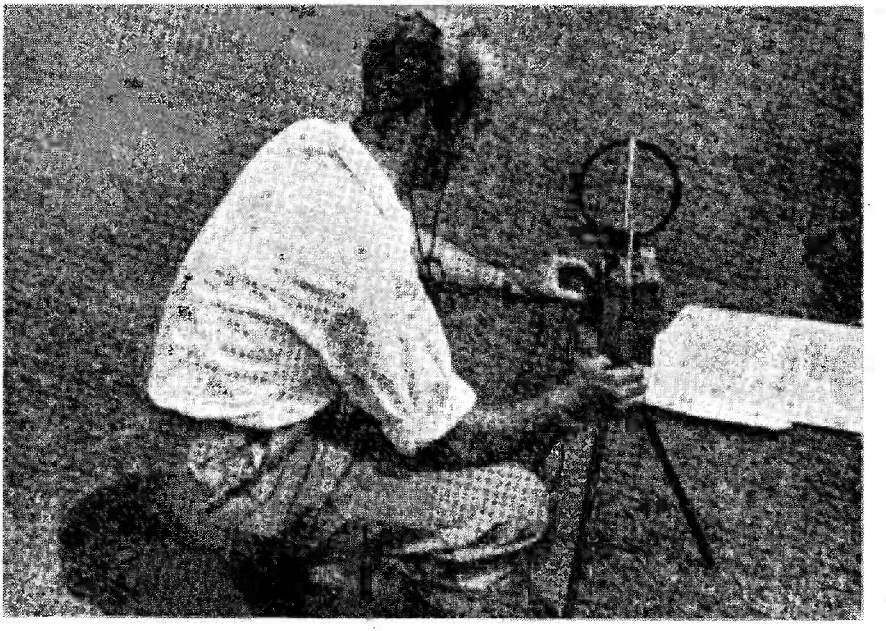
Portsmouth & District Radio Society.—The above is the new title of the former South Hants Radio Transmitting Society. The Hon. Sec.'s QTH is in the panel, and the Club has been issued with the call G3DIT.

Reading Radio Society.—At the July meeting Mr. G. T. Peck gave a talk on 160-metre portable D/F equipment and its use in Field Day competitions. He then went on to talk about Radio as used for Oil Prospecting, and showed a film loaned for the occasion by the Anglo-Iranian Oil Co., Ltd.

Rhigos & District Radio Club.—There has been a gap in the meetings on account of holidays, but they resume in the middle of August. Great interest is being shown in the forthcoming "MCC" event, and Rhigos, the winners of the 1948 MCC, intend to hold their title ! Active members are GW3ZV, 5TJ, 8BW and 3CDP. The Club station GW3FFE has been busy on 14 mc.

Slade Radio. — Forthcoming events include a talk on Communications Receivers (August 19), a visit to Daventry (August 21), a Junk Sale (September 2) and a D/F Test (September 4). On September 18 there is an Inter-Club D/F Competition, of which full details are available to other clubs if they will contact the Hon. Sec. (QTH in panel.)

Solihull Amateur Radio Society.—Recent events have been a talk on Measuring Instruments



G3AUT with his D/F receiver for the BTH Club's direction finding contest, when G3BXF/P was the target.

and the second D/F Contest of the season. The Club is now busy moving into new headquarters and it is hoped to have a transmitter on the air in the near future. Prospective members will be heartily welcomed at the Clubroom, c/o Tucker Switches, Ltd., Kings Road, Tyseley.

Southend & District Radio Society.—An exhibition of Amateur Radio Equipment was held in Chalkwell Park on July 9. All kinds of gear were on show and demonstrated to the public. G5QK/P was in operation throughout. The next indoor meeting is on October 7, but in the meantime several outdoor activities have been arranged, including D/F Contests and visits to places of interest.

Southport Radio Society.—Monthly meetings, consisting of lectures, discussions and Morse classes, continue to be well attended. Lectures in preparation for the next Examination will start in September. Regular meetings are held on the third Monday, but the Clubroom is open every Monday and Wednesday.

Stourbridge & District Amateur Radio Society.—At the July meeting Mr. Hudson of the Dudley Model Aero Society gave an interesting talk on Radio Control of Model Aircraft. Various models and equipments were on show and members saw some very fine midget apparatus in action. Next meetings are on August 8 (King Edward's School) and August 26 (Corn Exchange Vaults).

Sutton & Cheam Radio Society.—Forthcoming events are: September 6, Lecture on Modulation of Class-C Amplifiers; September 20, Lecture and Demonstration on Home Constructed Television Apparatus; October 4, Open Evening for General Discussion.

Torbay Amateur Radio Society.—Well-attended meetings are held every third Saturday at the YMCA, Castle Road, 7.30 p.m. A visit was recently paid to the BBC station at Start Point, and at the June meeting some technical films were shown. Amateurs visiting Torquay are asked to make themselves known and will be heartily welcomed. See panel for Secretary's QTH.

Warrington & District Radio Society.—Meetings have reverted to the Sea Cadet Headquarters off Wilderspool Causeway, and are now held on alternate Mondays, 7.30 p.m. A visit to the local power station was paid on July 25, and it is hoped to organise one to the BBC at Moorside Edge during September. Morse classes are held on all club nights and also on Thursday evenings, and work proceeds on the Club transmitter.

West Bromwich & Handsworth Radio Society.—The above title is newly acquired, Handsworth having been "brought in." During June G6FK lectured on Time Bases, and in July Mr. Bills gave a talk on the Superhet, with a demon-

stration of his own home-built receiver. Prospective members will be heartily welcomed at the Lewisham Hotel, High Street, West Bromwich, on the last Wednesday in each month.

West Cornwall Radio Club.—From the Club journal, *The Radio Link*, we gather that the various groups of this widely-dispersed Club are all very active. Four members from Penzance sat for the recent R.A.E.—so Penzance hopes for four more callsigns in due course.

Wirral Amateur Radio Society.—Recent talks have included one by G2AMV (Reduction of Hum in High-Gain Amplifiers) and one by G3ERB (Modification of the Rx Type 78). Plans for the winter months include a Constructional Contest. The August meetings (YMCA, Whetstone Lane, Birkenhead) are on the 10th and 24th.

Worcester & District Amateur Radio Club.—Steady progress is being made and attendance at the weekly meetings is encouraging. Application has been made for a transmitting licence and constructional work has begun. Several of the Blind College students are leaving at the end of term and taking up training for their particular calling. The Club will miss them and wishes them every success. Visitors welcome on Thursdays, 7 p.m., in the basement, Worcester City Library.

South Manchester Radio Club.—At the AGM, in July, the committee was re-elected *en bloc* and thanked by the members for their efforts during the past year. The club licence is on the way and it is hoped to get a station on the air very shortly.

Radio Amateurs' Club, Walsall Technical College.—This Club meets every Wednesday at 7.30 in Room G of the Wisemore Annexe, and a Club station will be completed as soon as a private room is available. The first meeting took the form of an exhibition of gear, most of which has been given or loaned to the Club. A field day is planned for one week-end in August, and an R.A.E. Course is being arranged to commence in September.

Thames Valley Amateur Radio Transmitters' Society.—TVARTS hold their Field Day on August 28; about six club stations will be operating on the 3·5 mc band, with 5 watts 'phone or CW. The duration is from 1100 to 1900. Any other clubs or individuals keen on joining forces or organising a contest are asked to contact the Hon. Sec. immediately.

Bournemouth & District Amateur Radio Club.—The new Television Section is flourishing, and the Club's TV receiver is nearly completed. Many members are active on 2 metres, and the membership increases steadily. A recent visitor was SM5JN from Stockholm. Club night is

Photo G3CUM, Baildon.

Some of the Bradford and District amateurs who joined the trip, organised by the Spenborough Radio Club, to the BBC transmitters at Skelton on April 3 last.

Friday at 8 p.m. Visitors to Bournemouth will be heartily welcomed.

West Middlesex Amateur Radio Club.—Great activity continues and the membership is on the increase. An interesting programme has been laid on for the next three months, including "Transmitter Nights," when the Club station G3EDH will be on the air. Meetings are on the second and fourth Wednesdays at 7.30—Labour Hall, Uxbridge Road, Southall.

Derby & District Amateur Radio Society. — Fortnightly meetings continue, but this Club is searching for larger and permanent premises. At recent meetings a home-built television receiver has been demonstrated, and talks have been given on various subjects, including a demonstration of the "Commander" receiver. On August 17 there will be a talk by Mr. C. E. Woolley (Post Office Engineering Dept.) on Radio Interference.

NAMES AND ADDRESSES OF CLUB SECRETARIES :

BIRMINGHAM : N. Shirley, 14 Manor Road, Stechford, Birmingham.
BOURNEMOUTH : A. E. Harvey, Hillview, Curlieu Road, Oakdale, Poole.
BRENTWOOD : J. F. Moseley, G2CIW, 45 Geoffrey Avenue, Harold Park, Brentwood
BRIGHTON : L. Hobden, 17 Hartington Road, Brighton.
B.T.H. : Hon. Sec., Radio and Television Section, c/o Gen. Sec., BTH Recreation Club Office Rugby.
CARLISLE : J. Ostle, G2DYV, Outgang, Aspatria, Cumberland.
CHESTER : H. Morris, G3ATZ, 24 Kingsley Road, Boughton Heath, Chester.
CLIFTON (S.E. LONDON) : W. A. Martin, 21 Brixton Hill, S.W.2.
DERBY : F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.
EDGWARE : R. H. Newland, G3VW, 3 Albany Court, Montrose Avenue, Edgware, Middx.
EDINBURGH : D. A. E. Samson, 56 Elm Row, Edinburgh.
GRAFTON : W. H. C. Jennings, G2AHB, Grafton LCC School, Eburne Road, London, N.7.
HARROW : S. C. J. Phillips, 131 Belmont Road, Harrow Weald.
KINGSTON : R. Babbs, 28 Grove Lane, Kingston, Surrey.
PORTSMOUTH : H. G. Martin, G3ACM, 184 Kirby Road, North End, Portsmouth.
READING : F. Hill, G2FZI, 997 Oxford Road, Reading.
RHIGOS : F. Hamer, GW8BW, 7 Neath Road, Bungalows, Aberdare, Glam.
SLADE : C. N. Smart, 110 Woolmore Road, Erdington, Birmingham, 23.
SOUTH MANCHESTER : M. I. Wilks, 57 Longley Lane, Northenden, Manchester.
SOLIHULL : G. Haring, 121 Bradbury Road, Olton, Birmingham.
SOUTHEND : J. H. Barrance, M.B.E., G3BUJ, 49 Swanage Road, Southend-on-Sea.
SOUTHPORT : F. H. P. Cawson, G2ART, 113 Waterloo Road, Southport.
STOURBRIDGE : W. A. Higgins, G8GF, 35 John Street, Brierley Hill, Staffs.
SUTTON AND CHEAM : L. Seaton, 8 Croft Road, Sutton, Surrey.
THAMES VALLEY : A. Eden, 31 Chatsworth Crescent, Hounslow.
TORBAY : K. Grimes, G3AVF, 3 Clarendon Park, Tor Vale, Torquay.
WALSALL : J. F. Young, Walsall Technical College, Bradford Place, Walsall.
WARRINGTON : W. R. Murray, G3CUB, 56 Crow Wood Lane, Widnes.
WEST BROMWICH : G. Johnson, G2BJY, 20 Lynton Avenue, Hateley Heath, West Bromwich.
WEST CORNWALL : R. V. A. Allbright, G2JL, Greenacre, Lidden, Penzance.
WEST MIDDLESEX : H. C. Bostock, G3BWC, 1 Grange Road, Hayes.
WIRRAL : R. A. Browning, 24 Norbury Avenue, Bebington, Cheshire.
WORCESTER : J. Morris-Casey, G8JC, c/o Brookhill Farm, Ladywood, Droitwich.

USEFUL BOOKLET

A little manual well worth having is *Making the Most of Your Receiver*, which gives a lot of practical, up-to-date information on such matters as aerials for short wave reception, general-purpose aerials, aerials on board ship, use of an earth, reducing interference and care of batteries. It is published by Messrs. Stratton & Co., Ltd., Eddystone Works, West Heath, Birmingham, 31, price 1s.

MAKING CERTAIN

If you want to be sure of having the *Short Wave Magazine* regularly and right on time, we suggest you place a direct subscription order with us. For 20s. (post free) for a year of twelve issues it will be sent to you direct on the day of publication. Write the Circulation Manager, Short Wave Magazine, Ltd., 49 Victoria Street, London, S.W.1.

DX ZONE MAPS

One of the measures of DX achievement is the Zone System, by which the world has been arbitrarily divided (for Amateur Radio purposes) into 40 different zones, some of them sparsely populated in the amateur sense and correspondingly difficult to work, or hear. To have proven contact with 40 Zones puts any amateur among the world's leading DX operators. Our Zone Map gives all the information required, and is an extremely useful great circle map of the world, centred on London, as well. In five colours on heavy linen-backed paper, suitable for wall-mounting and size 21 in. by 35 in. it costs 6s. post free and reaches you in a cardboard postal tube to prevent damage in transit. Write the Circulation Manager, Short Wave Magazine, Ltd., 49 Victoria Street, London, S.W.1.

SMALL ADVERTISEMENTS

9d. per word, minimum charge 12/-. No series discount: all charges payable with order. Insertions of radio interest only accepted. Add 25% for Bold Face (Heavy Type). No responsibility accepted for errors.

TRADE

COPPER Wires: Enamelled, tinned, Litz, cotton/silk covered. All gauges. BA screws, nuts, washers, soldering tags, eyelets. Ebonite and laminated bakelite panels, tubes. Paxolin coil formers. Tufnol rod, permanent detectors, etc. List S.A.E. Trade supplied. —Post Radio Supplies, 33 Bourne Gardens, London, E.4.

QSL'S and LOGS by MINERVA. The best there are. Samples from Minerva Press, Elm Park, Essex.

RE Amateur Radio Service. *T. B. Wimbush, deceased.* The deceased, who traded as "Amateur Radio Service" (G6HP) from 27/29 Canning Street, Burnley, died on the 19th March, 1949. All persons having any claims of any description against the estate should communicate them forthwith to the undersigned, Solicitors for the Administrators of the estate, Robt. Kidd Whitaker & Pratt, Solicitors, 1 Queen Street, Accrington, Lancashire. (Dated this 12th day of May, 1949.)

QSL CARDS. Distinctive and attractive designs. Samples and prices from—G5KT, 35 Hillside Avenue, Kingswood, Bristol.

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

50 only. Brand new BC1147A Radio Receivers, A highly sensitive 4-band 13-valve superheterodyne receiver, covering a frequency range from 1·5 to 30 megacycles. Each set is complete with full book of instructions. This cannot be repeated at the price of £25 each, ex works. Please apply: J. C. Westbrook, Elmswood Works, Briarwood Road, Aigburth, Liverpool.

AMERICA'S FAMOUS RADIO MAGAZINES—*RADIO ELECTRONICS* 22/6, *RADIO & TELE NEWS* 25/-, *QST* 25/-, *AUDIO ENGINEERING* 20/- per year post free. For list of others, send S.A.E. to Willen, Ltd. (Dept. 62), 101 Fleet Street, E.C.4.

ALUMINIUM Chassis and Panels. Any size manufactured quickly. Holes punched for valveholders, etc. Crackle and cellulose finishing. E.A.D., 18 Broad Road, Willingdon, Sussex.

16 + 16 μF 350v. 1/9. Aluminium Chassis 12 in. × 6 in. × 3 in., drilled for 7 valves, IFT's, etc., 3/6. Bargain lists from T. G. Howell & Co. (G), 29 McWilliam Road, Brighton.

TRANSFORMER from 6d. Co-ax cables with plugs, 1/-; Bias electrolytics, 1/-. Receiving valves, 1/-. Transmitting valves, 5/-. Ex-B.B.C. 19 in. rack equipment. Audio filters, 15/- each. Timebase units, valve repeaters, switch and fuse panels, 10/- each. Switch and line termination units, 5/- each. Misc. units, 2/6 each. Above less valves. Magnetron, 60/-; 600-ohm line transformer, 3/- each. Racks £1. Carriage extra. Other bargains. Send for lists.—Annakin, 2 Sunnydale Crescent, Otley, Yorks.

XTALS, METERS, CLAPP/VFO's. See last month's issue of *Short Wave Magazine* as advertised by G8VB, S. Ealing, London, W.5.

SMALL ADVERTISEMENTS

TRADE—*continued.*

WANTED : R.A.F. TEST SET TYPE 65, REFERENCE NO. 10S/137. FERRIS SIGNAL GENERATOR, TYPE 18C. ADVISE CONDITION AND PRICE, BOX NO. 570.

CLAPP VFO. Lab converted U.S. equipment, 6J5-6AC7-6AG7. High stability, temp. comp, vernier drive. Switched output 40 or 80 m, ample drive for 807 £5, including postage. Pertwi Radio, 39 Claremont Road, Smethwick, Staffs.

CRYSTAL Microphone Inserts (Cosmocord), MIC-6; bakelised diaphragm, brand new : 15/6 each, post free.—Radio-Aid, Ltd., 29 Market Street, Watford.

B2 Receivers 3·1-15·5 mc, 2 IF's, BFO, £3/19/6, carriage 2/6, or with neat midget 230v AC pack for Receiver, only £5/12/6. Mains transformers 230v primary, 290-0-290, 6v twice, 5v, tropicalised, 19/-. Type 6E indicators £2/13/6, carr. 4/-. AC Power Packs for 145 Oscillator 6/700v DC out, £2/19/6, carriage 3/-. Mail only.—Jennison, G2AJV, Dalton Hall, Victoria Park, Manchester, 14.

TRANSMITTING VALVES NEW IN ORIGINAL CARTONS ! ! RCA, 813's, 41/- ; 866A's, 16/6 ; 811's, 27/6 ; 809's, 23/6 ; HYTRON TZ40's, 23/6 ; E1MAC 35T's, 36/- : 6K7M's, 4/9 ; 6G6G's, 6K7GT's, 5/6 ; 6SA7M's, 6J5M's, VT6I (RK34), 6/- : 6SP5M's, 6X5GT's, 1LN5GT's, 6/6 : 6C6G's, 6K8M's, 6V6M's, 6J7M's, 5Z4M's, VR150/30's, 7/-. PRICES INCLUDE POSTAGE. J. T. ANGLIN, G4GZ, 233 WELHOLME ROAD, GRIMSBY.

BC348 RECEIVERS WANTED ! PREFERABLY NEW, UNMODIFIED WITH DYNAMOTOR. OFFERS OF OTHERS CONSIDERED. QUOTE QUANTITY AND PRICE CARRIAGE PAID TO LONDON. BOX NO. 580.

READERS' ADVERTISEMENTS

3d. per word, min. charge 5/-, payable with order. Box numbers 1/6 extra.

HALLICRAFTER S29 Sky Traveller, Portable, 540 kc 30·5 mc, 110v AC/DC or batteries, bandspread, ANL, BFO, 100w 230/110v Thordason Auto Transformer. £23. Offers, or would exchange for radiogram, table or floor model, with cash adjustment. —Powell, U.22 Sutton Way, Kensington, W.10.

B2 Receiver, £2/10/-. 5-0-10 mA meters, 5/- each. DET25, 5/- each. S.A.E. for list.—Limbrick, International Aeradio, Bovingdon Airport.

SALE.—Crystals, 7063, 7160, 7195, 3720 kc, 10/- each.—G2DRT, 10 South Parade, Spalding, Lincolnshire.

CANADIAN Type 58 Set, complete and new, with all accessories, £8 plus carriage.—G3CDZ, 3 Rose Lane, Norwich, Norfolk.

R107 Receiver, modified pentode output, recently re-aligned, good condition. Manual, spare valves.—Offers, Mathews, 55 Mount Park Avenue, South Croydon.

SALE.—R.107, 80, 40, 20, with convertor for 10. Perfect, £12.—Box No. 569.

SMALL ADVERTISEMENTS

READERS'—*continued.*

NATIONAL HRO, 9 coils in container; 50-2050 kc, 1·7-30 mc, P/Pack, speaker. Instructional manual. Good order, £33.—McWalter, 114 Marlborough Road, Hightown, Manchester, 8.

B2 Tx/Rx in case with coils, perfect condition. Power pack for rec only. Complete, £9.—33 Wellington Avenue, Sidcup, Kent.

QCC P5 Crystal units. 7025, 8030, 7125, 7145 kc, 15/- each, new. Hobut 0-1 milliammeter, 3½ in. 12/6; 100/150w converter, 24v DC to 230 AC, 50 cs, 70/-. Sigma highly sensitive relay 2,000 ohms, SPCO, 8/-; 465 kc IF transformers (6), 4/- each; 1½ kW Auto-transformer, 50/-. Other items available, 100w modulator, 1,000v 250 mA power pack, etc. Details and list from Street, c/o Muskett, Grove Street, Petworth.

WANTED.—HRO, any condition, less coils and valves, must be cheap.—G2RP, Old Gaol House, Abingdon, Berks.

TYPE 145 oscillator and 392 power pack (230v 50 cs AC), complete with valves, £8.—Schofield, Piniarra, Almada Avenue, Laindon, Essex.

WANTED.—Polystyrene Rod and Tube, all sizes. Also American valve 826 with base.—Worsley-Talbot, G6WT, Woodburn, Livermead, Torquay.

YOUNG Radio enthusiast, unmarried, planning "working tour" of the United States for period up to three years approx., requires one or two companions, preferably Ham types, aged 18 to 26. Please write, if keen, for details to BM/ESPB, London, W.C.1.

AMERICAN magnetic recording wire, new, on temporary spools, running time approximately fifteen minutes, three only at 12/6 each plus postage.—Box No. 571.

SALE.—AR88LF with speaker, little used, £32. CR100, modified, improved layout, panel sprayed and lettered, S-meter, voltage regulator, limiter, spare valves, IFT's, xtals, manual. Bargain £27.—G2FZG, 75 Beech Tree Lane, Cannock, Staffs.

R1155 modified, perfect, £5/10/-: 3-phase ¾ h.p. (approx.) motor, £2/10/, add carriage.—1 South Terrace, South Bank, Middlesbrough.

WANTED.—HRO, 1·7 to 4·0 mc coil unit, G.C. or B.S.—A. E. Clarke, 79 St. Mary Street, Woolwich, S.E.18.

EXCHANGE or sell, Hambander as new £14, or exchange R.107 or BC348, AC.—Lister, 13 Silver Royd Grove, Leeds, 12.

SCR522 Tx-Rx 144 mc. Completely modified for standard rack. Complete with P/P, also RF, signal generator and field strength meter, 100-156 mc.—Offers and particulars to Box Bo. 572.

G3ADT is selling ALL his gear—wants cash or photographic equipment in exchange. If YOU are interested, you will find it worth while ringing Wanstead 7976 after 6 p.m. or week-ends. Anyone having enlarger, Leica or similar, welcome.

TELEVISION.—*Electronic Engineering* synchronising separator and time bases. Complete with valves, less line transformer, £7/10. Sound receiver, complete, £3/10/-. Power chassis with a few components, £1/5/-. Eddystone 145 mc converter, £10. All to specification.—9 Southfield Park, North Harrow.

SMALL ADVERTISEMENTS

READERS'—*continued.*

HAMMARLUND Super-Pro Rx, with 12-in. dynamic matched speaker, wanted; must be in first-class condition.—GM3BKC, Garvald, Cottage Crescent, Camelon, Falkirk, Stirlingshire.

WANTED.—Maintenance instructions and circuit diagram Reception Set Canadian R103 Mk. 1, hire or buy. Also 1B3-GT/8016.—Marshall Harvey, Jnr., 36 Station Street, Sittingbourne.

FOR SALE.—AR88 (540 kc-32 mc), good condition. Nearest £30.—C. H. Bell, 55 Westfield Road, Anlaby High Road, Hull.

TX—28 mc in 5-ft. rack, comprising CO 6V6, 1st Dblr 6L6, 2nd Dblr 6L6, PA 2 807's, MOD 6SJ7, 36J5's, P/P 707's. 7 meters, 1 Power Pack and mains bias pack combined, two 500v power packs, 250 mA, Keston and Woden (both choke input), £40, or exchange Mains Mod BC348, good condition, and cash adjustment.—G3AIZ, 56 Hampton Road, E.7.

10,000 mc equipment. Amateur selling collection, including 723A/B Klystrons, waveguide components, cavity wavemeter, etc. Please send for details if interested. About £7 the lot or exchange. Wanted, Army Type 21 set, case for BC221, BC624A, R109.—Box No. 573.

HRO/MX Power Pack, 9 coils 50 kc-30 mc. Perfect, £32/10. R107 with EL32 output stage, £13/10. T1154 with valves and meters, £5. Transit case and carriage, 10/-.—G3DUC, Pleasant View, Checkoe, Redbrook, Whitchurch, Salop.

WAVEMETERS 119A £3, 1117 £1/10. BC455, £1/5. Bendix T1A2B, £4/10. All carriage paid. Wanted Phone/CW Tx, Tabletop or cabinet, state size, weight. G2MHFV, 23 Noran Avenue, Dundee.

BC342 Xtal model. Laboratory aligned, fitted noise-limiter and modified 1st RF stage, as per *Radio Handbook*. With external power pack, £15. Eddystone Five and Ten converter, £4. BC453, Q-Fiver, £2. RF Unit Type, 27, £1.—G5HB, 1 South Street, Watchfield, Swindon, Wilts.

SALE or exchange, for Rx with vibrator supply, CNY2 complete Tx /Rx, Ph/CW. Tx 1 to 10 mc; 807 VFO, 807 PA, pair 807's mod; Power 100-250 AC 12/24v DC. Offers?—L. Grout, 68 The Drive, Worthing.

NATIONAL 1-10 metre 4-valve receiver, complete with power pack, in perfect condition, VHF Bazooka with above, £17/10/-.—A. C. Brown, 85 Queenswood Road, London, S.E.23.

BRAND new Eddystone 640, £23. Also two 1154 transmitters, good working condition, AVO Minor, each £6.—J. A. A. Short, Sterling House, Choppington, Northumberland.

1155—For sale, £7. In good condition. Will exchange for small P/P AF Amplifier.—Owens, 8b Priory Road, Hornsey, N.8.

WANTED, 1 or 2 American handie-talkies SCR536 (BC611). Also handbook for same. State frequency and condition. Your price paid. Also BC342 Rx.—Box No. 577.

R103A receiver, self-contained AC or 6v DC, 1·7-7·6 mc, perfect. First £8/10 secures. Also R.1132A, R1224A, new condition. RF26, brand new—offers, quick sale.—P. W. Barnett, Station Residence, London, Road, St. Albans.

SMALL ADVERTISEMENTS

READERS'—*continued.*

WANTED. Two TN 16/APR/4 tuning units. Would consider chassis only, if undamaged. Also manual for Canadian Marconi CSR5 receiver.—Box No. 576.

R1116A £5. 9v communication superhet 170 kc-42 mc in 6 bands, £11. 25w 40/20 Tx P/P, coils, crystal, key, £12. Vales, VT61A, 9003, 6K8, 6B8, 12A6, 12SG7, 4/-. VR54, VR65A, V1103, 2/-. Inquiries. S.A.E. Pse.—Box No. 575.

WANTED, buy or loan 1947 copy *CQ*, describing SCR522.—Williams, 45 Old Oscott Lane, Great Barr, Birmingham, 22a.

AR88D for sale, perfect condition, matched speaker, £50. Buyer collects.—G2FRM, 132 Bath Road, Reading, Berks.

SALE.—HRO Senior 3 coils, S-meter, speaker, good condition, £18/10s. Also RCA ARR77E 540 kc-30 mc S-Meter, excellent condition, £25.—Bass, 155 Green Lane, New Eltham.

22 SET, complete with m/c phones, mike and power unit. Exchange for R107, 208, 1359.—K. Berry. 30 Princess Avenue, Surbiton, Surrey.

CANADIAN 58 set as new. Complete with spares, power pack, head set, telescopic aerial, £10 or offer. —Davis, 23 Carnarvon Road, Redland, Bristol, 6.

B2 Transmitter/Receiver and power pack, complete. Brand new in parachute-dropping case, complete set, replacement valves, etc. Specially built miniature modulator which fits into spare parts. Ideal 20-w phone /CW, portable rig. £18 with mike and circuit diagram.—Box No. 574.

G6KB closing down. All low freq. gear to be sold. Meisner Signal Shifter (de Luxe) 60w Tx, 40, 20, 10, 25w Tx 10, 5. AR88, HRO, 10, 5- and 2-metre converters and a large quantity of other gear, cable, meters, etc. S.A.E. for list.—Greener, Stoke Row, Henley-on-Thames.

SALE.—National NC81X, with speaker, S-meter, etc. and 50-w transmitter, near finished, all parts. Clapp—6AG7, 807 with 500v, supply, in rack, with valves, key and one crystal, £30 the lot. Also TV sound and vision receiver only, with power supply, minus mains transformer, most valves and one VCR517 CRT. All for £10. Call after 7 p.m. any night. *Ken.* 5527.

145 VFO new, less valves and drive, £2. 30-w multi-ratio mod. xfmer, as new, 35/-.—G3BMC, 36 Godfrey Street, London, S.W.3.

TX.1154 complete with valves and meters, 200 kc-10 mc, perfect, tested on the air, 6 gns. Buyer collects.—G3DYF, 107 Brixton Hill, S.W.2.

FOR SALE. Eddystone 640, matching speaker and S meter, six months old. With manual. Offers to Kay, 6 Morton Place, Aberdour, Fife.

EDDYSTONE 640. Perfect. Still under guarantee. With Rola 5-in. speaker, £22.—Walker, 247 Bellegrove Road, Welling.

AR88D excellent condition, S-meter incorporated, loudspeaker and manual, £50. —Wickham, 1 Arcadian Gardens, London, N.22.

SMALL ADVERTISEMENTS

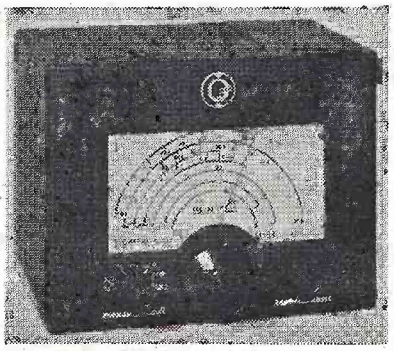
READERS'—*continued*

HALLICRAFTERS SX16. 550 kc-60 mc. 1,000 degrees bandspread. Recently completely overhauled complete, with 12-in. matching speaker. £30 or nearest offer.—Box No. 578.

ACTIVE AMATEUR, XYL, Junior OP after four years waiting require unfurnished flat or house near or in London, will share hobby and help SWL or Ham with gear. Box No. 579.

S640 PURCHASED April 1949 with L.S., perfect, and brand new T1154, £25. Devaney, 12 Colville Street, Derby.

"Q-MAX" CV-I VARIABLE FREQUENCY OSCILLATOR



This is a V.F.O. employing the series tuned Colpitts (Clapp) circuit, and is extremely stable and free from drift. Output at 3·5 ; 5·25 or 7 Mc/s. Calibration on all amateur bands from 3·5 to 30 Mc/s. High or low impedance output to drive voltage or power stages.

Price 14 gns.

MODULATION TRANSFORMERS

UM1 to mod. 60w RF	£2/14/-
UM2 to mod. 120w RF	£3/12/6
UM3 to mod. 240w RF	£4/10/-
UM4 to mod. 500w RF	£10/15/-

LABGEAR WIDE BAND COUPLERS

3·5, 7, 14, 21, 28 Mcs.	ea. 17/6

SIGNAL GENERATORS

AVO. 50 Kcs.-80 Mcs....	£25/-/-
ADVANCE, 100 Kcs.-60 Mcs. ...	£23/10/-
B.P.L. 100 Kcs.-30 Mcs.	£21/-/-
TAYLOR. 100 Kcs.-160 Mcs. ...	£17/15/-

CRYSTALS

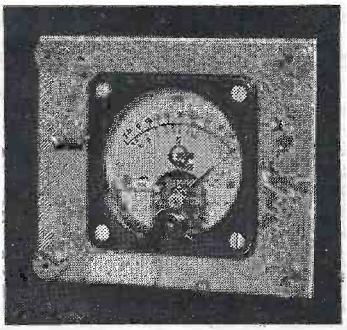
We carry a large stock of Brookes and Q.C.C. crystals in nearly all frequencies ... 32/6

MICROPHONES

TRIX M.C., with switch	£6/15/-
MEICO M.C.	£5/5/-
ROTHERMEL D.104 Crystal... ...	£5/5/-

AERIALS

ARNINE folded dipole, 14 Mcs. up...	£3/2/6
ARNINE folded dipole, 7 Mcs. up ...	£3/12/6
G.E.C. Antiference	£4/10/-
EXSTAT Antiference	£4/5/3



"S" METER

For Fitting to AR88's

Complete with back-plate **63/-**

AN INDISPENSABLE TOOL

THE "Q-MAX" CHASSIS CUTTER

SIZES FROM $\frac{5}{8}$" to 2 $\frac{3}{32}$"

REGISTER NOW FOR OUR NEW CATALOGUE

3d. POST FREE

BERRY'S (SHORTWAVE) LTD

25 HIGH HOLBORN · LONDON · W.C.1

(OPPOSITE CHANCERY LANE). TELEPHONE: HOLBORN 6231

Printed in Great Britain by Lochend Printing Co., Ltd., London, S.W.9, for the Proprietors and Publishers The Short Wave Magazine, Ltd., 49 Victoria Street, London, S.W.1. The *Short Wave Magazine* is obtainable abroad through the following: Continental Publishers & Distributors, Ltd.; William Dawson & Son, Ltd.; CANADA—Imperial News Co., of Canada; AUSTRALIA AND NEW ZEALAND—Gordon & Gotch, Ltd.; AMERICA—International News Company, 131 Varick Street, New York. Registered for transmission to Canada and Newfoundland by Magazine Post. *August*, 1949.