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SHORT WAVE

Magazine

VOL. XIII

MAY, 1955

NUMBER 3



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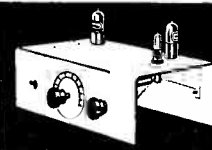
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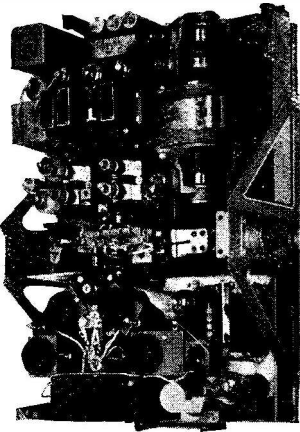
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(PUBLICATIONS DEPARTMENT)

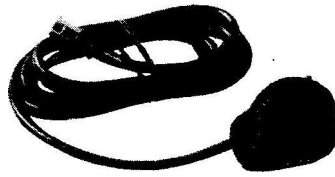
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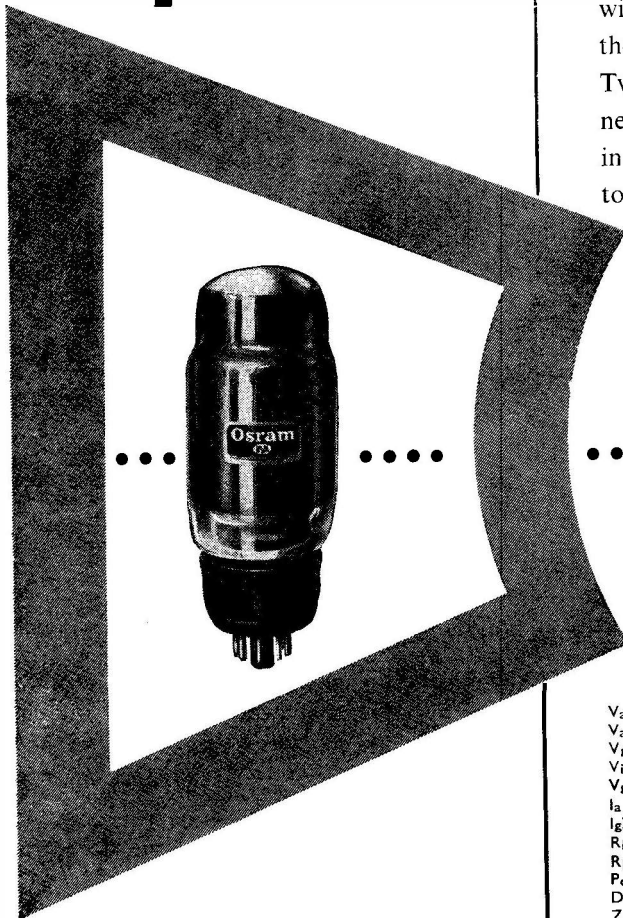
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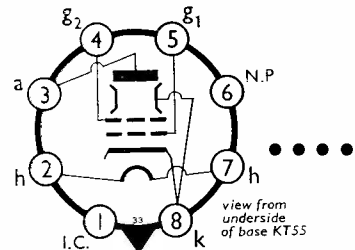
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V_{g1} (approx.)	-20.5	-23.5	V
I_a	220	225	mA
I_{g2}	15	45	mA
R_k (per valve)	175	175	Ω
$R_l(a-a)$	2	k Ω
P_{out}	25	W
D	2	%
Z_{out}	9	k Ω

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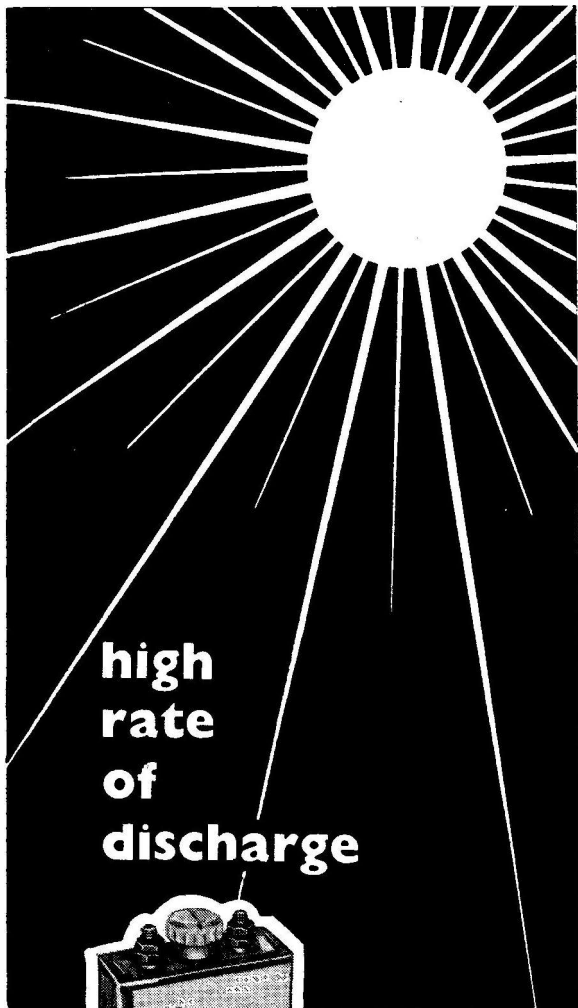
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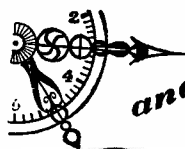


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FOR THE EXPERIMENTER AND THE RADIO ENGINEER

The SHORT WAVE Magazine

E D I T O R I A L

Interference

With the climate in the matter of BCI and TVI much milder and more temperate for the radio amateur, it is of great interest to see, once again, the digest on radio interference complaints prepared by the G.P.O. Engineering Department.

This covers the year to January 1955, and discusses interference with TV and BC reception as reported by the general public and investigated by the Post Office Interference Branch. We find that while radiation from TV receivers produced 6,805 complaints of BCI, there are only 125 cases of BCI caused by radio amateurs — indeed, foreign commercial transmitters (353 cases) gave much more trouble than amateurs ! Faulty electric house-wiring is down for 2,194 cases of BCI and 494 of TVI. A remarkable figure is that given for electric sewing machines ; they were responsible for no less than 8,956 TV incidents, compared with 303 cases only of amateur-caused TVI. Television receiver local oscillators themselves resulted in 1,604 TVI complaints !

Other large figures for both BCI and TVI, together, are given by : Electric drills 3,669 ; Hair-dryers 7,552 ; Electric house lamps 2,635 ; HV overhead power lines 2,252 ; Refrigerators 2,815 ; Vacuum cleaners 4,312 ; and Bed-warmers (!) 1,761.

These figures compare with the total of a mere 428 cases attributed to radio amateur interference with Television and Sound Broadcasting together ! Of the 26 known sources of interference listed, there are only three that give lower figures than the amateur total : External cross-modulation, 325 ; Industrial and medical RF equipment (spark), 256 ; and Faulty underground power cables, 192.

As a collective result, such figures are as important as they are interesting. They prove that the radio amateur has nothing to fear on the score of BCI or TVI and, with the new interference-suppression regulations behind him, can face squarely complaining neighbours or hostile radio dealers (known sometimes to suggest to customers that interference is being caused by a local amateur). Secondly, they show that while many operators must avoid BCI or TVI by closing down during the peak audience periods, many others have successfully overcome the problem and are on the air at any time they please, undeterred by the threat of BCI or TVI.

*Austin Foster
G.P.O.*

Making Up a Long-Wire

USING THE ROOF-SPACE
TO INCREASE LENGTH

A. D. TAYLOR (G8PG)

All sorts of aerial arrangements are in use at active 160-metre stations, many of them handicapped as they are by lack of space for the desired half-wave. This article suggests one way of getting out a 270-foot aerial — perhaps not as efficient as a straight run in the clear, but the next best thing. And for those who may doubt the efficacy of our contributor's idea, it is a proven fact that quite good local coverage can be obtained on the 1.8 mc band with an aerial wholly indoors, made as long as possible by running it round the roof-space, with a loading coil and tuned against ground, Marconi fashion.—Editor.

A 270-foot wire is probably the secret dream of every Top Band enthusiast whose efforts are cramped by a small back garden. The writer is no exception to this rule and this article describes how, in his case, the dream was made reality without moving house or operating from a $\lambda/4$ location. As in the solution of so many other aerial problems the answer turned out to be a combination of the re-use of existing space (remembering that the loft can be taken as an annex to the garden), plus a willingness to do something which, on the face of it, appeared to go against accepted practice. As so often happens with aeri-als, this willingness to adopt the unconventional method has produced results far better than those expected.

Method

The aerial in use at the writer's station before the modifications outlined below is shown in Fig. 1. While it performed reasonably well it was felt that a resonant aerial would give much better results on Top Band—especially if it could be made half-a-wavelength long. At first the whole scheme seemed to be wishful thinking, but eventually a method was worked out by which the length of the aerial could be increased to 270 feet. This was done by moving the house end of the existing aerial to the centre of the house, then installing an additional 170 feet of wire in the loft. The indoor

and outdoor sections were then joined together to form a continuous 270 foot length. While at a first glance this seems simple, the obvious snag lies in finding space in which 170 feet of wire can be accommodated in a loft measuring 30 feet by 16 feet! It was here that *Short Wave Magazine* came in — or rather, the memory of a picture published in the *Magazine* some years back and showing a "zig-zag" 20-metre beam. Zig-zag was, of course, the answer. While it is difficult to get 170 feet of wire into a loft in straight runs, a zig-zag arrangement takes up a far greater amount of wire for a given length of run and allows the required length of wire to be accommodated. The application of a little arithmetic soon confirmed this supposition and the layout shown in Fig. 2 was chosen as being the most convenient in the writer's case. As can be seen, the indoor part of the aerial starts in the radio room, then goes through a hole in the ceiling and straight across to the far side of the loft, being run a few inches above the ceiling beams. It is then taken between the eaves and the roof peak in a series of 5 inverted V's, each six feet wide at the base. Approximately 125 feet of wire is taken up in this way. To accommodate the remaining 45 feet the wire is run from the bottom of the last inverted-V up to the roof peak, back along the roof peak for just over half the length of the loft, then down the other side of the roof to a point where the outdoor section is brought in under the eaves. At this point the 170 foot indoor section and 100 foot outdoor section are soldered together to form a continuous 270 foot length.

At G8PG the outdoor section is run in 18 SWG enamelled wire and the indoor section in 18 gauge having both cotton and enamel insulation. This allows the wire to be supported directly on small hooks screwed into the dry wood of the roof beams, no further insulators

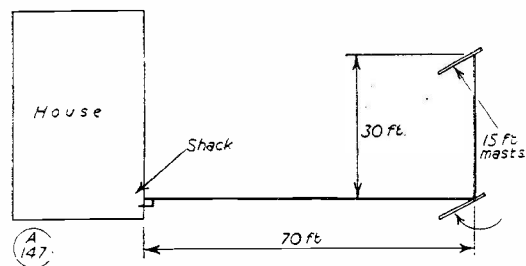


Fig. 1. The situation at G8PG before he decided to try the arrangement illustrated in Fig. 2. By using the roof-space, he has been able to acquire the full length necessary for a half-wave on Top Band.

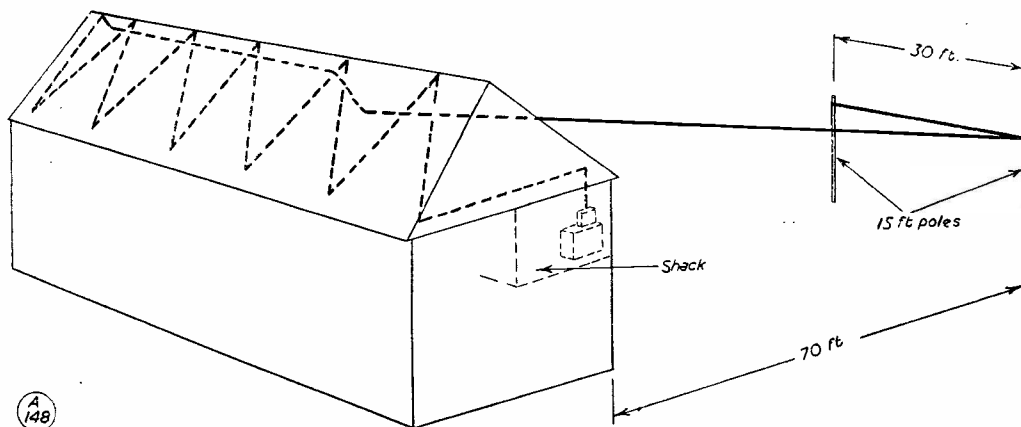


Fig. 2. The 270-foot aerial layout as used by G8PG. The extra length required is accommodated in the roof-space by criss-crossing as shown. The system loads up normally for 160-metre working and, though by no means an ideal arrangement, is giving much better results than a short outdoor wire.

being employed. With the aid of an extending ladder (a "must" for anyone who wishes to get in and out of a loft regularly and safely), inspection lamp, gimlet and sidecutters the indoor section was erected in just over an hour. It was then soldered to the outdoor section and the new aerial was ready for test.

Results

In planning the 270-foot aerial the following advantages of the new arrangement had been kept in mind:

- (1) Even though the 270-foot zig-zag aerial would not be as efficient as a straight 270-footer, it was likely to get out much better than the existing 100-foot wire;
- (2) It would be far easier to match the 270-footer to the transmitter efficiently;
- (3) The power wasted in the base loading coil of the 100-foot aerial would now be efficiently radiated;
- (4) With a half-wave aerial the rather lengthy station earth lead would no longer form an integral part of the radiating system. This would eliminate a further source of inefficiency.

In practice the additive effect of these four improvements in efficiency was remarkable. Top Band signal reports were up by 1 to 2 S-points and the percentage of unsuccessful calls dropped sharply. While no trans-Atlantic contact has yet been made, Europeans have been worked without difficulty under the worst "wolf pack" conditions. Results on 3.5 and 7 mc also show a very marked improvement and on the only occasion that 14 mc has been tried excellent reports were received from

Europe despite poor conditions which made DX tests impossible. Matching on the Top Band has become very simple and the transmitter is fully loaded with the aid of a conventional parallel tuned circuit.

Conclusion

The work put into the new aerial has been fully repaid by the results obtained. It is hoped that this article may encourage other Top Band enthusiasts who are handicapped by lack of space to try zig-zag wires. They certainly pay dividends!

R.A.F. INSPECTION FLIGHT

The Hastings aircraft, *Iris II*, now returning from an R.A.F. Signals inspection flight to Australia and New Zealand, is the vehicle for the Inspector of Radio Services (G/Capt. C. C. Morton) and his party. The function of I.R.S.—hence the name of the aircraft—is to examine and report on R.A.F. telecommunication services and installations the world over. In consequence, the aircraft is elaborately fitted with radio equipment for communications (MF, HF, VHF and UHF), navigation, monitoring and recording. Three long-distance trips are made every year, with shorter flights out to Africa and the Middle East as occasion demands.

Of particular interest is the present trip, because one member of the crew is G3IDC, Sgt. F. Johnstone, carried "spare-hand" for the purpose of doing an Amateur Radio survey on behalf of the R.A.F. Amateur Radio Society, the Hq. station of which is G8FC, Locking, Somerset. Arising from a suggestion by Air Vice-Marshal L. Dalton-Morris, C.B., C.B.E., Assistant Chief of the Air Staff (Signals) at the Air Ministry, to the Editor of *SHORT WAVE MAGAZINE*, it has been arranged that on the return of G3IDC, his report, with films and photographs, will be made available for publication in these pages.

Bendix Receiver RA-1B

SOME SUGGESTED MODIFICATIONS

D. W. PAYNE (G3KCR)

THE Bendix RA-1B is now available at a very reasonable price from "surplus" sources. It is an aircraft receiver with a frequency range of 150 kc to 15 mc, with an "IF gap" from 1.5 to 1.8 mc. The valve sequence is 6K7 RF, 6K7 Osc., 6L7 Mixer, two 6K7 IF's, 6R7 Det., 6K6 Audio and 6K7 BFO. The intermediate frequency is 1630 kc.

Having been designed for airborne operation, the construction of the receiver is excellent. The power socket is on the front panel and the set is intended for operation off a 12-volt dynamotor. The detail of the heater wiring for a 12-volt supply can be seen in Fig. 1. One of the modifications is to convert for a 6.3v. heater supply.

The CW sensitivity of the receiver is quoted in the instruction book as being 2 microvolts for a 50 milliwatt output when the gain control is set to give a noise output of 5 mW with no signal input. The RA-1B has a very useful degree of selectivity; the figures given in the manual are taken by observing the ratio of the input voltage off-resonance to the input voltage at resonance, at a given band-width; this is done by varying the input voltage to maintain

a constant output level for the frequencies off-resonance at the band-width being checked.

Modifications

It was decided to wire the filaments and dial lamp in parallel, to fit a noise limiter, and separate the RF and AF gain controls, which in the original are ganged—as is the case with so many of the Service types. The two controls were separated because it was found that the AVC was acting under every impulse of noise and so reducing the sensitivity of the receiver. The first step is to remove all filament wiring, including R14, R15 and the associated tag boards; then run a positive lead from the power socket to the dial light, and then on to one side of each valve. The other side of each valve filament is taken to the nearest earth point.

Noise Limiter

The noise limiter uses two crystal diodes in series shunt, and the extra components are mounted on a tag board in the position originally taken up by the filament resistor wiring. Half of the "Remote/Local" switch as fitted is used as the noise limiter "On/Off" switch. The RF gain control remains in position at the top right hand corner of the front panel, and the AF gain control is fitted in place of the original six-pin power socket.

It should be noted that component values are the same in Figs. 1 and 2 where the number

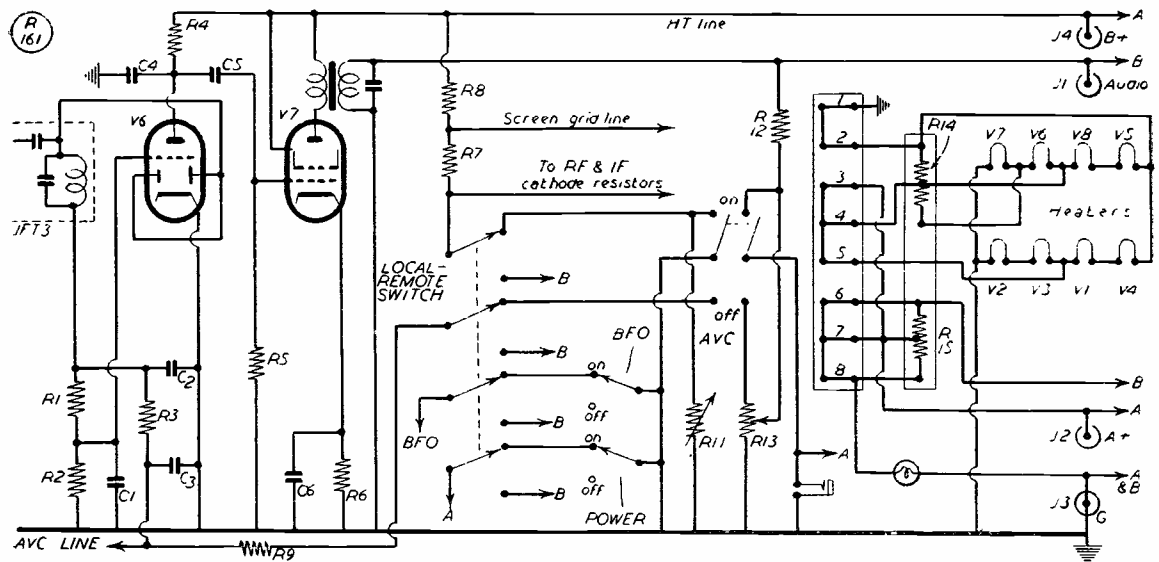


Fig. 1. Electrical layout of the final stages of the Bendix RA-1B, before modification. Values are given in the table.

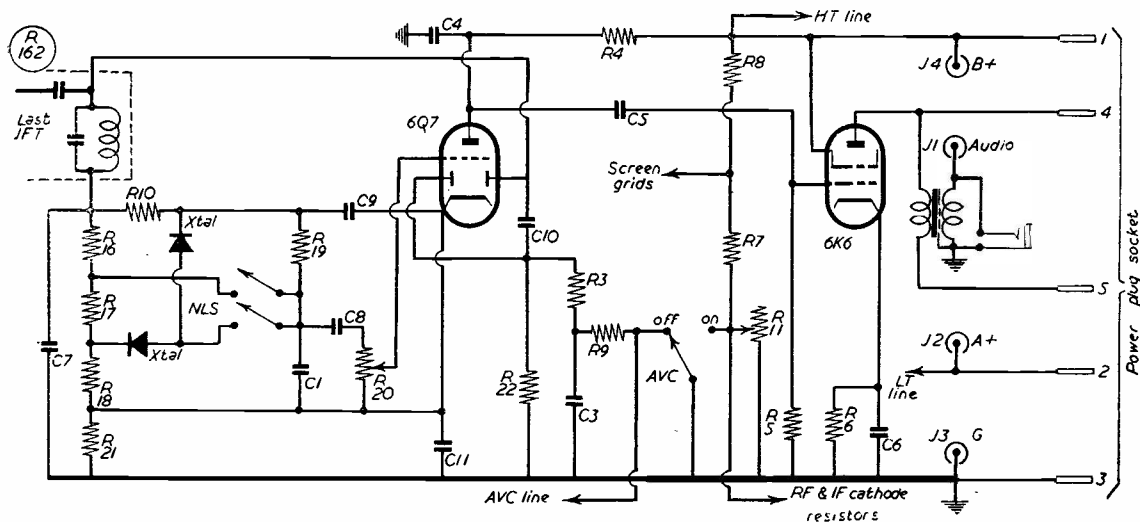


Fig. 2. The circuit of Fig. 1 as modified by G3KCR. The table of values refers both to this circuit and to Fig. 1.

is the same, and it will be found that many of the circuit elements need not be disturbed. The only valve to be changed is V6 and this was replaced by a 6Q7 which was found more suitable for the circuit used.

Front Panel Changes

Other front panel changes are the fitting of a power socket and replacing the aerial trimmer for an extended shaft type of the same value, 100 $\mu\mu\text{F}$.

All "remote control" wiring must be removed from the receiver before any modification can take place. The remote control socket can be replaced by an octal valve base and the appropriate plug used in conjunction with it, complete with screened lead, to run from the power pack and speaker cabinet.

Power Pack

It is probable that a power pack and speaker already available will be used. Power requirements are 180-250 volts at about 70 mA, and 6.3 volts at 3 amps. The receiver is very stable without any voltage regulation.

BFO

As in most Service receivers, the BFO injection is far too "strong" and an improvement was obtained when the injection was reduced. The BFO output is taken from the anode via a 1.5 $\mu\mu\text{F}$ condenser to the secondary winding of the second IF transformer. This condenser is inside the screening can ; it is fed

Table of Values

Figs. 1 and 2. Rearrangement of Bendix RA-1B Circuit.

C1, C2 = 150 $\mu\mu\text{F}$	R11 = 10,000 ohms, potentiometer
C3 = 0.1 μF	R12 = 500 ohms
C4 = 230 $\mu\mu\text{F}$	R13 = 2,000 ohms, potentiometer
C5, C8 = .01 μF	R14 = 126 + 63 ohms, 20-w.
C6 = 1.0 μF	R15 = 120 + 120 ohms, 20-w.
C7 = 50 $\mu\mu\text{F}$	R16 = 22,000 ohms
C9 = 0.5 μF	R17 = 47,000 ohms
C10 = 100 $\mu\mu\text{F}$	R18 = 68,000 ohms
C11 = 10 μF , 25v. wkng.	R19, R22 = 1.2 megohms
R1 = 700,000 ohms	R20 = 500,000 ohms
R2 = 300,000 ohms	R18 = 68,000 ohms
R3, R5 = 1 megohm	R21 = 2,700 ohms
R4, R9 = 50,000 ohms	Xt1 = Crystal diodes for NL
R6 = 750 ohms, 1-w.	
R7, R8 = 20,000 ohms, 2-w.	
R10 = 470,000 ohms	

Notes:
 All condensers 400v. DC working, except as specified.
 All resistors rated $\frac{1}{2}$ -watt, except as specified.
 All leads marked "A" are to 6-pin socket.
 All leads marked "B" are to 8-pin remote control socket.
 J1-J4 are check jacks on front panel.
 NLS is the Noise Limiter switch.

through a spare terminal at the bottom of the can, and is marked "K." (It is the terminal nearest the rear of the chassis.) The injection was reduced by unsoldering the wire from the terminal and then winding two or three turns of the insulated wire around the same terminal, thus producing two very small capacities in series.

Finally, when it first comes into the user's hands, the receiver may be thought to be very good as it stands, without modification. But the reader can be assured that the recommended alterations will be found well worth while, and a great help in working the DX !

Beam Rotator and Indicator Panel

LAYOUT AND GENERAL ARRANGEMENT

K. J. HINTON (DL2KH)

SO many beam aerals are, even today, rotated by car steering wheels, mangle handles, bits of rope and even "stick your arm out of the window, old chap, and give the pole a twist," that it was quite definite that something which needed the minimum of effort and was as automatic as possible would have to be provided for this station.

The final design was not a five-minute effort but was thought out over a period of time when nothing else in the amateur line could be done. The product evolved is fairly compact, comparatively simple and does the job extremely well.

It all started with the accidental acquisition of a 230 volt AC induction motor of about one-eighth horse-power with a speed of 1725 r.p.m. This was fitted with a set of reduction gears to give a final speed of about 1 r.p.m. to the last gear wheel and the beam turning shaft. No previous experience of cutting gears had been gained but after a bit of thought, reference to the odd textbook and some calculations, all the gear wheels, spindles and washers were turned out on the normal workshop lathe. The actual final speed is relatively unimportant as long as the beam does not rotate faster than about twice a minute and the

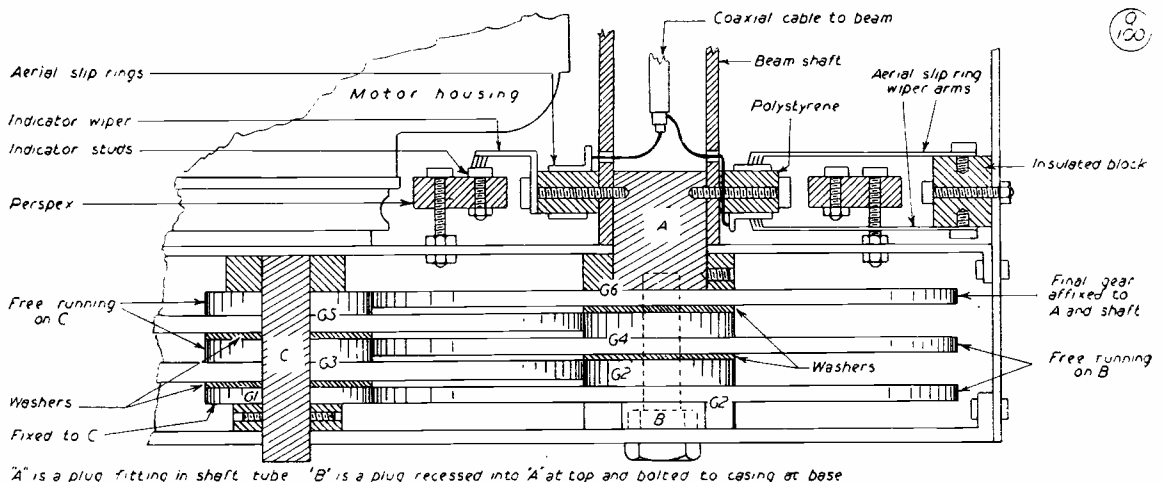
size of the gear wheels and number of teeth can be worked out more conveniently this way.

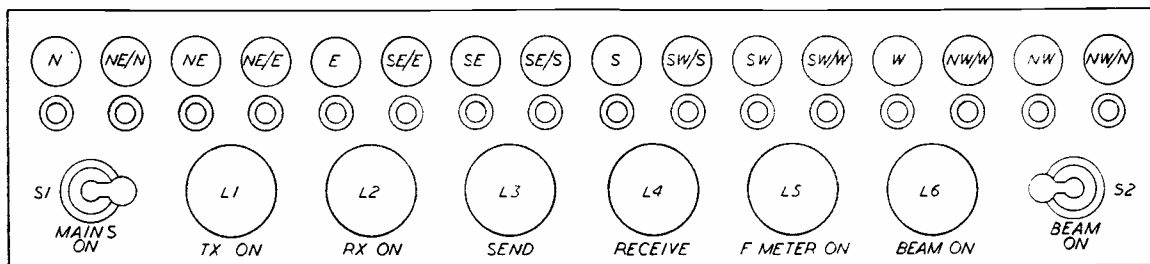
General Arrangement

The final gear wheel drives the one-inch diameter steel tube beam shaft on which are fitted two circular slip rings separated by a polystyrene ring. A wiper arm presses on to each slip ring as the beam shaft rotates, the arms being connected to a coaxial socket on the case of the apparatus and the rings to a length of coaxial cable which is led up the centre of the shaft tubing. A further single contact arm is fitted to the outer surface of the polystyrene ring which separates the slip rings by a long 4 BA bolt tapped into the shaft tubing. This contact arm is rotated with the final shaft to run over a circle of 16 studs mounted in a panel of perspex about $\frac{3}{16}$ in. thick, aligned and fitted about half-way between the two slip rings. This wiper contact must be of a type which gives make-before-break on the studs, in order to make continuity for the electrical circuit of the indicator lamps. The circle of studs is neatly cabled to two 8-way Jones sockets fitted to the apparatus case.

The two power leads from the motor, together with the motor-case connection, are taken to a 3-pin Bulgin mains socket, also fitted to the

Fig. 1. Cross-section showing general construction and layout of the rotator unit. By a system of fixed and free-running gear wheels, with C as the primary drive shaft, a large reduction is finally obtained between G5 and G6, the latter being bolted to the beam shaft itself. Indication of beam heading is given by a wiper arm travelling round a series of contact studs, and RF feed to the beam is by slip rings. All this may seem rather elaborate but in fact it is easier to construct than might appear and certainly results in a sound engineering job. It is the sort of unit that could readily be put together, from the information given here, either by a keen amateur mechanic or in the average garage workshop.





Q/OI
 Fig. 2. Layout of the indicator panel and control unit, as adopted by the author. This could of course be arranged to suit individual requirements, where a different control system is used.

apparatus case. The earth socket on this mains termination is connected to the final shaft via the gears and apparatus case. The layout of the main pieces such as slip rings, wipers, indicator arm studs and aerial slip ring wipers is shown at Fig. 1 and can be gleaned from the photographs.

The whole of this apparatus was enclosed in a cover made from a biscuit tin, reinforced, painted and internally packed with grease. It fits over from the top with a gasket round the beam shaft and has a screw-on underside which is permanently fitted to the connecting cables. (There may be better ways of waterproofing but this elementary system seems to be quite satisfactory providing plenty of grease is sloshed about inside !). The whole equipment weighs about 15 pounds and although fixed to a stand on a flat roof could well be supported by a lattice mast, or a telegraph pole with clamps.

Indicator Panel

In the station itself is the indicator unit, a black crackled steel cabinet 13 x 7 x 3 in. It houses the 16 lamps used for beam direction indication, each with a single-pole press-button switch, six other lamps for station control and indication, and two mains toggle switches. The diagram at Fig. 2 illustrates the layout and functions.

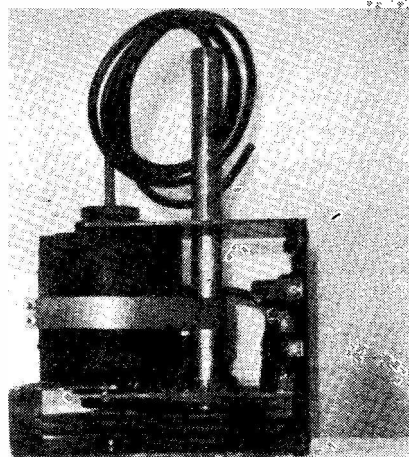
Inside the indicator cabinet are also fitted a 230 to 6.3 volt AC transformer, a relay with one heavy duty and normally "made" contact and a small one amp. full wave selenium rectifier. These can all be grouped up at one end of the cabinet leaving space for any other small equipments such as station relays, suppressors and so forth.

The connections from the lamps and other control panel items are all brought out to four 8-way Jones sockets at the rear of the cabinet, as are the mains leads, control lamp leads and the various power lines to other equipments. All that is needed to operate any of the control

lamps is an "earth" from the equipment concerned which can be obtained by fitting a larger switch with an extra contact as desired.

A diagram of the internal wiring of the indicator cabinet is given at Fig. 3 and one of the photographs shows the general arrangement of the control panel.

With the two equipments connected up with the necessary cables, the motor apparatus at the top of the mast and the indicator cabinet within the station, it is only necessary to throw the "Beam On" switch for whatever array is being used to start rotating. This is will do *ad infinitum* until one of the press button switches associated with the indicator lamps is operated. The beam will then stop in the



General view of the assembly, showing the compact nature of the finished unit which will give a powerful drive to the beam shaft at about two revolutions per minute.

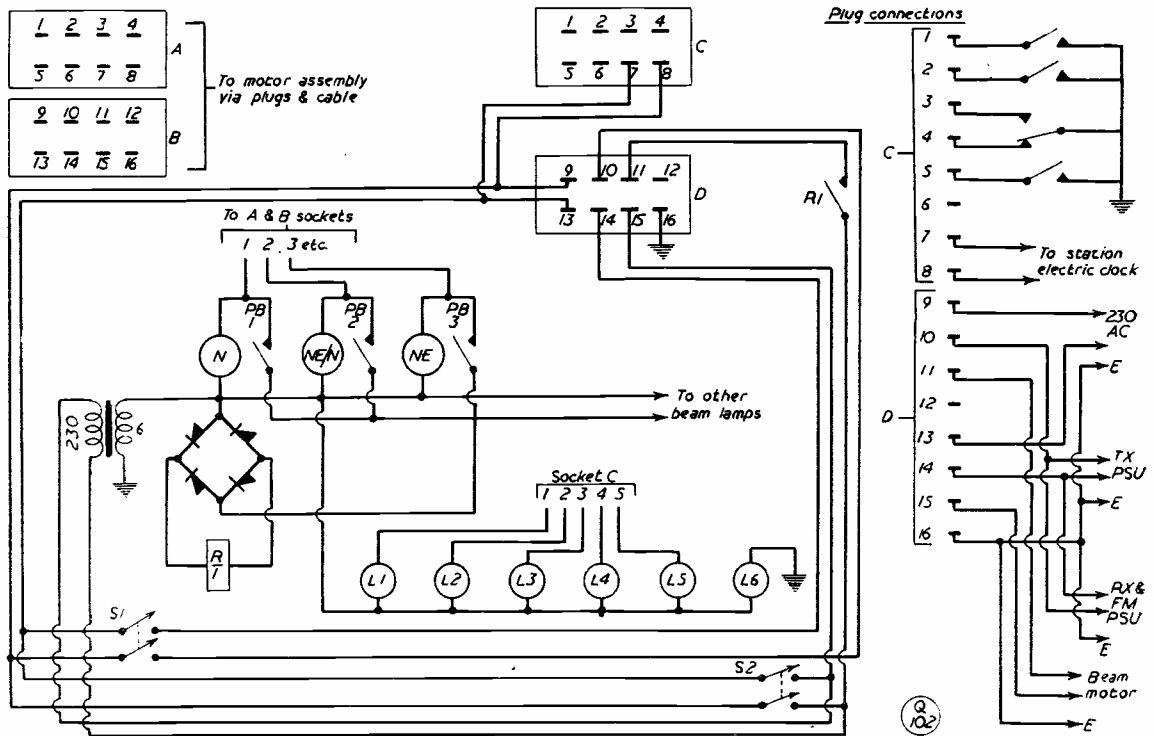


Fig. 3.

The cables used are all surplus types which are quite adequate and so much cheaper than current production patterns. There is a 20-wire half-inch diameter cable for the indicator lamps, a three-wire mains cable and a half-inch heavy duty coaxial cable. All three can be bunched and supported down the mast or building by suitable rubber lined clamps to reduce strain.

The whole equipment has the great advantage that it can be taken down or erected quite rapidly; it has certainly saved a lot of manual labour, and one knows in what direction the beam is actually aiming without it being necessary to walk outside on a dark and stormy night to have a look.

"RADIO AMATEUR'S HANDBOOK"

The 1955 issue of this well-known and indispensable reference manual on the theory and practice of Amateur Radio is now available, and once again it covers in the most practical way the whole field of design, construction and operation, in all modes and on all bands. Many illustrated constructional designs are discussed in detail, and there are pages of reference data—nearly 70 pages are given to valves alone, with base diagrams and operating characteristics. The text runs to over 500 pages, and large sections are devoted to a very full treatment of receivers, transmitters, speech amplifiers and modulators, aerial systems, VHF equipment, power supplies, and control methods. The *Radio Amateur's Handbook*, now in its 32nd edition, has for long been recognised as the standard guide to the subject, and it is found not only in amateur stations, but also in research establishments and radio engineering laboratories throughout the world—for the professionals use it for its quick answers to many a practical design problem. The price of the 1955 Edition of the *Radio Amateur's Handbook* is 31s. post free, available from stock. Orders, with remittance, to: Publications Department, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1. for immediate delivery.

BBC ENGINEERING DIVISION APPOINTMENT

The BBC announces the appointment of Mr. T. P. Douglas, M.B.E., as Engineer-in-Charge, Sutton Coldfield Television Transmitting Station. Mr. Douglas joined the BBC in 1938 as a junior maintenance engineer at the Daventry transmitting station. During the war he held a commission in the Royal Corps of Signals and was, for 3½ years, a prisoner of war in Siam. He was awarded the M.B.E. in 1948 in recognition of his services while in captivity, when he was actively engaged in radio work.

Mr. Douglas returned to the BBC at Daventry in 1946. He is well known to many of our readers as G3BA, active on VHF and the communication bands.

THE NOTTINGHAM CASE

Arising from the Editorial in our April issue and following correspondence between the Editor of *Short Wave Magazine* and Mr. C. I. Orr-Ewing, O.B.E., Member for North Hendon, the following question was put to the Assistant Postmaster-General by Mr. Orr-Ewing on April 6:

"Whether it was with his authority that the solicitor prosecuting for the General Post Office in a Nottingham police court stated that amateur transmitters were cluttering up the air and spoiling programmes."

To which Mr. Gammans replied:

"I am glad to have this opportunity of clearing up any misunderstanding that may have arisen. The case before the court related to a transmitting station which was not only operated without a licence but was also worked on a frequency not available to amateurs. The solicitor's comment, of which varying reports have appeared in the press, was to the effect that the air was crowded with transmitting stations of all kinds and unless there was a close check on them listeners' enjoyment would be spoiled. There was no intention whatever to cast any reflection on the numerous able and devoted amateurs who operate within the terms of their Post Office licence and on their properly allotted wavelengths."

These quotations are from *Hansard* for 6 April 55 (Vol. 539, No. 69, p. 107). We may regard Mr. Gammans' statement as satisfactory and the last part of it as an acceptable apology on behalf of the Post Office.

But this does not repair the damage done by the national newspapers, and the more horrific organs of the Sunday press, one or two of which excelled themselves in the crudity and ignorance by which they handled the matter. This was directly due to the misleading statement by the solicitor prosecuting for the Post Office. Therefore, it is now for the Public Relations Department of the Post Office to issue to the press a corrected statement, quoting Mr. Gammans. The necessity for this has been put to that Department and we await action in the matter. Editor

PRETORIA CENTENARY CELEBRATION

This year the city of Pretoria in South Africa celebrates its 100th anniversary. In collaboration with the city council, the Pretoria branch of the S.A.R.L. have got out a special QSL card, which will go to all operators who work a ZS6 in Pretoria. Only a limited number of these cards has been printed, with the idea that they should acquire a rarity value as "collectors' pieces."

Measuring Inductance and Capacity

SIMPLE AC VOLTMETER METHOD

F. HAGUE (ZB1AH)

THERE have been published in *Short Wave Magazine* from time to time many circuits showing instruments that can be constructed easily — and sometimes not so easily — to measure inductance and capacity, all of which are very good. But it is not everyone who wishes to build such instruments as it is sometimes felt that the work involved does not justify their use.

However, in the life of every radio amateur comes the time when he finds, in the junk box, condensers and resistors which either are not marked or with the markings obliterated. Although not generally known, these are easily measured using nothing but an AC voltmeter, the results being quite accurate. To obtain them does require a little mathematics, however, and in case this might deter those not so skilful in the art, then the examples given can be used, and own figures substituted for those shown.

If it is desired to experiment along these lines a condenser (or inductance) of known value can be used and then the figures worked out as a check—and don't be surprised if the figures prove the manufacturers to be wrong!

To find experimentally the inductance of the Choke (L) which has a resistance of 100 ohms, it should be connected across the mains with a 5,000 ohm resistor in series as shown in Fig. 1. (Note that R_{ch} represents the actual DC resistance of the choke.) Measure the voltage across L and the voltage across R with an AC voltmeter and calculate as follows:

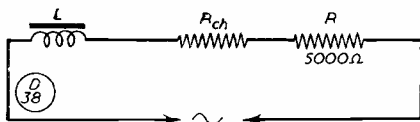


Fig. 1. The arrangement for finding the inductance of the LF choke, the resistor R_{ch} merely representing the internal resistance of the choke and being a quantity that can usually be neglected for practical purposes.

(A) To find the inductance of the choke neglecting R_{ch} , which is usually near enough for average purposes:

Voltage across Inductance equals 150 volts.
Voltage across Resistance R equals 100 volts.
Since the current through the choke and the resistor are equal we have:—

$$I = \frac{100}{5,000} \text{ and } I = \frac{150}{X_L}$$

$$\text{Thus } \frac{100}{5,000} = \frac{150}{X_L}$$

$$\text{and } X_L = \frac{150 \times 5,000}{100} = 7,500 \text{ ohms}$$

which corresponds to an inductance of

$$L = \frac{X_L}{2 \pi f} = \frac{7,500}{2 \times 3.17 \times 50} = 23.65 \text{ Henrys}$$

(B) To find the inductance of the choke including the resistance of the choke then the current is found by Ohms Law.

$$I = \frac{100}{5,000} = 0.02 \text{ amp.}$$

the voltage drop across R_{ch} is

$$E_{ch} = 0.02 \times 100 = 2 \text{ volts}$$

$$E_L = \sqrt{150^2 - 2^2} = 149.9 \text{ volts}$$

$$X_L = \frac{E_L}{I_L} = \frac{149}{0.02} = 7,495 \text{ ohms}$$

which corresponds to an inductance of

$$L = \frac{7,495}{2 \times 3.17 \times 50} = 23.64 \text{ Henrys}$$

Error equals $\frac{\text{Difference}}{\text{True Value}}$

$$= \frac{23.65 - 23.64}{23.64} = \frac{0.01 \times 100}{23.64} \% = 0.04 \%$$

To find experimentally the capacitance of the condenser C (Fig. 2) connect a 25,000 ohm resistor in series with the condenser and apply the mains across the circuit. Measure the voltage across the condenser and the resistor and calculate as follows:

To find the capacity of the condenser given

Voltage across the Resistor 165 volts.

Voltage across the Condenser 173 volts

The current in the circuit is found by Ohms Law.

$$I = \frac{165}{25,000} = 6.6 \text{ milliamps}$$

$$\text{Thus } X_C = \frac{E_L}{I} = \frac{173 \times 10^3}{6.6} = 52,600 \text{ ohms}$$

$$\text{Using } X_C = \frac{1}{2 \pi f C}$$

$$\begin{aligned} \text{we obtain } C &= \frac{1}{2 \pi f X_C} = \frac{1}{2 \times 3.17 \times 50 \times 52,600} \\ &= \frac{1}{10^6} \text{ microfarads} \\ &= \frac{1}{317 \times 52,600} \\ &= 0.05 \text{ microfarads} \end{aligned}$$

It will be seen in the above figures that the resistance of the choke has to be very high to affect the result obtained by this method to any appreciable extent; thus, it can normally be ignored.

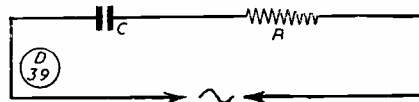
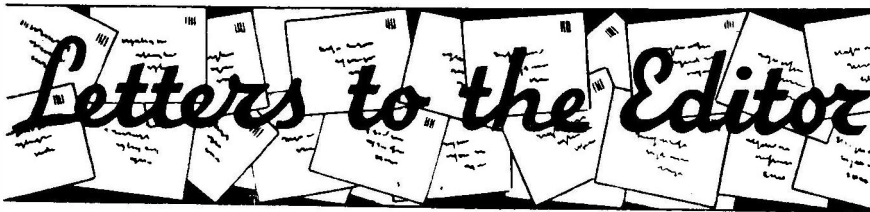


Fig. 2. To find the capacity of the condenser C using only an AC voltmeter, readings of voltage across C and R are taken and calculations made as shown in the text. Accuracy is good enough for all practical purposes and a low-voltage AC supply can be used if that is more convenient.

It should also be remembered that any AC supply will suffice for these measurements, so that a step down transformer can be used should a low voltage meter only be available.



Letters published are those which seem to us to be of general interest, but should not be read as necessarily being in accordance with our own views on the subject. We welcome readers' comments.

THAT NOTTINGHAM BUSINESS

SIR.—May I congratulate you on your Editorial comment in the April issue of SHORT WAVE MAGAZINE. There appears to be a lot of ill-advised and uninformed comment on the rights, status and behaviour of the radio amateur fraternity in the press and the world outside. This last example has been so widely reported that the action you suggest is the only adequate way of redressing the wrongs that have been done. I am sure you have the support of all concerned.

R. A. Parrott, G3HAL, 28 Vicarage Lane, Winslow, Bletchley, Bucks.

SIR.—Thank you for taking up the case of the Nottingham pirate in your April Editorial. When the court proceedings were published, I had plenty to say publicly, myself, on our local Top Band net, knowing that a considerable number of SWL's and BCL's regularly listen to our proceedings. In regard to the value of amateurs and Amateur Radio, let Lord Sandhurst's words in a House of Lords debate on the Wireless Telegraphy Bill be remembered, and repeated: "Radio amateurs are a valuable asset to this country; they are the breeding ground for our

operators of the future, and they are the people who need protection, far more than the ordinary household broadcast listener."

You may well ask what the Post Office were doing to allow the person concerned such a run for his money—though I might add that to get evidence for the prosecution of the first pirate in this neighbourhood (before the war), the GPO had to ask a local amateur for the loan of a receiver that would tune the Top Band!

N. P. Spooner, G2NS, 7 Foxholes Road, Southbourne, Bournemouth, Hants.

As readers can imagine, we have had a number of letters, visits and telephone calls on this topic, unfailingly in indignant support of the Editorial in our April issue.—Editor.

ATTITUDE TO SSB

SIR.—As you are no doubt aware, there is a considerable "anti-SSB" feeling on the amateur bands. In my opinion, this is unjustified and rather petty, and should be exorcised forthwith. In the past there has been some justification for an antagonistic attitude to this form of transmission, but on investigation it would be found that it was caused by the operators perpetrating SSB, rather than by the system itself. Certain of them have chosen to

adopt a rather aloof attitude towards "old-fashioned AM types" and seemed to regard them as museum pieces.

That is where the bad feeling started. Coupled with this was the fact that some of the SSB operators obviously had scant knowledge of the intricacies of the system, even when it came to setting up the transmitter. Consequently, there were some very uninspiring SSB signals to be heard on the 80-metre band. Moreover, few of those concerned had adequate knowledge of SSB reception technique.

Nowadays, however, one has only to tune on to the HF end of Eighty to hear some very fine SSB transmissions, and, with care in the handling of the receiver, many of the signals are of a quality far surpassing that of the average AM output to be heard on the same band. The equipment required for SSB working is, we know, somewhat more complicated than the conventional AM transmitter. But that is no reason for any bad feeling between the exponents of the two systems. Let us have a little more co-operation and mutual understanding—or, if not that, at least an attitude of "live and let live."

W. Shearman, 32 High Street, Brightlingsea, Colchester, Essex.

[Over

ARTIFICIAL AERIAL LICENCES

SIR,—I refer to the letter from G3JOX (see "Cleaning Up The Bands," p.24, March), in which he suggests the return of the AA licence. That is the very best suggestion I have heard for a long time. I feel sure that though the pre-war licence holders gained a certain amount when they were automatically granted full permits in 1946, with the withdrawal at that time of the AA licence, much was lost to Amateur Radio. Beginners were placed in an immediate difficulty. Surely one must learn to walk before one can run.

Nowadays one sees, and hears, taxi companies, the Gas Board, ambulance services and other similar organisations provided with radio-telephones; every day between 5000 and 5250 kc there are Army cadet groups and school CCF stations, with call-signs like AB64 or GB21, transmitting on what appears to be a nation-wide network general chatter and school gossip, and never any Army or similar official traffic. They even exchange some sort of QSL card, too! All this without any technical or operating knowledge being required of anybody!

In the circumstances, while I hold no brief for those who wish to get on the air without any knowledge of theory or the Morse Code, I do feel that some concessionary stepping-stone should be allowed to those who would honour such a concession and use it to obtain a full licence under the present regulations. It would undoubtedly help to produce the type of radio amateur one heard in the old days and, at the same time, give a good grounding to those of us who, no doubt, will be called upon in the event of another war.

I defy anyone to give a single good reason why the amateur AA Licence should not be reinstated. I would like to see the matter pressed to the full with the relevant authority.

R. Winters, 64 Victoria Street, Melton Mowbray, Leics.

We are in entire agreement with the tenor of our correspondent's arguments—though it is fair to

say, in regard to his second paragraph, that the GPO answer would probably be that they have no control or jurisdiction over stations authorised to operate on Army networks; nor should we concern ourselves with activities outside the amateur bands. As to the principle of AA licensing, we would say—as we have done at intervals over the last eight years—that if ever a step backwards was taken in the post-war organisation of Amateur Radio licensing, it was when the G.P.O. were permitted, apparently without argument or opposition, to withdraw the AA Licence. Its provisions were very seldom abused, and some of the best-known calls on the air today started with just such a "non-radiating permit."

However, as we interpret the Act, there appears to be nothing against an individual experimenting with transmitting equipment which (a) Does not cause interference, (b) Does not radiate outside his own premises, and (c) Is not used for actual communication. The Post Office may well have different views, because for commercial purposes they now offer what is known as the "Testing and Development Licence," which is in effect an AA Licence much as we used to know it; the fee is £1 for five years. It would appear that individual experimenters would be covered by this licence—see p.279 of the July 1954 issue of SHORT WAVE MAGAZINE.—Editor.

AMATEUR STATUS

SIR,—Like two of your correspondents in the March issue, I am worried at the way in which Amateur Radio has developed into a "society for mutual admiration." In my opinion, this "ham spirit" business is overdone, and is quite out of keeping with our traditional British modesty in personal relationships when stressed to the extent it is. Of course, it's a good thing to help one's fellows, and to provide hospitality for unknown visitors who arrive without warning—but surely, other hobby-enthusiasts, whether stamp-collectors or bug-hunters, are equally friendly towards their own kindred

spirits? What is meant by the "ham spirit" is not by any means the monopoly of radio amateurs.

In order to keep our frequencies, should we not concentrate more on convincing the authorities of our usefulness?

E. G. Allen, G3DRN, 65A Melbury Gardens, Wimbledon, London, S.W.20.

SIR,—With reference to the comment by GM3IAZ ("What Do You Think?", p.24, March), the amateur may no longer hold the position that he did in the 'Twenties, but he is not entirely forgotten—apart from numerous instances in the electronics industry in this country, one large American valve manufacturing concern actually prefers licensed amateurs for its technical staff. Here in Chelmsford, we hold our monthly meetings in sheer luxury, through the courtesy and generosity of a world-famous radio manufacturing company, members or non-members of the firm itself being offered hospitality on an equal footing.

If we have suffered any loss of standing, it is probably due in some measure to the enormous strides in commercial techniques, with which the average amateur naturally finds it difficult to keep pace. It must also be said that the emphasis we now place on communication pure and simple—tending to make ladder-placings, points and handles almost the be-all and end-all of our hobby—is another reason. To those who revelled in the "string and jampot" days of the halcyon 'Twenties, it is rather tragic to see the technical side of Amateur Radio being thus relegated. If, as is suggested, we have become merely "a pool of operators," then our bed is largely of our own making.

Most of our work today that is of any value is being done on the UHF/VHF bands. But in other fields, as just one example, the conquest of TVI alone is so fascinating, and arduous, that the "plumber-minded" among us can well occupy every minute of spare time for many months.

As for the commercials continuing to operate while we close down for TV, the answer is that we have to live with our neigh-

hours, few of whom are ever likely to experience a commercial station on the other side of the party wall—which is, perhaps, a pity, for then they might learn that it is not only amateurs who can cause TVI!

L. J. Fuller, G6LB, Meadow Brook, Vicarage Lane, Great Baddow, Chelmsford, Essex.

ANOTHER QUESTION OF STATUS

SIR.—I wonder why, in the current literature, the expression "G3-plus-3" always appears in a context that gives it a faintly derogatory odour, a vague atmosphere of inferiority. Your own excellent Magazine is not entirely innocent of this—see p.100 of the April issue.

One is given the impression that "G3-plus-3" is synonymous with *gaucherie*, *inexperience* or *helplessness*. I am a G3-plus-3. My first call was AA in 1923 with two letters. After the Kaiser's war, my first signals were radiated by a spark coil bought for a shilling. The other day, I was in a net on Eighty, recalling the time before broadcasting began, when we strained our ears to hear gramophone records from 2MT on Tuesday evenings or, more exciting still, what was reputed to be a real orchestra from The Hague (PCJJ) on Sunday afternoons.

At least three of the Old Timers in that net were G3-plus-3's. No doubt there are many, like myself, who have found their original call-sign issued to someone else. Quite a number of the present-day G2-plus-2's must be transmitting under re-issue calls, belonging originally to an older generation of amateurs, now long forgotten, with whom many of today's G3-plus-3's were once contemporary workers. So if we cannot purge the expression "G3-plus-3" of its faint tinge of inferiority, let us

scrap it altogether—or are we the exceptions that prove the rule?

G. F. Kellaway, G3BDL, Coker Hill, West Coker, Yeovil, Somerset.

The description "G3-plus-3" as used in SHORT WAVE MAGAZINE, where it originated, is not, of course, intended to be in any way derogatory. It is a term which does clearly identify the recently-licensed amateur (irrespective of his technical status), and that is all it is meant to signify—indeed, we are sure it is accepted as such by the great majority of readers. While, in fact, G3-plus-3's are mainly beginners, and of the younger generation, we are fully aware that they also include physicists, qualified radio engineers, research workers and technicians far advanced in some branch of the radio art. In this, as in so many other matters, it is the exception that proves the rule! And any derogatory meaning that may be inferred by the use of the term "G3-plus-3" in SHORT WAVE MAGAZINE—either now, in the past or in the future—is hereby refuted and denied absolutely!—*Editor.*

YL VIEWPOINTS

SIR.—Why I am glad my husband is a radio amateur: It may be an expensive hobby, but if it is a pleasure to her husband, then the XYL ought to be grateful that he spends his evenings at home instead of going out drinking with his friends, which to my mind can be more expensive than Amateur Radio! If our complaining XYL would only ask her husband not to start a QSO just as she is putting lunch on the table, I am sure she would find that harmony would prevail. That is what I do—and my husband also likes re-building and re-organising his rig, but he also likes to do a few jobs about the house. So for my part I am thankful for Amateur Radio.

Eileen Hawkesford, XYL-G2HKT, 190A Icknield Street, Hockley, Birmingham 18.

SIR.—I was very pleased to see your references to YL's in recent issues of SHORT WAVE MAGAZINE. Whilst serving as an R/T operator in the WRAF in Singapore I met VS1BQ, now my husband. After we were married, I found it was a case of either listening to the sort of radio I didn't understand for the rest of my life, or getting my own ticket. So I became VSIYL. I shall never forget the thrill of calling my first CQ, and getting VS1AQ back—wonderful! When we returned to England we had G calls, mine being G3HSQ and my husband's G3HSR, but we were only home for a few months so had no opportunity to use them.

We have been in Germany for three years now, and both use the same rig; this runs 120 watts CW and 100 watts on phone, operating on all bands 3.5 to 21 mc. The transmitter is completely contained in an AR88 cabinet, the receiver is an SX-28, and we have tried most usual types of aerial; we favour the shortened rotary beam, with the ground-plane as a fairly close runner-up.

Whilst in Singapore I worked our one and only G phone contact, with G3EOG; to my surprise, one of my first QSO's from Germany was with G3EOG; I have also worked G3AAT/OX and was very pleased to get their QSL card. I personally am not keen on DX hunting. I like to get on the air and just talk to anybody who is willing to stay awhile. I have worked all continents, but more by luck than judgment.

I do hope that you will hear from more YL's and perhaps find space to print a few lines about them. I have not made contact with any G-YL's so far, but I am always hopeful!

Jean Smith, DL2YL (XYL-DL2TH), c/o Sergeants' Mess, R.A.F., Buckeburg (Airfield), B.A.O.R.29, Germany.

DX COMMENTARY

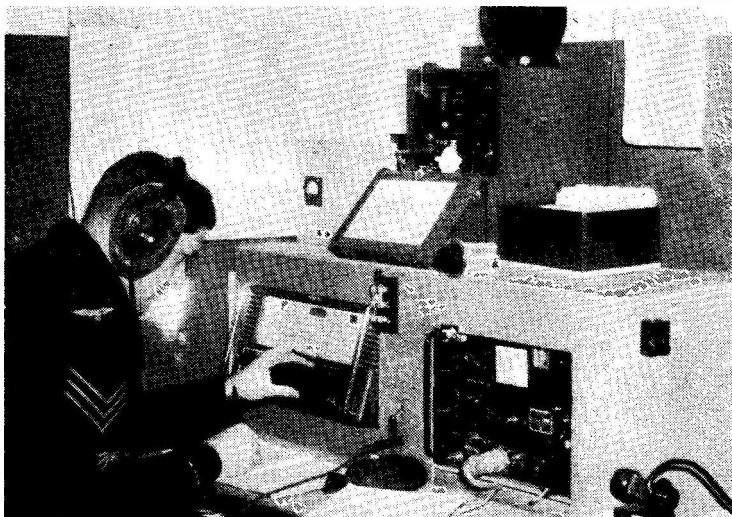
L. H. THOMAS, M.B.E. (G6QB)

THIS seems as good a time as any to remind readers that this feature is, for good reason, called a *Commentary*, and that we should like it to live up to its name. Mere lists of DX worked may be interesting to the few whose ambition is to reach the top of all the ladders and to collect every available Certificate and Diploma, but there is more to the world of DX than that.

To use the old clichè, "DX is where you find it," and what is a real thrill to G3XXX may be just a plain nuisance to G2YYY. Every reader of these pages has his own individual outlook, and we should like to know a lot more about all of them.

This is another way of saying that we don't want anyone to be afraid that his little monthly contribution is not worth sending in. For every amateur who can come on the air and scoop in a few KX6's, VR2's, VP8's and the like with effortless ease, there are many hundreds to whom the working of just one ordinary W6 would be a thrill. Likewise, there are many who are busy looking for a new country (even, perhaps, a European) to work on 80 or 40, and who will be just as pleased when they find it as our DX Ace would be with a brand-new one made possible only by an "Expedition."

So . . . please remember the "Commentary" aspect and don't expect a never-ending series of lists of exotic DX. In this way we shall continue to differ from some of the other "columns" published throughout the world, but we intend to keep it that way,



G3KAY

CALLS HEARD, WORKED and QSL'd

and we already have evidence to show that the average DX-chaser appreciates it.

As a final word, remember that we cannot supply all the Commentary while readers supply the DX! We need your comments on this and that, we are interested to read them, and we will pass them on for the benefit of others.

Around the Bands

If the bands do not seem to have improved very much, at least we don't have to record a recession of any kind. Conditions remain at about the same level, although on *Twenty* they have probably improved a little. With the lengthening days, the hours of DX have also widened out, and it has been fairly common to find the band in a lively state until 2300 or thereabouts. (Now we are on BST it should be open at midnight.) *Fourteen* is open, all right, but under-populated as ever. We comment on this in the appropriate place. *Ten* has

actually yielded real DX signals, mostly on North-South paths.

Top-Band DX

We thought last month's summary of the Top Band Tests had disposed of another season's activity—but no! That band just won't lie down, and we have fresh items of real DX that can't be overlooked.

First, the grand news that VS6CQ and W6KIP finally made it, after weeks of trying. On April 3, at 1300-1325 GMT, this outstanding contact took place—outstanding not only on account of the fact that it was Trans-Pacific, but also because VS6CQ was using only 10 watts, while W6KIP is 600 ft. below sea level, in Death Valley, Calif. Thus is patience rewarded . . . it was VS6CQ's only Top Band contact, apart from ZL and another VS6, in two or three years of trying. During this period, VS6, ZL and W6KIP are the only signals he has even heard on the band!

Our tabulated account of Top Band DX, last month, ended with the morning of February 13. Briefly, this is what has happened since then: On February 16, OK3AL, OK3VV, G3ERN and G3GGN all worked W's; on February 20, TI9MHB provided the main excitement, but G3ERN, 3GGN, 6GM, HB9CM and OK1HI were also getting across; on February 26 G3ERN, 3GGN and 3PU made it, with XE2OK also showing up and causing a bit of a stir.

Several G's worked North America on February 27, including G5JU and G5RI. G3PU worked YV5DE that same morning. By March 6 the band was still open, with G5JU, G5RI and G6GM successful. On March 13 YV5FH showed up on *phone* and worked W0NWX. March 20 brought another new country on, with HK4DP making a "first" with W1BB, and March 27 yet another, with HR1LW and W1BB doing it again for a "first." G13IOS worked W1BB the same morning, and G3PU heard HK4DP and YV5DE. Incidentally, HK4DP's contact with W1BB was his first QSO of any kind on One-Sixty!

G3JOJ (Camelford) writes that only two of his Trans-Atlantic QSO's were made on a 50ft. aerial—the remainder were with a 200ft. wire. But the "Vim" carton was in use throughout! (See p.86, April.)

There is a lot of other news of Top Band DX, which we cannot give in detail. We *must* note, though, that the band was wide open on Easter morning, April 10, when W1BB worked G3ERN, G5JU and G13IOS, and found signals at least as good as on any morning during the winter.

All Top Band enthusiasts will be very sorry to hear that we have the sad duty of listing Clarry Roach, VE1EA, as a "Silent Key." He was one of the pioneers of Trans-Atlantic work on the band, and was almost invariably the first VE that any of us heard or worked on One-Sixty. He died on March 4 after a long illness, at the early age of 47, and he will be sadly missed as a keen amateur, a real Top Band enthusiast, and a good friend. *Vale!*

Other Top Band News

G3IGW made the long trek from Halifax to some of the sterner parts of Caledonia over Easter, and cheered the hearts of many by so doing. At the same time we had portable activity from G5PP and G3IWF in Rutland, G3BHT in Montgomery and G2AJS in Devon. Several correspondents suggest that G3IGW, in particular, might be induced to write a short saga describing the number of contacts each night, how they were dealt with and where they came from.

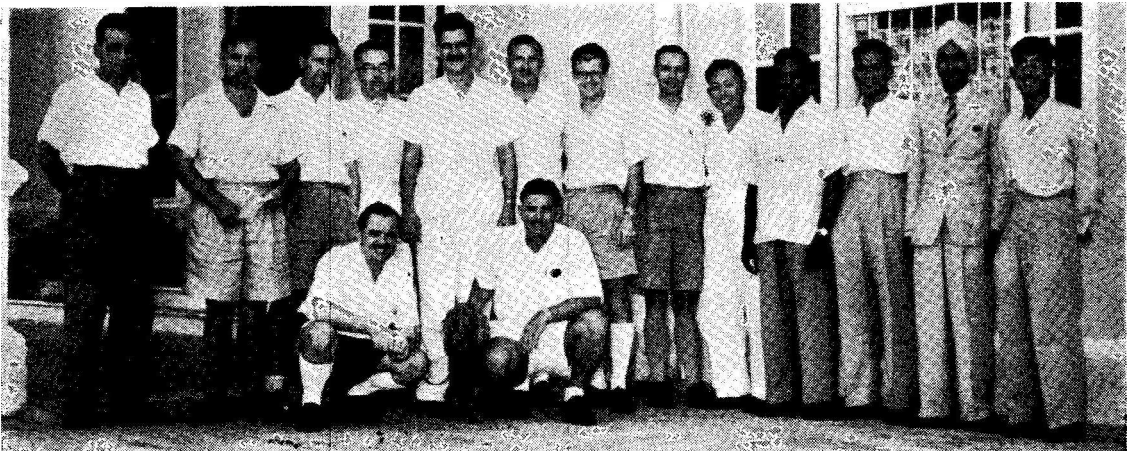
G3HQT (London, S.W.9) was

lucky with GM3IGW/A in Kinross and East Lothian, GW3BHT/A in Merioneth, G3AJP for Suffolk and GW3QN (Caerns.)—and he would like to thank all concerned for their prompt QSL'ing.

We aroused a small storm of protest by giving GM3GZA's address, last month, as "Stornoway Airport, Isle of Harris"—although we merely reprinted what he himself sent us! We should have remembered that the upper part of that Island is known as *Lewis*. And it does make a difference, because Lewis is in Ross-shire, while Harris is Inverness-shire. Thanks to GM3AUD and GM3EFS for giving us this information. GM3EFS adds that Harris and all the Outer Hebrides, plus the Inner Hebrides from Skye down to Eigg, are part of Inverness, while the remaining Inner Hebrides (Mull, Islay and so on) are part of Argyll. It is very important to get the administrative and geographical boundaries right, these days!

G3JKO (Nottingham) worked GM3IGW's three counties from three different QTH's—one from Morden, one from Purley and one from Catford—while he was on his own Easter vacation.

G3HAL (Winslow, Bucks.) passes on cheering news for those whose small aerials have kept them off One-Sixty—he raised GM3HSB, who said he was using



The VS2 group met at Ipoh, Malaya, recently, and in this photograph we see, standing, left to right, VS2's: 2DX, 2DQ, 2DL, 2CR, 2BD, 2DH, 2EB, 2EL, 2BS, 2DY, 2DW, 2EF, 2DN; seated front, VS2DO, VS2DS.

a 66-ft. indoor job. . . . G3JJZ (London, S.E.6) worked OK1JX, who speaks excellent English, for over an hour; the Easter expeditions gave him four new ones, and he also winkled out Ross, Suffolk

and Aberdeen.

G3JBK (Bexleyheath), too, found most of them, and reports F7AK calling CQ and attracting a wolf-pack, but not replying. Probably on Eighty, with a VFO radiating handsomely on One-Sixty. G3FMZ (Keighley) claims WABC and tells us that his 8 watts (to a half-wave Zepp) have brought him ZC4, OH, OK, HB and DL on 160 metres.

GM3AUD is in Inverness, and is also connected with the Club station GM3IXR, active for the last two months and already in great demand. GM3EFS (Alexandria) finds that he has worked about 800 different stations on the band since "County-chasing" became fashionable. About 650 of these were G's, the rest from Europe and the remainder of the U.K. About 600 QSL's have been received in return for 800 sent out.

G3JHH (Hounslow) worked the expeditions and also had some good daylight QSO's over Easter. He wants to hear some activity from the rarer Welsh counties, but compliments GW3QN (Llandudno) on the big sig. from his 3 watts. G3KEP (Bingley) thinks that G3IGW and his team should be awarded a medal or certificate for their outstanding work; 'KEP also found Pembroke, Merioneth, Suffolk and Rutland in his wanderings. G6VC (Northfleet) bumped his score up to 91 worked.

G8CO (Grays) asks that stations working "rare ones" should QSY when they have done so, giving others a chance instead of cluttering the frequency themselves. G2HKU (Sheerness) added some new ones, and was amazed at the signals coming down from GM3IGW/A—never less than 579. He still works PAØPN crossband (160/80) every Sunday.

EI8J (Dublin) asks which European countries are allowed to use Top Band at present. So far as we know, the answer is OK and HA! In addition, though, there are certain special permits issued in HB, OH, YU and SP. G3CO (London, S.E.4) puts himself back on the ladder with 83/87, and would like to find some activity in Dumfries, Berwick and Roxburgh. G3BRL

(London, W.5) lacks Inverness still, and would like a contact. GM3JZK (Isle of Mull) says he is hoping to get up 1000 ft. of wire—if the weather, the chimney and the insulators hold!

A last-minute note from G3IGW himself says that he raised 137 stations from Selkirk, 127 from East Lothian and 132 from Kinross. Over 50 counties and 8 countries were worked, with HB9T and OK1HI as best DX. Weather and conditions were fine, and the customers queued in a most orderly manner. Best daylight QSO was G3KEP (589 both ways) from Selkirk at 1500. There were 44 direct QSL's awaiting Mike when he got back! His own are on the way from the printers. On behalf of all the happy 'chasers, we say "Good Show!"

So much for Top-Band news, and if some of it seems very condensed, please pardon us—we had enough letters to fill the whole Commentary!

Twenty Metres

Some quite nice spells of conditions have been observed on *Twenty*, although nothing terribly exotic has shown up. G5BZ (Croydon) raised ZD8AA, ZD3A and ZD2WAF, the latter being Bill Fenton, formerly of ZD9AA. Others were CE7ZJ, VP8AQ (home call G3ISL), VQ3FN and VQ2RH; gotaways were HKØAI and ZD9AC.

G6VC registered with ZD6EF. MP4QAL, FB8AK and KC6CG, and on March 30 he found an excellent spell of conditions, quite

TOP BAND COUNTIES LADDER

(Starting Jan. 1, 1952)

Station	Confirmed	Worked
G5JM	94	94
GM3OM	93	95
GM3EFS	93	93
G2NJ	91	94
G3HIS	91	93
G6VC	89	91
G3JEQ	87	87
G5JU	87	88
G3HDQ	85	87
G3HIW	84	89
G3CO	83	87
G2AYG	77	78
G3BRL	76	76
G3JHH	74	77
G3FTV	73	81
G3IGW	72	82
G3GYR	69	70
G3JKO	68	79
G3DO	68	72
G3HZM	63	68
OK1HI	62	62
G2HAW	61	70
G3FMZ	60	68
GM3JNV	58	68
G3JJZ	57	69
G3JBK	55	71
G2HKU	55	62
G8CO	49	64
G3FTV/A	47	65
G2CZU	46	47
G3DGN	43	59
G3JJG	42	55
G3FAS	40	49
G3IAD	38	59
G3JZG	33	49
G3JYV	33	48
G3KEP	31	62
EI8J	31	47
GC3HFE	30	44
G3HQT	30	36
G3JVK	24	39
GM3JZK	23	37
G3FNV	17	45



“. . . Di-di-di-Ding-de-Ding . . .”

like old times; in a couple of hours he worked W9's, W6's, 5A, VS1 and KL7.

DL2RO (Hamburg) says that on April 9 (1100-1200) the band was alive with JA's. Four were worked in quick succession and many others heard. FB8BR is still outstanding in the evenings, MP4 is well represented (both B's and Q's), and 4W1AB was an all-time new one (QSL via W4BRB). Others worked included EQ1ND, CR9AH, VS1BJ and FY7YC.

GM3ITE (Glasgow) raised VE8PF on phone—most northerly contact yet. He wonders which is the most northerly shack in the world. VE8PF is 250 miles inside the Arctic Circle, and he had five feet of snow and a temperature of minus sixteen on Easter Day!

DX on Fourteen

This continues to be the problem-band, whatever happens to conditions. Inactivity in most DX parts causes it to seem dead when it is really wide open. Certainly we in the U.K. are doing our share to give it an airing, but when is someone going to co-operate in a big way from overseas? In a QSO with ZC4IP, who was roaring in at S8/9, we gathered that on the previous Sunday he had heard ZD6BX, LU3EX—and a band-full of G's. This confirmed our own experience, since we, on the same day, heard only ZD6BX, LU3EX and ZC4IP!

VS6CQ tells us that he continues to work the band, but



OE6ET, Bruck/Mur, Austria, has worked many G's on 14 mc. He runs a VFO-FD-PA on Forty and Twenty, with 50w, to an LS50, Clamp modulated to a "Short Wave Magazine" design, and the receiver is a modified BC-342N. Aerials in use are a ground-plane, a folded dipole and a 120-ft. long-wire, Collins coupled. OE6ET says he is badly screened by surrounding mountains.

without any real success. He has raised 32 countries, the latest being XZ2OM, who comes on at week-ends only. Incidentally, he returns to the U.K. in November, and it breaks his heart to think of all the gear he will have to leave behind.

DL2RO thinks 21 mc as temperamental or as ill-used as ever, but he found a good opening on April 2, 1700-1900 GMT, when the band was alive with phone from the Middle East, Africa and

South America. ZS3A was a new one, but he was driven off by spiv-tactics. VQ4 and 4X4 stations "dominate the band" most evenings, with little else of note.

G3HCU (Chiddingfold) has made the century on phone, the three latest new ones being FB8BP, CT3AH and ZP51B. Others of note were CE2CC, CX3AA, three VK's, VP8BD and ZS7C. HCU is spending a holiday in Canada later in the year, with VE3ATU/VE3RCS; he has applied for his VE3 ticket and hopes to be operating from there during August.

G3CO often finds that the only stations coming through are a bunch of 4X4's on phone at the HF end of the band. He, too, comments on the nice opening on April 2, when he found some terrific South Americans. G5BZ thought the band perked up nicely over Easter, but there were few new ones to go for. CT3AN and VP8BD would have pleased him, but were gotaways!

The following stations are noted as active on 14 metres, according to the West Gulf DX Club

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

Station	Points	3.5	7	14	21	28	Countries	Station	Points	3.5	7	14	21	28	Countries
		mc	mc	mc	mc	mc				mc	mc	mc	mc	mc	
DL7AA	678	96	159	219	100	104	222	G2BW	368	24	57	144	100	43	165
G6QB	598	52	108	221	82	135	235	GM2DBX*	359	33	31	156	58	81	167
G5BZ	577	62	113	228	109	65	231	G8KU	335	22	50	160	28	75	168
G2VD	511	48	94	180	90	109	189	ZB1KQ	284	6	34	118	64	62	139
G4ZU	504	12	45	212	115	120	216	G8VG	280	36	76	124	18	26	141
G3FXB	492	67	121	181	77	46	187	G3IAD	251	41	88	112	9	1	140
G2WW	488	23	70	190	98	107	198	GM3EFS	189	22	39	96	12	20	105
G3DO	455	24	46	200	78	107	222	G2DHV	172	19	25	110	6	12	113
G2YS	405	59	77	144	79	46	160	G3HEV	43	8	19	14	1	1	26

* (Phone)

Bulletin: VQ2GW, FF8AJ, VP7NX, EL2X, CR6AT, and a few ZL's. It is reassuring to note that even in W5-land they are not hearing much that we don't get ourselves. But GW3AHN (Cardiff) finds them all right—he is bracket-top with 115C, and 90C on phone-only, new ones being ZP6 (CW) and FQ8, ZD3 (phone). He found the band in good shape over Easter, with strong signals from CE3CZ, CP5EK and OA4C.

Whispers on Ten!

Ten metres is stirring in its sleep, and if you spend long enough listening on the band, you are bound to hear something! It's difficult to believe that Ten and Fourteen will be the mainstay of all our DX work in a couple of years or so, but that is undoubtedly true.

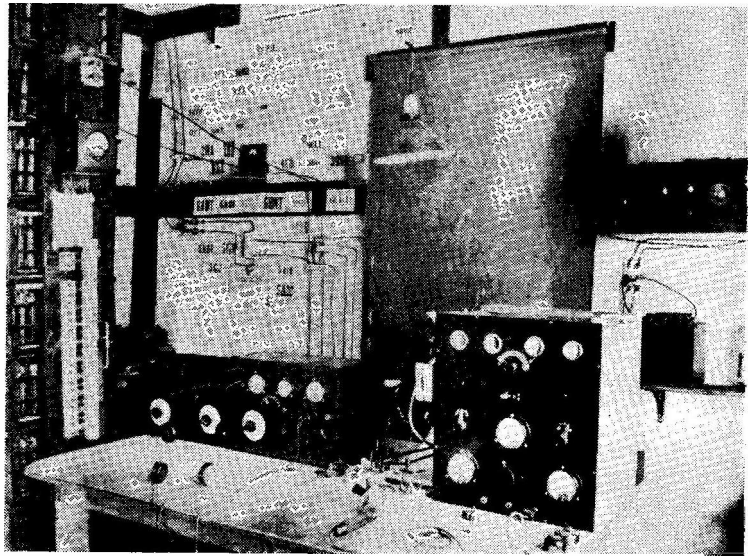
Coinciding, more or less, with the 21-mc opening on April 2 was a distinct awakening of Ten. Between 1830 and 1850 that evening G3IDG (London, S.W.12) heard CX4CX, LU3AAT, 6DJY and 8DDI. On April 10 he noted the following stations being worked or called: CX2CF, 7BA, 2CO, 2CE, 7BH, PY7XQ, 7DD, 4PQ, LU5DC, 7QB, 3AAT, 3CM. And on April 11, at 1400 GMT, a G station was calling OQ5RU. All this activity was on phone, by the way. GW3AHN mentions OQ5RU and ZS3E heard.

Seems to us that some of those ten-metre beams will be whirling madly by the end of *this* year! Spare a moment to look over the band whenever conditions seem good, and you may well surprise yourself.

The Overseas Mail

VU2JP will be home on leave from Travancore, from the end of May onwards, and hopes to contact as many friends as possible. All cards for VU, AC3 and AC4 should still be sent to Box No. 1, Munnar, Travancore, as usual; Nick can be reached *via* The Commercial Bank of Scotland, Edinburgh.

4S7FW has moved to a new address, still in Negombo, and will be active on Forty and Twenty, mostly on phone, running 20 watts to an 807 with two aeri—



VE3GG, Willowdale, Ontario, was licensed in 1919 and its owner is another of our septuagenarian readers. This photograph is actually of the station as it was in 1923, and is described as "the first valve job at VE3GG after giving up spark"! A 10-watt CW/phone transmitter is on the right, with the call sign plaque propped on the two-valve (0-V-1) Reinartz receiver cabinet; the meters read the plate and grid currents and the filament voltage of the detector valve in this receiver — VE3GG says that signals could literally be seen on that grid meter!

dipole for Twenty and a 67-footer for other bands.

DL2TH (BAOR 29) tells us that he is very active on Twenty phone and CW, and has been pretty happy for the past two months. CW brought in JA's, VS6, KA, MP4, FI8, FY, KH6, VP7 and the like; phone raised VS1, XZ2, YV, TF, 3V and I5. Nice ones missed included KC6CG, DU7SV, EL4B, ZD6EF. His present score is 94 — plus several hopes! DL2TH is ex-VS1BQ, and if anyone is short of a card from that station, send details of the QSO and a QSL will be forthcoming. ZD6RM (Blantyre) is GM3EAK, and is on a four-year tour in Nyasaland—his gear is on the way out, and in the meantime he is working round Africa with a B2 suitcase Tx/Rx; he will be on the look out for G's.

The Other Bands

GM3ITE received a card from KP4KD, confirming an 80-metre contact, on which 'KD describes him as the first GM QSO in 42 years! ITE has arranged a sked on Forty with HK0AI (do we

have to remind you that he is on San Andres Island and a "new one"?). The HK is anxious to work a GM, and we only hope the wolf-pack will thin out sufficiently for him to do it. Around 7010 kc at 0300 is the time and place.

A. G. Edwards, an SWL in London, N.12, listened round Forty at 1935 GMT on Easter Monday, and logged 19 broadcast stations in the amateur band. Also he noted that jamming noises are now beginning to spread to the HF end of Twenty, and makes some sinister remarks about "cluttering up the air and spoiling programmes," to use a well-known phrase!

G3JZ mentions a nice three-way on Eighty with G3GVA and OH5NF—the first OH for both of them. G3JHH, running 15 watts, worked YU3ABC after many tries, and is still covering Europe pretty well on Eighty; but he hopes something can be done about the various intruders, otherwise he thinks the band will become useless.

Our appeal, last month, for more entries for the Five-Band

Table has brought in only one newcomer, GM3EFS. He suggests that the lack of reports is simply because the average amateur knows his figures will not compare well with those at the top. But they are pretty sporting with the other ladders—and, after all, the bottom rungs of a ladder are just as important as the top ones. By the way, for the Five-Band Table the score is based on countries *worked* only, not confirmed.

G2NJ (Peterborough) reports a contact with HB9QF/MM, off Cape Finisterre; he was aboard M/S *Basilea*, bound for South America.

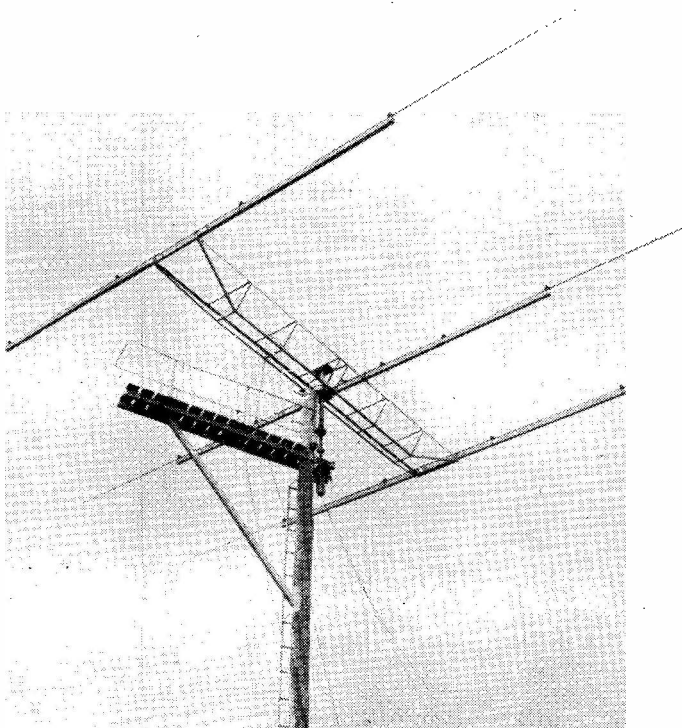
Mobiles

G3FYZ/M and G2DHV/M will be operating on the Norfolk Broads from May 14 to 28; G3FYZ/M (Blackpool) hopes to be mobile around the London area from May 1 to 14, on Eighty and Top Band. G2DHV/A and /P will be on the air in the Burgh Castle, Great Yarmouth and Norwich areas on Forty, Eighty and One-Sixty.

G3WW now has an NZ Mk. II working /M and has been getting some very good ranges, up to nearly 30 miles, on the 160-metre band. The aerial on the car is a loaded whip, and careful tests have been carried out to ensure maximum radiating efficiency. The NZ Mk. II does not tune below 1900 kc, but otherwise has great possibilities for mobile work.

DX Strays

Activity is reported from JZ0AG (Dutch New Guinea), VK9SP (Papua) and VK9RC (New Guinea)—all on Twenty. . . . KC6CG is located on Ulithi Atoll, Western Caroline Is. . . . KG1 stations are U.S. personnel operating from Greenland. . . . A possible YN0 station may operate from Corn Island (status uncertain). . . . St. Martin Island



The 3-element rotary beam for Twenty at VK4HR, Brisbane, is fitted with a cat-walk for tuning up on site.

(PJ2MA) counts as a separate country from June 1. . . . VP8AQ is in South Shetlands.

ON4QX may be going with a Cambridge University Expedition to the Himalayas, and if this comes off he might be signing ON4QX/AC4. . . . VS5CT is good in Brunei, North Borneo, phone around 14190 kc; the same goes for ZC5AC, Christmas Island, CC on 14163 kc; both can be QSL'd via Box 600, Penang, Malaya. . . . And the W6's and W7's may like to know that they are being well heard in Malaya at 1430-1630 GMT.

Modern Glossary

A few interesting additions to last month's collection of mislead-

ing terms have come in. We quote the best:

"*You're 5 and 7/8 old man*" (on Eighty): "I can hardly read you, but I'll try to make out what you're saying."

"*RR OK Vy solid FB*": "Mostly OK, except for QRM, QSB and of course you're going much too fast for me."

"*R*": "Everything OK, down to the last dot—even the extra ones that your El-Bug generates."

That's the sum-total for this month. Next month's deadline is **first post on Friday, May 13**. For the overseas types, the one after that will be *Friday, June 17*. Address everything to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. So, until next time, Good Hunting, 73 and BCNU.

DX ZONE MAP

Copies of our *DX Zone Map*, which is in several colours, is suitable for wall mounting, and gives a lot of useful DX information, are available for immediate delivery at 3s. 9d. post free. Orders to: The Circulation Manager, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

BROADCAST RECEIVING LICENCES

During the month of February, the number of television licences increased by 99,621. 13,916,246 broadcast receiving licences, including 4,407,393 for television, and 265,468 for sets fitted in cars, were current in Great Britain and Northern Ireland at the end of February, 1955.

DX COMMUNICATION FORECASTS

CHARTS FOR JUNE, 1955

R. NAISMITH, M.I.E.E.

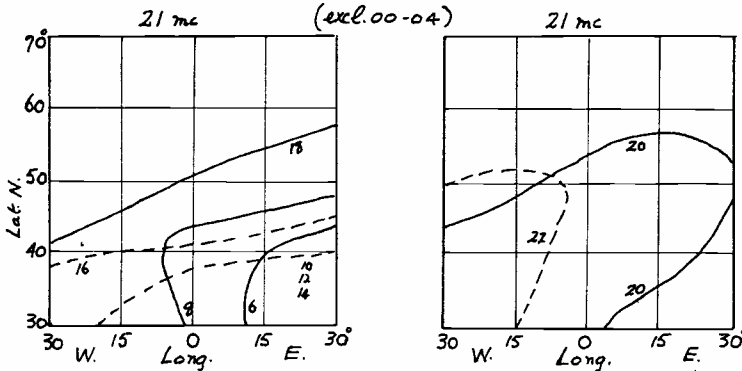
THE conditions which enable long-distance radio communication to be carried on are quite rigidly specified. They depend upon some natural processes which are well known and some which are still

unknown. Both the amateur and the professional must take account of these conditions for successful results. In this particular subject, therefore, the natural variations which occur introduce an element of competition which adds considerably to the interest. It is intended that these notes which accompany the forecasts will enable you to miss some of the pitfalls which are not always very obvious in interpreting the effects of these natural variations.

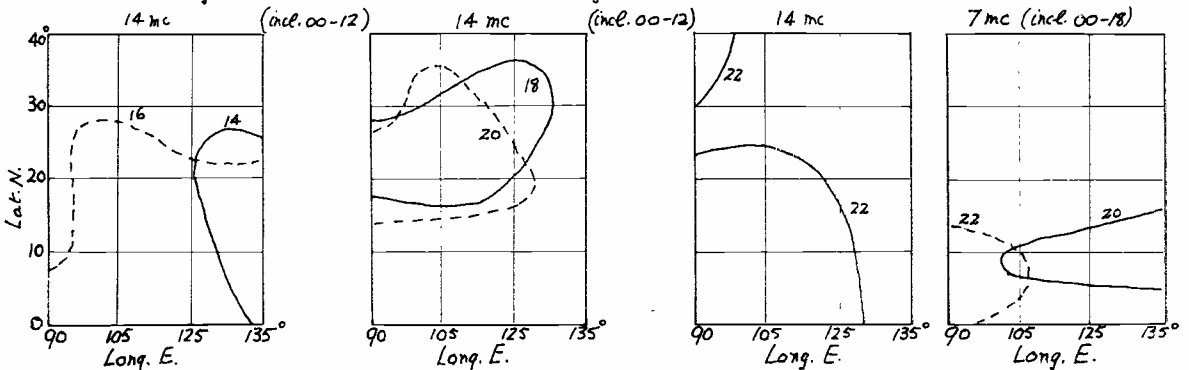
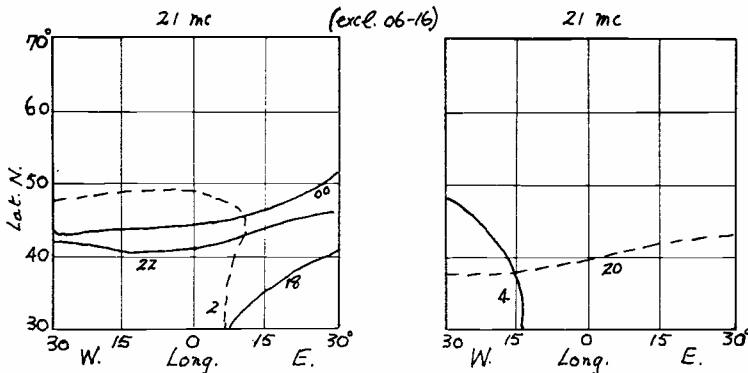
There are two boundaries in this field of radio communication. The lower one depends upon the power and efficiency of the transmitter, including the aerial system. It also depends upon the noise level, both local and atmospheric, at the receiving site. In addition, we shall have to take account of the absorption and reflection properties of the ionosphere.

The upper boundary is, however, much more definite, and we can say that if we pass *this* boundary no increase in power or efficiency which is normally available will make radio communication possible. It is this upper boundary which is provided in the forecasts. Theoretically, all frequencies lower than those specified in the forecasts can be reflected by the ionosphere. Generally, the greater the difference between the frequency specified and the frequency used, the less efficient will be the communication. If this difference is too great, the signals will be completely absorbed and no communication will be possible. It is therefore of particular importance, with the comparatively low powers used in Amateur Radio, to keep as close to the upper boundary specified in the forecasts as possible.

AREA 1



AREA 2



AREA 3

In applying this general rule, we have to remember that the range of frequencies between the two boundaries specified above will vary diurnally and seasonally.

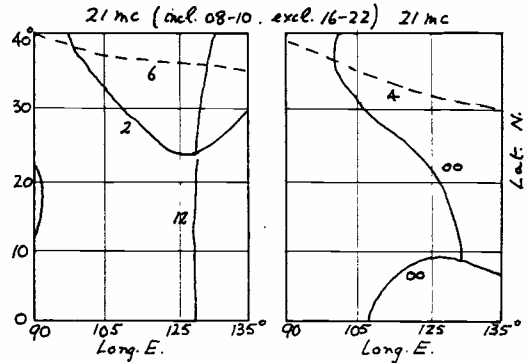
Some examples of the June forecasts were given last month. (Incidentally, the upper latitude quoted in the table for Area 1 should have been 70° north.) The remainder are given here, with the exception of those for Area 4, which will require special description later. In applying the above rule to these forecasts, it will be found sometimes that two frequency bands appear to be suitable for communication over the same circuit, but this should be interpreted as indicating that the *higher* is the one to use.

Twilight Zone

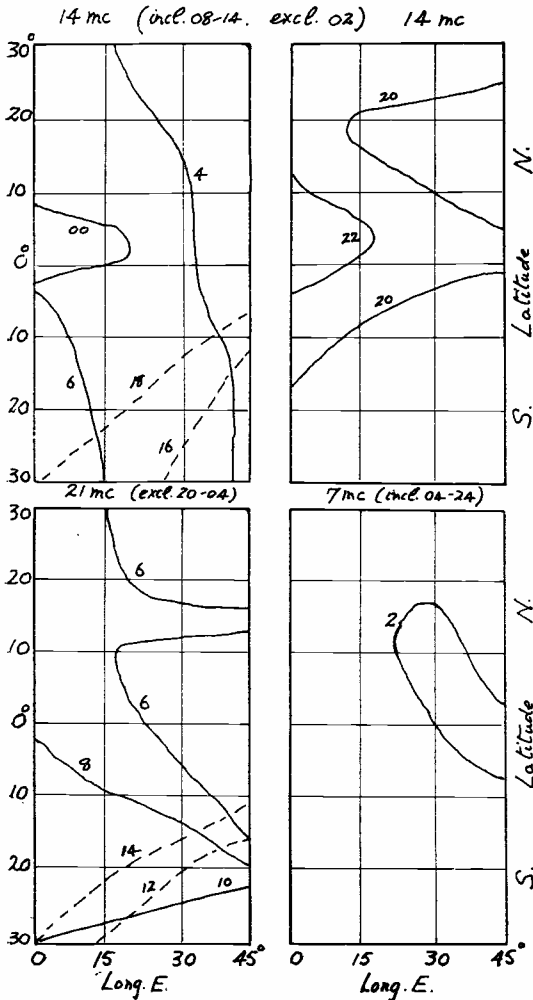
We have dealt with some of the unfavourable conditions for radio communication. Now we may quote a favourable one which exists when the

twilight zone covers the path from transmitter to receiver. There are many examples of echoes travelling several times around the world when this condition prevails. Many consider this zone only applies to transmissions along paths which are

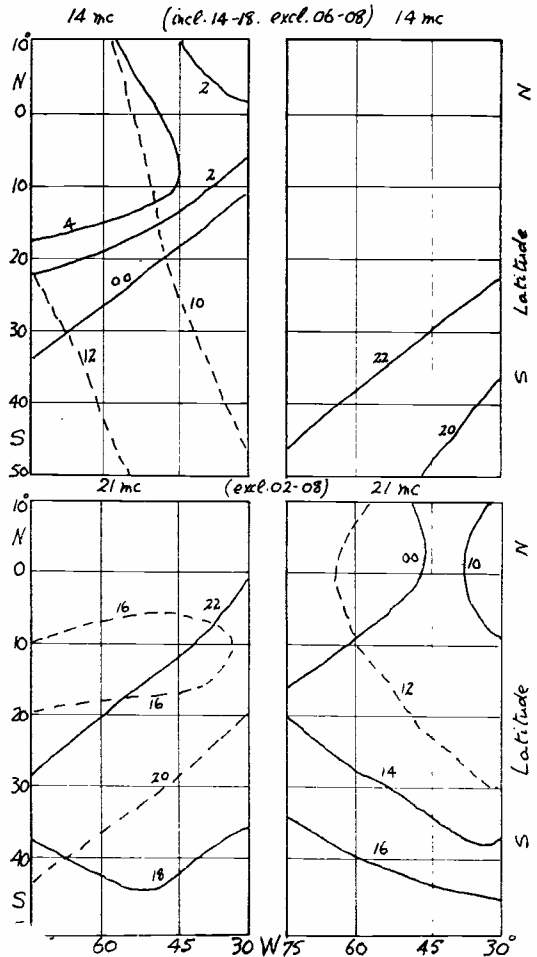
AREA 3



AREA 5



AREA 6



approximately North to South. Actually, this is far from true at times, for on occasion the twilight zone may run almost East-West.

Consider, for example, the midwinter condition on the London to Eastern Canada route. Even at noon we are then only 4 hours from sunrise in London. At that time it will be sunrise in Eastern Canada. So that at about 1000 GMT it is 2 hours before sunrise in Eastern Canada and 2 hours after sunrise in London, which makes the twilight zone extend roughly East-West across the North Atlantic at this time.

Interpretation

In the "two-control point" (see p.83, April) method of estimating the correct frequency to use over a particular circuit, the lower of the two forecast values is used. In all circuit communication to and from this country, one control point must lie within Area 1. In preparing the material, therefore, the forecasts are first made for Area 1; the forecasts made for other areas, which show that higher frequencies could be used in those areas, are discarded, since at such times the conditions in Area 1 will take control of the circuit. This enables us to increase the efficiency of the forecasts provided

by limiting the data reproduced to those which will be of practical use.

(To make the best use of the data given here, the *Zone Map* published by SHORT WAVE MAGAZINE should be available, with the Areas referred to plotted on it. This is easily done by reference to the Table on p.82 of the April issue, which sets out the geographical limits of the Areas. To find the "control points" for the path to be worked, a ruler—or thread-line suspended from the geographical centre of the Map, which is the U.K.—is laid across the Map, and the Lat./Long. determined. Thereafter, proceed as explained on p.83, April.

Note that this is a much more accurate method of choosing band and time for a particular path than the usual "blanket" forecast. A point to bear in mind, incidentally, is whether they are likely to be awake at the other end! For instance, if you find that 2100 BST (which is 20 hrs GMT, or "20" as shown on the curves) is the best time for getting into Zone 28 in Area 3 on the 7 mc band, the question is whether anybody is likely to be on in Borneo, VS4 or PK5, at 4 a.m. in the morning! The time-scale involved in this little calculation, as well as the prefixes for all the Zones, will be found on the *Zone Map* as printed.—*Editor*).

RADIO ASTRONOMY

CONCLUDING EXTRACTS FROM
THE PAPER READ TO THE
ROYAL SOCIETY OF ARTS

by

Prof. A. C. B. LOVELL, O.B.E., Ph.D., F.Inst.P., F.R.A.S.
(Professor of Radio Astronomy, University of Manchester)

The first part of this interesting discussion appeared in our April issue. Here, the author goes into some of the problems of astronomy to be investigated by, and the general programme of work for, his new 250-ft. radio telescope at Jodrell Bank in Cheshire. There will be many readers who will remember Professor Lovell as a distinguished member of the brilliant staff of radar scientists at the Telecommunications Research Establishment, Malvern, during the last war; while there, he was himself responsible for the development of several of the radar devices and techniques which, designed for the effective prosecution of the war in the ether, are now being applied to the new problems at Jodrell Bank.—EDITOR.

THE radio emissions from space are radiated over a wide range of wavelengths. Although the precise nature of the spectrum has not yet been established, it is well known that these radio sources can be detected over a range of wavelengths from a few centimetres to 15 or 20 metres. During the last year or so, however, a great deal of attention has been given to another type of radio emission from

space, which is generated in the neutral hydrogen gas in the Milky Way on a wavelength of 21 centimetres. This is a spectral line, which is emitted when the spin of the electron in the ground state of a neutral hydrogen atom reverses. The possibility that this type of radio emission might occur was first suggested by van de Hulst in 1944, but it was not until 1951 that scientists in America, Australia and Holland succeeded in detecting and measuring this emission. The detection of this spectral line is in itself a remarkable achievement. The hydrogen clouds are tens of thousands of light years distant and contain only about one hydrogen atom per cubic centimetre. Moreover, this change of spin in the atom is only likely to happen once in about eleven million years. It seems, however, that the atoms in their random motions collide every fifty years, and in a collision there is a one in eight chance that this transition will occur.

The success in detecting this line, in 1951, immediately opened up important new possibilities in radio astronomy and visual astronomy. The hydrogen clouds are, in motion, relative to the solar system, and this 21-centimetre spectral line will, in consequence, show a Doppler shift in its frequency. Using this technique, the astronomers at Leiden have been able to study the detailed motions of the hydrogen clouds in the region of the Milky Way, which are obscured from the view of the optical telescopes by the great dust clouds. Whereas a few years ago there was a good deal of speculation as to the exact structure of the Milky Way system, these uncertainties have been very largely removed, and in a few years the Dutch astronomers have presented us with a most remarkably complete description of the spiral formation of the Milky Way system. The

extension of this work to the extragalactic nebulae by the use of larger radio telescopes is eagerly awaited.

The Need for Large Radio Telescopes

Now, these studies of the radio emissions from space are carried out on a wavelength a million times longer than the wavelength of the light waves which are focused by the conventional optical telescopes. The radio waves are unaffected by cloud, fog or daylight, and in this respect the radio astronomer has a marked advantage over the traditional methods of astronomical investigation. On the other hand, because of the long wavelength, it is extremely difficult to achieve any appreciable resolution. The beam width, or the angle of the cone in which the radiation is received, depends on the ratio of the wavelength to the diameter of the telescope. Thus, to achieve the same resolution as a very small optical telescope, the aerials of a radio telescope would have to extend for thousands of miles. The need for the maximum possible resolution in the radio work has been a dominant feature of the technical developments. A great deal has been achieved by special devices in which two similar aerial systems, spaced by several hundred yards, are connected to a common recording equipment. This type of radio telescope, known as an interferometer, has been intensively developed in Cambridge and Sydney, and it was with systems of this sort that the original discovery of radio stars was made.

In an alternative approach, the physical size of the aerial system is increased. There are now several steerable radio telescopes of small size in existence, and the largest is believed to be the transit radio telescope at Jodrell Bank, which has an aperture of 220 feet, but this is fixed to the earth and only a small part of the heavens can be explored. Experience with this instrument soon demonstrated that a completely steerable radio telescope of this order of size was a prerequisite for the further exploration of space by the radio method. The engineering difficulties and expense of such an undertaking are formidable. Nevertheless, the results to be anticipated were such as to enlist the sympathetic interest of many prominent scientists, when the idea was first put forward in 1949.

In conventional astronomical investigations, the telescope has been the crucial instrument for the exploration of space. Successive increases in size have led to more light-gathering power and greater resolution, and although the improvements in auxiliary instruments, such as photographic plates and spectroscopes, have been very important, nevertheless the great advances in observational astronomy have come primarily from larger and larger telescopes. The situation in radio observations is very similar. Whereas large optical telescopes are required to improve the light-gathering power and the resolution, large radio telescopes are necessary in order to be able to pick up faint signals at greater distances from the earth, as well as for greater resolution. The Department of Scientific and Industrial Research and the Nuffield Foundation gave financial backing to this proposal for a large steerable radio telescope.

This telescope, which is now being built in Cheshire, at the Jodrell Bank Experimental Station of the University of Manchester, will have a paraboloidal reflector of steel sheet with an aperture of 250 feet. This moving bowl will weigh 500 tons and, by supporting it on steel towers rising 180 feet above the ground, it will be possible to direct it to any part of the sky. The foundations contain thousands of tons of reinforced concrete to hold the 17-gauge double railway track on which the telescope rotates. The steel towers run on twelve bogies driven by electric motors, and the racks for the elevation movement have been taken from the dismantled battleship *Royal Sovereign*. There are grounds for hope that preliminary tests with this telescope in a fixed position may be made in the autumn of 1955, and that it will be under full powered control in 1956.

Beam Characteristics

The beam width of this telescope will be about 1° when used on a wavelength of one metre, and its power gain will be over sixteen thousand. On the wavelength of the spectral line at 21 centimetres, its beam width will be a few minutes of arc only. The great discrimination and the power gain will be used to elucidate the nature of the radio sources and to plot detailed maps of the sky, particularly in those regions which are obscured by the interstellar dust. In the field of the 21 centimetre emission great importance is attached to the extension of these studies to the extragalactic nebulae. At the moment, it seems likely that the fascination and importance of the problems associated with the radio emissions from space will occupy nearly the whole time of the telescope for the first few years of its working life. On the other hand, it has always been intended that the radio telescope should be used in all aspects of radio astronomy, including those in which radio waves are first transmitted from the earth.

Detection of Meteors by Radio

Prominent amongst such uses will be the study of meteors or shooting stars. Although eight thousand million of these fragments of stone and iron bombard the earth's atmosphere every day, their investigation has always been peculiarly difficult. The streak of light created in the high atmosphere as the meteor burns away is so transient, that the accurate measurement of the velocity and direction by visual means has been almost impossible. The development of photographic techniques has provided the necessary accuracy, but unfortunately the interesting events are often obscured by cloud or bright moonlight. However, a part of the energy of the meteor is used in ionizing the air through which it passes, and the resultant thin column of electrons scatter back to earth radio waves which are sent out on an appropriate wavelength. In the last few years, this radio echo technique for the study of meteors has been brought to a high state of perfection. Methods for the accurate determination of the velocity and direction have been developed, and now at Jodrell Bank there exists an apparatus which can measure

accurately the individual orbits of several hundred meteors a day.

A great advantage of the radio echo technique is that the study of meteors can be carried out without hindrance by cloud or daylight. The discovery that great streams of meteors are active in the summer daytime must be considered amongst one of the most dramatic results of this new technique. These daytime meteor streams move around the sun in orbits of only a few years' period. One stream is almost certainly moving in the orbit of Encke's Comet, but, for the remainder, no relations with other bodies in the solar system have yet been established. It is certain that several of the major meteor streams are in some way associated with comets; on the other hand, the origin of the sporadic meteors remains an enigma. Some years ago there was a prominent body of astronomical opinion which believed that these sporadic meteors were of interstellar origin. The radio echo work has proved beyond doubt that they are localised in the solar system and actually move in very short period orbits around the sun.

The fundamental interest in this aspect of the work is cosmological—where do these meteors have their origin: are they the primeval matter left over from the formation of the solar system, or are they the result of some subsequent cometary or planetary disintegration? On the other hand, the radio investigation of the meteors can be used to measure the physical and meteorological conditions in the atmosphere 50 to 120 kilometres above the earth's surface. Pressures, temperature, scale height, winds, diffusion co-efficients and many other topics come within the province of these investigations. It is obvious that the interests in this aspect of radio astronomy extend far beyond the study of meteors as such, into the ramifications of meteorology, ballistics and high-speed flight at great altitudes. The actual atomic processes involved in the evaporation of the meteor, and the mechanism by which the radio waves are scattered, open up further wide avenues of research in physics.

Study of Moon and Planets

The detection of meteors is possible because they produce an ion trail which is an efficient scatterer of radio waves. In the case of the moon, nature provides no such assistance, and contemporary techniques have to be strained almost to the limit, in order to transmit a pulse of radio waves and record it $2\frac{1}{2}$ seconds later when it has been scattered back from the lunar surface. The radio waves, in this case, make two complete traverses of the ionosphere, and most interesting results have been obtained regarding the rotation of the plane of polarization of the radio wave. The new telescope, with its higher power gain, will greatly facilitate these lunar studies. The spectacular task of obtaining radio echoes from the planets will also be brought within the scope of modern techniques. In this case, enormous dividends will undoubtedly be reaped, including the determination of the rotation period of Venus and a more accurate measurement of the solar parallax.

Solar-Terrestrial Relationships and the Aurora Borealis

Finally, the telescope will be an invaluable asset in the investigation of many aspects of solar-terrestrial relationships. The origin of sunspots is not yet understood, but the phenomena which follow their appearance on the solar surface often have dramatic consequences so far as the earth's radio communications are concerned. The sun itself emits radio waves. These appear to originate in the corona, but when a spot appears on the surface much more intense radio waves are emitted, and these are known to originate in the region of the spot itself. Occasionally when the spot activity is considerable a solar flare forms in the region of a group of spots. The flare itself is generally only of a few minutes' duration, but it initiates a complex sequence of events which are felt on the earth for days afterwards. It is believed that these events result, first, from the emission of intense ultra-violet light; and secondly, from the ejection of great streams of hydrogenous material. The effect of the former is evident within the eight minutes which light takes to travel from the sun to the earth, but the corpuscular streams travel more slowly and take about 24 hours to traverse the 93 million miles of space separating us from the sun.

The intense flash of ultra-violet light creates a new layer of ionization at a height of about 80 kilometres above the earth. Normally, trans-oceanic radio signals penetrate this region and are reflected from either the E or F region of the ionosphere. When the 80 kilometre region becomes ionized, the radio waves are absorbed and there is a sudden and complete cessation of long-distance radio communication. Simultaneously, intense bursts of radio emission from the flare are received, and there is a sudden disturbance in the earth's magnetic field. Fortunately, the flare is of short duration and the ionized layer at 80 kilometres quickly disappears, with the result that normal communication is generally restored within about 30 minutes. About a day later, however, the earth suffers the impact of the more slowly travelling corpuscular streams. These cause serious upheavals in the F region of the ionosphere. Although there is no sudden cessation of signals as in the former case, nevertheless the fading and distortion are such as to interfere very seriously with long-distance radio circuits. In this case, the trouble may manifest itself for several days. At the same time, there are often brilliant displays of the Aurora Borealis.

Although it is possible to give a general phenomenological description of these events, the detailed processes are not well understood. In fact, there is still dispute as to the reality of the corpuscular streams. The new radio telescope will fulfil its part in these investigations, particularly in the study of the radio emissions from the solar flares and sunspots, and in the study of the Aurora Borealis by the radio echo technique. Here, again, the ionized material in the auroræ forms an efficient scatterer of radio waves, which enables auroræ to be recorded and studied under cloudy conditions, and also in

daylight. A direct attempt will also be made to detect the corpuscular streams by radio echo, but in this case one cannot be sanguine as to the result.

Conclusion

British astronomy achieved distinction in the eighteenth and nineteenth centuries, when the Earl of Rosse and Sir William Herschel pioneered the construction of large telescopes. Unfortunately, our country's leadership was doomed to capitulation to those living in a more favourable climate, and in this century the world has looked to the American continent for the startling advances in our knowledge of the universe. Now, by a strange twist of fate, the devices of war have been transformed into a revolutionary method for the exploration of space, independent of cloud or fog. In the study of the universe and nearby space, with its important ramifications in more practical matters, Britain can once more compete without handicap. The greatest radio telescope in the world will soon be operating within these shores, and scientists everywhere now watch it rise to completion, with great confidence.

IRISH RADIO TRANSMITTERS SOCIETY

According to their report for 1954, the I.R.T.S. membership is now 110, with some improvement in the financial position. The lapsed licences are balanced by new issues and, in fact, EI call-signs are now being allocated in the two-letter series EI2AA *et seq.* The new address of the I.R.T.S. (EI) QSL Bureau is: J. Morris, EI6U, 9 Shanrath Road, Whitehall, Co. Dublin. The annual dinner of the society was held in Dublin on January 29, some 70 members and guests being present.

MOBILE RADIO COMMITTEE REPORT

The recent report to the PMG on questions affecting users of commercial mobile VHF services in Band III is very interesting—and it is another warning that we must guard our frequencies against the increasing demand for ether space, even in the VHF region. The difficulties in Band III arise by reason of the blanket decision to clear it for CTV. The effect is to displace a number of established mobile VHF systems operating in the 170-175 and 180-184 mc regions of Band III. The users are classified as municipal and public utilities, industrial undertakings, ambulance and medical services, taxis and trade cars, the press and the Electricity Board, together with a number of single-frequency services, all to be moved to a total of 32 channels in the area 169.85-173.05 mc, with certain "base station" frequencies allotted outside this range. According to the Committee's report, in the London area alone there were already some 2,000 mobile transmitters licensed at the end of 1954—with the expectation of 17,000 being in operation by December 1957! The present cost of what is described as "VHF sets"—by which is presumably meant transmitter/receiver installations—for commercial mobile radio in the 170

mc band is given as about £80. It is estimated that the frequency change now recommended by the Committee will cost something in the region of £50,000. In spite of urgent representations to the contrary, this expense will *not* be met by compensation from public funds and so will have to be found by the established commercial users of VHF mobile radio.

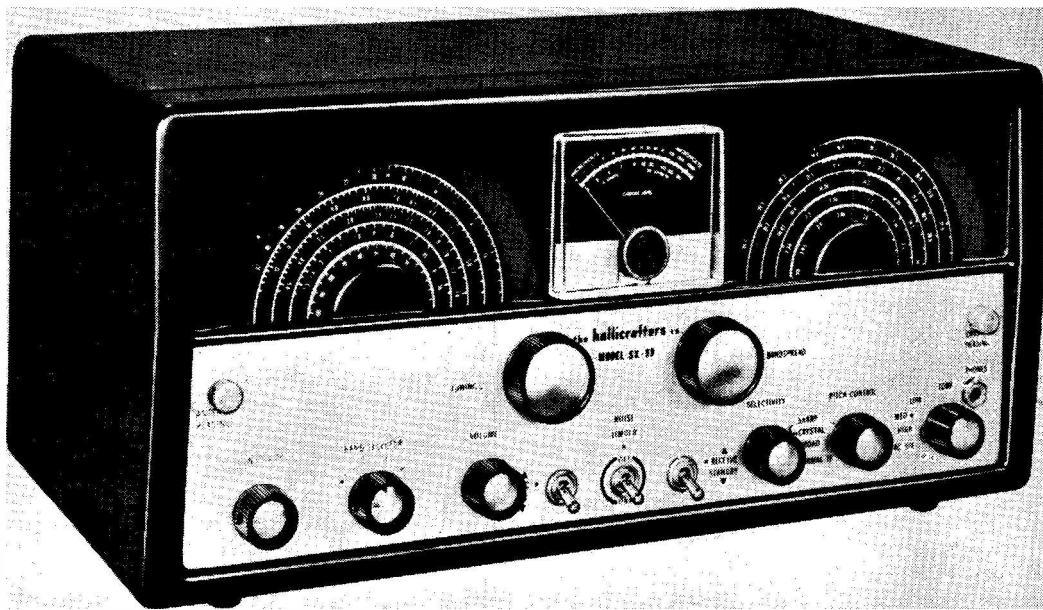
SPRING CALL BOOK

The G-section of the latest edition of the *Radio Amateur Call Book* contains 22 pages of U.K. listings, including all those given in our "New QTH" feature up to and including the February 1955 issue of *SHORT WAVE MAGAZINE*. The price of the *Call Book* (full edition, covering the whole world) is 31s. post free; the Abridged Edition (which excludes only the American section) is 15s. post free. Both editions are obtainable from the Publications Department, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

OBITUARY

It is with deep regret that we announce the death, recently, of Douglas A. Low, GW5WU, of Cardiff, formerly of Penarth, Glam., who will be well remembered as an active operator in pre-war days with a particular interest in DX on 160 metres; he took part in the 1937 Trans-Atlantic with success. Since the war, he had been in poor health and was not able to devote much time to Amateur Radio. A well-known figure in the shipping world, he held many important advisory appointments to the Chamber of Shipping, and was for many years a director and charter manager of Reardon-Smith & Sons, Ltd., who operate a large fleet of modern cargo vessels to all parts of the world. One of GW5WU's most noteworthy contributions was in regard to ships' radio communication. He pioneered short wave working for big cargo vessels in the foreign trade, and insisted on the use of crystal-controlled transmitters and modern receivers, as well as the private ownership of marine equipment where previously shipping companies had been content simply to hire the wireless office, complete with the operator. In Reardon-Smith ships, the status and conditions of the radio operator were long ago much improved, and many of the reforms introduced by Douglas Low in the ships under his control have since been embodied in the conditions of service of radio officers in all British ships. Douglas Low was a man of the utmost integrity, and a hard worker who brought freshness and enthusiasm to everything he undertook. He always said that it was his personal interest in Amateur Radio that had enabled him to see the solution of many problems in the radio equipping and long-distance control of big ships looking for cargoes in the ports of the world.

A.J.F.



General appearance of the new Hallicrafters SX-99, of which some details are given in the accompanying notes. This receiver has calibrated electrical band-spread over the five amateur bands Ten to Eighty, with S-meter (the centre dial), noise limiter and crystal filter.

HOURS OF TV TRANSMISSION

The Postmaster-General has laid down, officially, "hours of TV broadcasting" to equalise matters as between the ITA and the BBC. For the week-days Monday-Friday, the maximum allowed will be 35 hours, with not more than 8 hours on any one day; TV will not start before 9 a.m. nor go on later than 11 p.m. There will be a daily close-down by both the BBC and the ITA between 6 p.m. and 7 p.m. For the week-end period the total allowed will be 15 hours, and only between 2 p.m. and 11 p.m. on Sundays, with a close-down from 6.15 p.m. to 7.30 p.m.

These arrangements will remind many readers of the early days of the BBC itself, when there were well-defined break periods and compulsory silence times—of which the amateurs of those days took the fullest advantage. The moment the BBC carriers were cut after tea-time on Sundays, every amateur transmitter came up—on 180 or 440 metres!

HALLICRAFTERS SX-99

The notes following, and the illustration herewith, while not being in any way a test report on the new SX-99, will nevertheless be of interest to all who know Hallicrafters products and also to those who are familiar with receivers of this type. The wave-range is 1680 kc to 34 mc in three switched bands, with full calibrated band-spread coverage of the 28, 21, 14, 7 and 3.5 mc bands, on a separate tuner assembly having a very wide scale—this is the large

right-hand dial in the photograph above. The valve sequence is RF 6SG7, mixer 6SA7, 455 kc 1st IF 6SG7, 2nd IF 6SK7, ANL, AVC and detector 6H6, BFO and audio 6SC7, output 6K6, and rectifier 6Y3G. The RF input impedance is arranged to be 52-600 ohms, enabling either low-impedance feeder line, direct coupling or an aerial tuning unit to be used; there is an input (aerial) trimmer as an independent control on the front panel, so that the input circuit can be peaked on the band in use.

A crystal filter is fitted, with variable selectivity and phasing, and also an S-meter; the latter is the dial centred on the panel in the photograph. Provision is made for either headset or speaker operation, and maximum audio power output is given as 2 watts.

As illustrated, the SX-99 measures $18\frac{1}{2}$ ins. wide by $8\frac{1}{2}$ ins. high by 11 ins. deep (approximately the dimensions of the well-known SX-24 of pre-war vintage), weighs about 35 lbs., and at present is only available for 105-125v. AC, this being the standard American supply voltage; a small auto-transformer would, of course, run the set quite satisfactorily from our 200-250v. mains.

DIRECT SUBSCRIPTIONS

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ONCE again, it is a tale of better VHF conditions with improving weather—and probably the best DX developments were on March 30 and April 19, on both of which evenings the Continentals were getting well into the North Midlands and the West Country.

During the evening of the 19th, G6NB (Brill, Bucks.) was copying a weak and fading signal from SM6ANR for about an hour, but, as far as we know, the SM made no G contacts*; he was also heard by PE1PL. This is the first report of a Scandinavian signal being received in the U.K. for a very long time, and it was bad luck for Bill that SM6ANR, evidently not expecting DX, was working locals.

**(But see Stop Press.—Ed.)*

Going back to March 30, DL1LB was prominent in the south-east and the Midlands, with F, ON and PA also workable. On April 19, ON4BZ was busy with G's from about 2100 to 0100 clock time, and was a fairly steady signal in the Midlands for the whole of that period.

For some days from April 16 onwards, the glass remained high and steady and the weather was set-fair, but it was cold from the north-east and EDX development was mainly in favour of the southern part of the country, with April 10 and 12. good evenings for GDX, especially to the west.

A number of stations up and down the country came on regularly each evening, with the expectation of better conditions, and there was a decided increase in apparent activity. We say "apparent" because there is now ample evidence that there is plenty of local activity most evenings, the various groups beginning to hear and work one another when conditions allow. On April 18, northerly G's like G3AGS, G3EPW, G3HII (all in Lancashire)—and, of course, G5YV—were getting well down south, while G3IOE up in Newcastle was being heard by G3GHO (Roade, Northants.). On the 19th, G5MR succeeded with G3CCH and G6XM—both outstanding contacts for him because of his badly-screened location in Hythe, Kent,

VHF BANDS

A. J. DEVON

More EDX/GDX Worked—
The Mobile Activity—
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and a certain indication of exceptionally good GDX conditions that evening; apparently, however, they did not extend into GM. At about the same time, GC2CNC was being heard in southern England. On the 12th, G6NB worked EI2W, G13QB and G15AJ.

Much of the story is told in the calls h/w lists herewith, and it is gratifying to see such an encouraging response to the request made here last month for more of them—but we would like to see a wider coverage from the North, from Scotland and from Northern Ireland.

Mobile-to-Mobile "First"

It was mentioned here in December, p.564, that credit for the first mobile-to-mobile contact on Two Metres went to G2ATK/G2HCG, when they worked one another on November 3, while running, and without any prior arrangement.

Now G3FEX (Bramber, Sx.) writes to say that he and G8OS/M "made many earlier QSO's a few days after licences were first

released, and therefore lay a prior claim." Well, that's it, then! The first /M contact on the two-metre band is duly credited to G3FEX/G8OS.

On the /M theme, G2ATK tells us that he is still up and down the country every week, Monday to Friday, and still stirring up local activity every evening; he says he finds stations on nearly everywhere between 6.0 and 8.0 p.m., with more activity developing in the Midlands; Trevor's frequency is 144.79 mc, and just in case somebody may be on, he calls "CQ G2ATK/M" at 1.0 p.m. almost every day and, whenever possible and convenient, puts out a short call at the hour and half-hour during the day. As a result of this regular activity, G2ATK has an impressive log of two-metre stations worked while mobile, some from several different counties.

Another active mobile is G6AG/M, who can be worked from Surrey on fine evenings, and on the way up to Warwickshire for the occasional week-end. Likewise working mobile regularly is G3FEX, who gives G5TZ, 45 miles, and G3HCU, 35 miles, as his best /M contacts yet.

And it is worth mentioning that during the early evening of April 13, G2HCG/M spent a patient hour waiting to break in on a three-way contact on Two between G3CGQ, G5RZ and G6FO—as Bill said, "How I wished I had a VFO on the mobile rig"! However, in the end he raised G3CGQ and was homed in for a personal QSO. If anyone is thinking of claiming a /M record for speed, let it be put down here that on March 26 G2HCG/M was working G5RZ while doing 93 m.p.h. down the A5—though it is fair to say that Bill was doing the driving, not the operating, for, as he says, at that speed in a big car, he had to keep his hands on the wheel and his eyes on the road, while his companion ran the QSO with G5RZ.

In this context, G3FSG/M might be interested to know that he was heard calling "CQ Mobile" at Colliers Wood, and then again at Tooting Broadway

two minutes later, so he may have been just inside the 30-mile limit! As SWL Cox says, you never know who is listening . . .

Contacts and Schedules Reported

In addition to the QSO's and signals-heard already mentioned, on April 19 G8KW worked DL1LB, and G2HCG had good contacts with ON4ZK and PE1PL. G3HHD (Birmingham) did very well to raise DL1LB and was also glad to score with PE1PL.

The G3IOO-G6TA daily check-band schedule has been moved on to 10 p.m. clock time, and as at April 17 had been unbroken since March 10, phone usually being possible; the distance is 160 miles.

Between January 25 and March 30, G3JXN (Highgate, London) kept a daily schedule with PE1PL at 0740 GMT — practically sparrow-fidget for the time of year! Anyway, out of 41 possible attempts, they made solid contact on 32 occasions, with the morning of March 30 giving the highest signal level. G3JXN's only appearance since that date was on April 12, when GC3EBK was heard at workable strength and called a good many times, but no joy.

On March 30, both G3BJQ and G8VN in Rugby were getting an excellent signal, peaking 589, from DL1LB—he faded down and out with them while working G3WS (Chelmsford) after midnight. Also from the Midlands, G3DO (Sutton Coldfield) had three fine contacts that same evening—he raised DL1LB, PAØBP and PAØDOK.

One of the more northerly stations to get EDX on March 30 was G5CP (Nr. Chesterfield), who booked in DL1LB for a new country. Until Bob of G5MA gets settled in his new QTH, the G5CP/G5MA schedule has lapsed; in the meantime, G5CP is having a regular morning meeting, at 0830, with G6XM in York.

We are very glad to see G3IOE (Gosforth, Newcastle) figuring in the lists again; he says nothing spectacular has come his way yet this season, though some southerly stations have "filtered through"—see calls heard; G3NT and G6UJ have been worked for new

TWO-METRE ACTIVITY REPORT

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

SWL Cox, London, S.W.18.

HEARD: G2ABD, 2AHP, 2AHY, 2AIW, 2BPN, 2CZS, 2D2O, 2FSY, 2HCG, 2HDZ, 2MV, 3BRX, 3BSU, 3BVU, 3BYY, 3CGQ, 3CLW, 3CVO, 3DF, 3DGI, 3DVO, 3EGV, 3ENY, 3EYV, 3FAN, 3FD, 3FEX, 3FGZ, 3FPV, 3FQS, 3FSG, 3FSG/M, 3FUH, 3FYY, 3FZL, 3GDR, 3GHO, 3GOP, 3GOZ, 3GSM/A, 3HWJ, 3HXS, 3IIT, 3ION, 3IOO, 3IRW, 3ISA, 3ITF, 3JEP, 3JFR, 3JQN, 3JXN, 3KEQ, 4KD, 4RO, 4SA, 4SDS, 5JO, 5LK, 5RD, 5TZ, 5UM, 5YH, 5YV, 6AG/M, 6AG/P, 6BO, 6FO, 6JK, 6LL, 6LW, 6MB, 6NB, 6OU, 6OX, 6RH, 6SG, 6TA, 6XM, 8BP, 8JP, 8KW, 8LN, 8RW, 8UQ. (March 11 to April 14).

G8DA, Exeter, Devon.

WORKED: G2ADZ, 2DDD, 3CQC, 3FSG/P, 3MU, 4SA, 6AG/M, 6JK, 6TA, GC2FCZ. HEARD: G2AHP, 2AIW, 2BMZ, 2DVD, 2FTS, 2UN, 3AUS, 3DIX, 3FSG/M, 3HXS, 5TZ, 6NB, 8IL, GW8UH. (April 9 to April 17).

G3ITF, Basingstoke, Hants.

WORKED: G2AHY, 2D2O, 2IT, 2YB, 3DO, 3DQC, 3EGV, 3EJA, 3FQS, 3GHO, 3GVF, 3JFR, 3JH, 3DF, 5TZ, 5YV, 6CW, 6JK, 6NB, 6OU, 6OX, 6TA, 6XM, 8UQ/P. HEARD: G2ANS, 2CZS, 2HCG, 3BII, 3FAN, 3ION, 6AG/M, 6XX, 8DA, 8IL, 8KW. (March 13 to April 14).

SWL Ball, Brentwood, Essex.

HEARD: G2AHL, 2AHP, 2AIW, 2BDP, 2CZS, 2D2O, 2DVD, 2HCG, 2HDY, 2MV, 2UJ, 2YC, 2YF, 3BRX, 3BSU, 3BTC, 3CJF, 3CGQ, 3CLW, 3CNF, 3CVO, 3DGY, 3DJX, 3ECA, 3EYV, 3FAN, 3FKG, 3FSG, 3FUH, 3FYY, 3GDR, 3GOP, 3GOZ, 3GSM, 3HWJ, 3IES, 3IYW, 3IRW, 3ISA, 4AU, 4KD, 4OT, 4SA, 5LK, 5RV, 5TP, 5TZ, 5YH, 6AG/M, 6JI, 6JH, 6LL, 6NB, 6NF, 6OX, 6RH, 6TA, 8KW, 8LN, 8RW, 8SC, 8SK. (March 21 to April 18).

G3IOE, Newcastle 3.

WORKED: G3CGH, 3NT, 5YV, 6UJ, 6XM, 6XX. HEARD: G2HOP, 3GHO, 3WW, 5GX, 6NB. (April 1 to April 11).

GW3GWA, Wrexham, Denbs.

WORKED: G2ATK, 3EPW, 3FMI, 3GHU, 5YV, 6FK, 6QT, 6XM, 8BP. HEARD: DL1LB, G2AIW, 2AK, 2COP, 2MV, 3CH, 3CUZ, 3DO, 3EPW, 3GHO, 3GNJ, 3HAZ, 3IIT, 3IOO, 3IYW, 5MA, 5ML, 5YV, 6NB, 6TA, 6WF, 8BP, 8SB. (March 9 to April 16).

G3DO, Sutton Coldfield, Warks.

WORKED: DL1LB, G2ATK, 2COP, 3EGV, 3GHU, 3HAZ, 3HHD, 3ITF, 3IVF, 3JZF,

3KEF, 5HK, 5TZ, 6OU, 6XY, 6XX, PAØBP, PAØDOK. HEARD: G2AOK, 2YB, 3EJO, 3EPW, 3FEX, 3HZF, 3IIT, 3HZF, 4SA, 5JU, 5ML, 5YV, 6FK, 6NB, 6TA, 8VN, PAØFB. (March 29 to April 16).

G3FEX, Nr. Steyning, Sussex.

WORKED: G2BDP, 2DDD, 2DVD, 2UN, 3IAM, 3IPB, 3IIT, 3JEP, 3JHM, 5TZ, 6AG/M, 6RH, 6HM, 8OS/M. HEARD: G2HCG, 3EGV, 3FRG, 3JYV, 4SA, 5MA, 5UM, 6FO, 6NB, 6OX, 6TA. WORKED when Mobile: G2DSP, 2DVD, 2UN, 3HCU, 3JEP, 3JHM, 3JYV, 5TZ, 8OS/M. HEARD when Mobile: G2DDD, 5KW/P, 5MA.

G2BRR, Wootton Bassett, Wilts.

WORKED: G3GNJ, 4AP, 6AG/M, 6JK, 6TA, GC2FCZ. HEARD: G2AHP, 2AIW, 2BMZ, 2DVD, 2FTS, 2UN, 3AUS, 3DIX, 3FSG/M, 3HXS, 5TZ, 6NB, 8IL, GW8UH. (April 9 to April 17).

G3YH, Bristol.

WORKED: G3FKO/P, 3HSD. HEARD: G3FIH, 3GNJ, 4GR, 6NB, 6OX, 6OZ, GW2ACW, 8SU, 8UH. (March 21 to April 17).

G6FO, Maids Moreton, Bucks.

HEARD: G2AIW, 2DVD, 2FTS, 2HDZ, 2WJ, 3BII, 3DJX, 3FD, 3FYY, 3GGJ, 3GHO, 3GHU, 3HXS, 3IJJ, 3JQN, 3KEQ, 3MI, 3WS, 4RO, 5MR, 6NB, 6OX, 6RH, 8KW, 8RW, ON4BZ. (April 18-19 only).

G6TA, London, S.W.12.

WORKED: G2ABD, 2AHP, 2AIW, 2ANS, 2ANT, 2AOK, 2BDP, 2DDD, 2D2O, 2DUV, 2DVD, 2GG, 2HCG, 2HDY, 2YB, 2YC, 3AGR, 3BA, 3BHJ, 3BII, 3BJQ, 3BVU, 3BYY, 3CGQ, 3CRH, 3DF, 3DGI, 3DVQ, 3EGV, 3ENY, 3EPW, 3FAN, 3FD, 3FEX, 3FPV, 3FQS, 3FSG, 3FUH, 3GHO, 3GKD, 3GOP, 3GOZ, 3GSM, 3HHD, 3HZJ, 3IIT, 3IOO, 3ISA, 3ITF, 3IUL, 3JEP, 3JFR, 3MI, 3YZ/P, 4GT, 4HQ, 4SA, 5BM, 5DF, 5HK, 5HN, 5JO, 5KW, 5MA, 5SK, 5TP, 5YH, 5YV, 6AG/M, 6BO, 6CW, 6FK, 6FO, 6GR, 6JK, 6LL, 6NF, 6OU, 6OX, 6XM, 8BP, 8DA, 8DM, 8KW, 8LN, 8PX, 8SC, 8UQ/P, 8VN. (March 17 to April 17).

G3HHD, Erdington, Birmingham.

WORKED: DL1LB, G2AOK, 2AIW, 2ATK, 2ATK/M, 2AVQ, 2COP, 2CVD, 2FXK, 3BA, 3BJQ, 3CKQ, 3CRH, 3CUZ, 3DJX, 3DKF, 3EJO, 3ENY, 3EPW, 3GBJ, 3GHU, 3GKZ, 3GNJ, 3HAZ, 3HXS, 3HZF, 3IOO, 3IUD, 3IVF, 3JGY, 3JZF, 3JZG, 3MA, 5TZ, 5YV, 6FK, 6TA, 6WF, 6XX, 8VN.

HEARD: G2XV, 2BMZ, 3NL, 3FMI, 3GHO, 3IWI, 5BM, 5MA, 5RZ, 6CW, 6XM, 8BP, PE1PL. (March 20 to April 19).

SWL, Coventry, Warks.

HEARD: G2AK, 2ACV, 2AOK, 2ATK, 2ATK/M, 2BMZ, 2BVW, 2COP, 2DCL, 2HCG, 2HOP, 3BA, 3DO, 3ABA, 3AZT, 3BJQ, 3CKQ, 3DKF, 3EJO, 3ENY, 3EPW, 3FAN, 3FUW, 3GGJ, 3GHO, 3GHU, 3GKZ, 3GNJ, 3GWB, 3HAZ, 3HHD, 3IOO, 3IVF, 3JGY, 3JZG, 3KEF, 5BM, 5JU, 5LJA, 5ML, 5SK, 5TZ, 5YV, 6AG/M, 6CW, 6FK, 6NB, 6PO, 6SN, 6TA, 6XA, 6XM, 6XY, 6YU, 8BP, 8VN. (March 16 to April 16).

G3JXN, London, N.6.

WORKED: G2DDD, 2CZS, 2RD, 3BSU, 3BUN, 3CGQ, 3CLW, 3DGI, 3FUH, 3GOZ, 3GSM, 3IIT, 3IYW, 3FD, 3WS, 3WW, 4FB, 4GT, 5LK, 5TZ, 5UM, 6OX, 8KW, 8RW, 8SC, PE1PL.

HEARD: G2AHL, 2D2O, 2HCG, 2UN, 2XV, 3ANB, 3CZU, 3DBP, 3EGV, 3FYY, 3GHO, 3HVO, 3HWJ, 3JHM, 4AU, 4SA, 5IO, 5KW/M, 5MR, 5YV, 6AG/M, 6NB, 8UQ/P, GC3EBK. (March 11 to April 12).

G3BJQ, Rugby, Warks.

WORKED: G2ANS, 2HGR, 2UJ, 2WJ, 3BA, 3WS, 3AZT, 3CGQ, 3CKQ, 3CRH, 3DKF, 3DJX, 3FD, 3FYY, 3GGJ, 3GHO, 3GKZ, 3HHD, 3IEY, 4IJ/P, 5LJA, 5SK, 5TZ, 5YV, 6AG/M (Warks. and Surrey), 6CW, 6TA, 6XM, 6XY, 6YU, 8BP, 8PX/P, 8VN. HEARD: DL1LB, G2ABD, 2AHP, 2AOK, 2BMZ, 2BVW, 2COP, 2HCG, 2XV, 3CVD, 3DJX, 3DO, 3EGG, 3EPW, 3FAN, 3FD, 3FEC, 3FQS, 3FSG/M, 3FUL, 3FUS, 3FW, 3YZ, 3GHU, 3GWB, 3HXS, 3IOO, 3JZG, 3KEF, 3KEK, 4SA, 5CP, 5JU, 5MA, 5ML, 5RV, 6FO, 6NB, 6PO, 6RH, 6SN, 6XX, 8KW, PAØFB, PE1PL. (March 18 to April 17).

SWL, Bridgend, Glam.

HEARD: G2ADZ, 2AIW, 2ATK/M, 2BMZ, 2DDD, 2DVD, 3CGE, 3EGG, 3EGV, 3FAN, 3FWW, 3GNJ, 3HSD, 3YH, 4KD, 4SA, 5BM, 5TZ, 6NB, 6OH, 6OX, 6TA, 6WF, 8DM, GW2ACW, 3EHN, 3EJM, 3KEN, 8SU, 8UH.

G8VN, Rugby, Warks.

WORKED: G2ATK, 2COP, 2DCL, 3AZT, 3BA, 3BJQ, 3CKQ, 3CUZ, 3DKF, 3DGT, 3EPW, 3FFC/A, 3GHO, 3HHD, 3MZP, 3IEY, 3KEF, 5JU, 5LJA, 5SK, 5YV, 6AG/M, 6PO, 6TA, 6XM, 6XX, 6YU. HEARD: DL1LB, G2AIW, 2AOK, 2ANS, 2FTS, 2HDZ, 2WJ, 2XV, 3CGQ, 3DJX, 3EJO, 3FMI, 3FUW, 3GHU, 3GNJ, 3GWB, 3HAZ, 3IIT,

3IOO, 3IUD, 3IUK, 3IVF, 3KEQ, 3WW, 5KW/P, 5ML, 5RZ, 5TZ, 6CW, 6FK, 6NB, 6RH, 6XY, 8BP. (March 15 to April 15).

SWL, Erith, Kent.

HEARD: G2ABD, 2ADD, 2AHP, 2BYF, 2CZS, 2DGY, 2HCG, 2MC, 2MQ, 2VA, 3BRX, 3BOX, 3BSU, 3BTC, 3CGQ, 3CVO, 3DGI, 3DJX, 3EMU, 3EOH, 3EV, 3EVV, 3FAN, 3FD, 3FKJ, 3FNL, 3FPV, 3FSG/M, 3FQS, 3FNY, 3FZL, 3GDR, 3GHO, 3GNN, 3GOZ, 3HT, 3WW, 3JEZ, 3JXN, 3TW, 3VI, 4AO, 4BA, 4CW, 4FB, 4GT,

G6OX, Hampton Court, Surrey

WORKED: F9JY, G2ABD, 2AHL, 2AHP, 2AHY, 2AIW, 2ANT, 2BDP, 2BMZ, 2CZS, 2DDD, 2DTP, 2DTO/P, 2DUV, 2DVD, 2FSY, 2HCG, 2HDZ, 2HG, 2UN, 2WS, 2XU, 2YB, 3ASG, 3BHJ/A, 3BIJ, 3BJQ, 3BPM, 3BRX, 3BTC, 3BYU, 3CGE, 3CLW, 3CNF, 3CZU, 3DF, 3DJX, 3DVG, 3ECA, 3EGV, 3EVV, 3EYV, 3FAN, 3FIH, 3FPV,

3FQS, 3FSG/M, 3FT, 3FUH, 3FYY, 3GDR, 3GGJ, 3GHI, 3GHO, 3GOZ, 3GSE, 3GSM, 3GXG, 3HBW, 3HCU, 3HHY, 3HWJ, 3HZJ, 3IAM, 3IFT, 3IIT, 3ION, 3IPB, 3ISA, 3IUL, 3JEP, 3JFR, 3JJH, 3JQN, 3JXN, 3KEQ, 3ML, 3SM, 3WL, 3WS, 3WW, 4AJ, 4AU, 4GR, 4GT, 4RO, 4SA, 5BC, 5DF, 5DS, 5HN, 5LK, 5JO, 5KW/P, 5TZ, 5UM, 5YH, 5YV, 6AG, 6AG/M, 6BO, 6CW, 6GR, 6LL, 6NB, 6NF, 6OU, 6RH, 6SG, 6TA, 6TA/P, 6XH, 6XM, 6XX, 8BP, 8CK, 8KW, 8KZ, 8PX, 8RW, 8UQ/P, GWSU, 8UH. (January 17 to April 15).

stations. G3ITF (Basingstoke) was pleased to raise G5YV "at long last." G8DA (Exeter) writes in again after a long silence, with a calls h/w list, and says that both he and GC2FZC found that mid-day conditions on April 11 and 14 were better than during the evenings of those days.

GC2CNC (Jersey) is on once more and reports hearing G3IIT (Cambridge) and G4KD (London), with G5TZ "his usual RS-59." DL1LB was certainly covering the country on March 30; the next report is from GW3GWA (Wrexham), who was copying him 569 on peaks; calls were, however, fruitless.

EI2W started up again on April 11, finding EI5Y and GI3GQB, with GI3GXP worked on the 13th. Others heard or worked by Henry on his new 24-element array, all during April 14-20, were: EI6A, G2CBR, G2NY, G3GZM, G3HII, G5AU, G5YV, G6NB, G6WF and G6XM—the latter a consistent signal in Dublin.

Some Equipment Notes

G3HHD (Erdington, B'ham) has a Cascode-HRO receiver, the transmitter is EL91-6BW6-6BW6-832, and the beam, to the design by G2HCG on p.597 of the January issue of SHORT WAVE MAGAZINE, is a pair of slots with four reflectors, fed with 150-ohm air-spaced coax through a quarter-wave matching section; this beam is at a mean height of 32 ft., 383 ft. a.s.l., and on it G3HHD could give DL1LB 579.

G3JXN (London, N.6) has a Cascode, exactly as described in the March 1952 issue of SHORT WAVE MAGAZINE, into an S.640; the PA is an 832 at 25w., and the

beam a 4-ele wide-spaced flat-top. G3BJQ breaks away from the "Rugby tradition" by changing over to an outdoor beam assembly, with improved results to the South, but apparently no great change in the northerly direction, due to house screening.

G6OX (Molesey, Sy.) is an Old Timer, but has been on two metres less than four months—he runs a modified ex-RAF Type 50, which is the transmitter unit of the TR.1143 equipment, with the basic circuitry unchanged and the original pair of TT11's in the PA, at 18w. The beam is a skeleton slot assembly, spaced full-wave (again as the design in our January issue), and the receiver is a CC converter, 6J6-6J6, into a CR101A tuning 26-28 mc. G6OX remarks that by changing the slots from the original close spacing to full-wave separation, he gained about one S-point on both transmission and reception. (G2HCG recommended full-wave spacing in his discussion on VHF slots.) Incidentally, G6OX puts in a very comprehensive calls-worked list, covering three months' activity.

G3IOE (Newcastle) has done a big job of beam construction—he now has a 20-element affair, consisting of four 5-element Yagis in one wavelength square; quite a ponderous erection, that must be. Anyway, it has greatly improved his results (which is the main thing), and he is now on S8-9 terms with G5YV and G6XM, under almost any conditions. GC2CNC (Jersey) has a 4-ele Yagi at a good height, and his main receiver is now an Eddystone S.750.

G3FEX (Bramber, Sx.) sends a detailed description of his equip-

ment, divided into three separate sections—home pitch, /A and mobile. At home he runs a 3E29 at 90 watts on 144.91 mc, with full modulation using a pair of TZ40's; the beam is a 4-ele flat-top, motor controlled; and the receiver a CC converter into an AR88D tuning 28-30 mc. At the /A location, an 829B is run at 55w. on 144.138 mc, 807 modulated, the aerial is a ground-plane, and the receiver an 11-valve double conversion superhet, or a National 1-10. The mobile transmitter is EF91-EF91-QV04/7-832, Clamp modulated by a 12AU7, and run at about 10w. input; the aerial is a ground-plane on the car, with a 3-element knock-down beam assembly for /P working. The mobile receiver, designed for the job, is the "G3FEX Special"—a 14-valve two-conversion superhet with CC oscillator, built into a box only 5 ins. by 7 ins. by 9 ins.! The /M power supply gives 300v. 120 mA from the 12v. car battery.

SWL Offerings

This month, we are joined by five SWL's, all of whom send useful calls-heard lists. "Squiggle" of last month turns out to be SWI Juleff, of Erith, Kent, who mentions hearing G5MR, S9 at lunchtime on Easter Monday when working G3EMU. SWL Lee (Bridgend, Glam.) hears the stuff when conditions allow, and SWL Drybrough (Coventry) discusses his new rotatable bi-directional 8-element stack; he says it "shows extensive areas of noise, mostly in desirable directions." He is putting a second RF stage on the converter to bring the front-end gain up, since he gets best signal-noise ratio when the neutralised triode-connected 6AK5 RF stage is made slightly regenerative, suggesting a lack of gain at signal frequency.

SWL Ball (Brentwood, Essex) has been working hard on the converter in order to get the most out of his "much thwarted R.1155"; a coaxial front end gave no appreciable improvement, due, he thinks, to "lack of precision in construction." A 70-centimetre receiver is in hand, using a design of B.A.T.C. origin.



Photograph taken at the Scottish VHF Dinner in Glasgow on March 30, which was attended by nearly all the GM's active on VHF, as well as by EI2W, G3BW, G4KD and GI5HV. At centre, receiving the Irish trophy, is GM6WL (right). To the right of GM6WL in the photograph is EI2W. The meeting is reported as having been a great success.

SWL Ball brings up, very properly, a point also made by several transmitting operators this month—the gabbled call-sign on quick change-overs, making it very hard to identify the station. The operator who signs clearly and distinctly is such a pleasure to hear that it

SEVENTY CENTIMETRES

ALL-TIME COUNTIES WORKED
Starting Figure, 4

Worked	Station
26	GW2ADZ
23	G3BKQ
18	G2XV
16	G6NF
15	G4RO
14	G3HBW
13	G3IOO
11	G2HDZ, G5YV
7	G2HDY, G3IRW
6	G3FAN, G3JMA
5	G3FUL
4	G2DDD, G3JGY

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

baffles us why everybody does not try to do it; because two phones are in S9 contact, it does not mean that they are S9 to everyone else. SWL Cox (London, S.W.18) says he was getting very good signals from G5TZ at the end of March, and that his reports to G2HCD and G3XT show that these calls are being pirated on Two.

Comments out of Context

“Unfortunately, I have got some BCI and TVI and have been trying to clear it without much success” (G6TA) . . . “In the middle of house decorating, so sha’n’t be active for a few weeks” (GW5BI) . . . “G5YV was 579 with the beam east instead of north, so may be this is going to be a good spot” (G2BRR) . . . “Owing to the fact that I will be spending May-June delivering babies at the Royal Free Hospital, my two-metre activities will be curtailed somewhat; if I am heard on the air it will reflect a falling birth-rate!” (G3JXN) . . . “France keeps the equivalent to BST all the year round, so we are level with her again; a good time to look for F’s is about 7.30 p.m. (G5MR) . . . “I have the prob-

lem of interference from the harmonics of local TV receiver oscillators; I can usually count upwards of a dozen, from S1 to S9, at the LF end of Two” (G3YH) . . . “My one regret is that I did not venture on Two before; I am meeting so many OT friends and a notable contact was with G5TZ—our only previous QSO had been on 440 metres, in 1922!” (G6OX) . . . “I have had an offer from a local amateur for tuition in Morse” (SWL Drybrough) . . . “Most spare time is being devoted to getting phone going in case we have a few decent openings” (G3IOE) . . . “I am now out of the RAF and so very much more active on Two” (G3ITF) . . . “Keep me in the Tables; perhaps with luck I’ll improve my position” (GC2CNC) . . . “I will be scouting round for a possible /P site on the Horseshoe Pass in Denbigh, 2000 feet a.s.l.” (GW3GWA) . . . “Outside my shack window the SHORT WAVE MAGAZINE shrub *Forsythia splendens* has burst into bloom—a harbinger of Spring and better conditions on Two” (G5MR).

[The old man was quite moved.]

when we showed him this.—
A.J.D.]

... "Notch me up one more on the 70 cm ladder—I have worked G3EGV for Hants." (G2XV) . . . "A particularly elusive station in a wanted county is G2HCG, Northampton, called time and time again" (G3JXN).

This and That

G8DA reports G3MU as a new station on, also in Exeter. Anent G2ADZ's lack of results and G3FYY's suggestion (see last issue), GC2CNC quotes his own experiences, on 14 mc, after moving a short distance in Jersey; from the first, apparently more favourable, location he could work nothing; from the second, much worse to look at, everything was possible. G8VN gives

TWO METRES

**COUNTIES WORKED SINCE
SEPTEMBER 1, 1954**

Starting Figure, 14

From Home QTH only

Worked	Station
40	G5YV
38	G3GHO
35	G2FJR
34	G5MA
33	G6TA
29	G3BJQ, G3WW
28	G3FIH
26	G3FYY, G5DS
25	G8VN
24	G2CZS
23	G2DVD, G3DO
22	G3IIT
20	G2ADZ, G2AHP, G3DVQ, G3HWJ, G3IRA, G5JU
19	G3HHD, G3ITF, G5BM
18	G3DBP, G3IER
16	G5MR
14	G2HDZ, G3EGG, GM3DIQ

Note: This Annual Counties Worked Table opened on September 1st, 1954 and will run for the twelve months to August 31, 1955. All operators who work 14 or more Counties on Two Metres are eligible for entry in the Table. The first list sent should give stations worked for the counties claimed; thereafter, additional claims need show only counties worked as they accrue. QSL cards are not required for entry in this table.

STOP PRESS ** EDX REPORT SM6ANR

Writing from Gothenburg, SM6ANR says he was aware of the opening on April 19, when he was getting good signals from LA and OZ in the early evening. At 2200 BST, G6XX (Howden, E. Yorks.) was worked at 569, and G6NB heard (and called) on a long CQ. Another G, on about 144.85 mc phone, who said he was "20 miles south-east of London with a 4-over-4," was heard but not identified due to fast signing, and could have been worked 559 on CW. (Let that be a lesson to somebody!). No other G's were logged at SM6ANR, but Continentals worked during the evening of April 19 were DL1LB and PE1PL, with DL3QH, DL3VJ, DL9ARA, ON4BZ and PAØBX received at a workable level. SM6ANR watches conditions, is on the look-out for G's, and can be found on 144.43 mc; he has a 4/4/4 array, a good receiver and runs 120 watts, CW and phone.

G3DTG, Birmingham, as a new station on, G3AZT in Rugby as re-activated, and G5UF, Dorchester, as coming on again shortly. GW3GWA says that for 103S worked he has so far only managed to acquire 48 cards. All-Time Counties is squeezed out this month by pressure on space.

A new annoyance in the two-metre band is the greatly increased strength of the umpteenth harmonic, at about 144.9 mc, of one of the BBC's overseas service transmitters at Daventry; the beat is strong enough to obliterate some stations on or near that frequency. Representations are being made; no doubt the trouble will be cleared in due course, because the same BBC transmitter also throws a strong harmonic in that part of Band III in which CTV is to appear—in fact, the beat is uncomfortably near to G9AED, the Belling-Lee experimental TV transmitter on 194.75 mc.

The French now have a national two-metre band plan, based very much on that originated in these columns some years ago and subsequently adopted as the "British Isles Two-Metre Zone Plan"—see p.38, March. The country is divided by frequency areas, each about 200 kc wide, the northerly French stations being in the zones 145.2-145.35 and 145.35-145.5 mc, the Paris region on 144.8-145.0 mc, and the southern area on 144.3-144.5 mc. None of this need concern us greatly, because what most G's are interested in is to be able to work any French station,

irrespective of where he may be in the band. The same applies to us, *vis-a-vis* the Continentals.

VHFCC Application

Your A.J.D. rubbed his eyes a bit when an application for VHF Century Club membership came in from JA1AN, Tokyo, who is a Japanese national. Up to this point, nothing unusual—but the claim is in respect of 100 different JA stations worked, all on the 50 mc band, and all in the last two years, with the cards to prove it! Until now, we did not even know that the JA's had the inestimable benefit of the six-metre band, let alone that there could be so much activity on it. But there it is, all in accordance with the rules, and, of course, we are delighted to issue VHFCC Certificate No. 179 to Shiyō-zō Hara, Shinjūkoku, Tokyo, with an expression of our respect and admiration for his remarkable feat.

His cards themselves are naturally very interesting; from them one can see that, by and large, the JA's are using modern equipment, with beam aerials in most cases. Nearly all transmitters are controlled and receivers are mainly superhets. There are just a few SEO stations, using wabblers, squish receivers and what are described as "dublet ants."

JA1AN himself runs 250 watts to an HK257B, plate modulated with 120 watts of audio; his receiver is given as "6AK5 converter with HRO," and the beam is a 5-element Yagi, motor controlled. Apparently, the station is on six metres exclusively. Over

TWO METRES**COUNTRIES WORKED**

Starting Figure, 8

- 15 G4MW (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, ON, OZ, PA, SM).
G6NB (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, ON, OZ, PA, SM).
- 14 G3GHO, G5YV, G8OU, ON4BZ
- 13 G3BLP, G3CCH, G5BD, G6XX
- 12 G2HDZ, G2HIF, G2XV, G3WW, G6LI, G6RH.
- 11 G2AJ, G3ABA, G3IOO, G4RO, G4SA, G5UD.
- 10 EI2W, G2FJR, G2FQP, G3BK, G3EHY, G3FAN, G3GHI, G3HAZ, G5DS, G5MA, G8IC, GW5MQ.
- 9 G2AHP, G3BNC, G3FIJ, G3WS, G6XM, PA0FB.
- 8 G2XC, G3GBO, G3GSE, G3HCU, G3VM, G5BM, G5BY, G5ML, G5MR, G8SB, GM3EGW

London VHF Meeting

A one-day UHF/VHF convention is being arranged in London for Saturday, May 14, at an inclusive charge of 20s. for lunch, dinner, exhibition and the meetings. Tickets and full details can be obtained from: P. A. Thorogood, G4KD, 35 Gibbs Green, Edgware, Middlesex.

The Tabular Matter

At this point, and under this heading, your A.J.D. would like to take a few lines of space for his periodical bleat about claims for the Tables and the setting out of calls h/w lists. On separate sheets of paper, *please*, and not

mixed in with the body of the report. And could we have a little more attention to the preparation of call lists? DJ/DL, EI and F come before the G's, and ON, PA and SM after; call-signs should be in strict alphabetical and numerical sequence, with the prefix given once only, but the numeral every time. If not using a typewriter, take care to differentiate between Z and 2, between U and V, between I and 1, and between D and O! Put your call-sign and location (only) at the top of the sheet and the date area at the bottom.

In fact, write out your list, taking as much space as you like, in exactly the form in which you see it in print, as we ask every month! If everyone did this, and used a separate sheet, they can be pasted up and sent to the printers as received, which saves your A.J.D. hours of precious time at a critical stage in getting the issue to press. If lists are scribbled out anyhow, it means that they have to be prepared for the printer, involving much furious typing effort. Remember, the printer can only set what he is given; if you leave out a numeral, or a comma, it has got to be put in (by A.J.D.) before the neat, complete and accurate form in which you see the "Activity Report" can be achieved.

This month, the calls h/w lists were pretty rough, one way and another, and, with few exceptions, they had to be sorted out and re-

70-CENTIMETRE FIRSTS

G/DL	G2WJ-DL3FM	10/8/53
G/F	G3DIV/A-F8GH	5/9/51
G/GD	G2JT-GD3DA/P	26/8/51
G/GW	G4LU-GW2ADZ	5/7/50
G/ON	G3DIV/A-ON4UV	15/10/51
G/PA	G3DIV/A-PAPON	15/10/51
GD/GW	GD3DA/P-GW5MQ	29/7/51
GI/GD	G13GQB-GD3DA/P	14/6/53
GM/GI	GM6WL/P-G13FWF/P	9/9/53
GW/EI	GW2ADZ-EI2W	10/7/54
GW/ON	GW2ADZ-ON4UV	3/3/53
GW/PA	GW2ADZ-PA0NL	1/7/53

typed. (On this occasion, G6FO elected to put in a list of some locals he happened to hear, and it would be no exaggeration to say that his effort was the messiest of the lot.)

And So—

Boiling a little, we come once more to the bottom of the tray, in the hope that this piece has covered all the ground; told you, perhaps, a few things you didn't know; and convinced you that Two Metres is a happy, active band on which it is good to be alive! "The dopes," as some of our Continental friends would say, for next month should be in by **Monday, May 16 certain** (and that doesn't mean Tuesday or Wednesday will do!), addressed: A. J. Devon, "VHF Bands," Short Wave Magazine, 55 Victoria Street, London, S.W.1. With you again on June 3, all being well—and that is as early in a month as we can be.

MOBILE RADIO INSTALLATION AT CORYTON OIL REFINERY

The transport section of the Coryton Oil Refinery, owned by the Vacuum Oil Company Limited, has recently been equipped with a comprehensive VHF radio installation. This provides two-way communication between the vehicles and a control station at transport headquarters. Such a system is particularly useful in oil refineries where emergencies, when they arise, have to be met with the minimum of delay, since breakdowns are liable to be exceptionally expensive and dangerous. The equipment is also proving useful for general administration purposes and has stepped-up day-to-day operating efficiency.

The VHF equipment was supplied by The General Electric Co. Ltd. The system takes in the whole refinery and also covers the ground set aside for future extensions. The control station is in the transport manager's desk and is linked to a fixed

station transmitter/receiver which is installed in a small room at the top of the 300-ft.-high Thermofor catalytic cracking unit. Two aerials connected to this equipment are mounted on the rail at the top of this unit.

The transport section at Coryton includes a Land-Rover, a shooting brake, some general purpose mules, and pipe-carrying trucks, an ambulance, a fire engine and a foam tender.

POSTAGE — PLEASE NOTE

Due to heavy postage charges, we must ask that all correspondence to which a reply is expected should be accompanied by a stamped addressed envelope. This need not, of course, apply to correspondents' reports for our various activity features, to which in the ordinary way no individual reply is given.

CC Converter for Two

SUPERIOR PERFORMANCE AND SIMPLE DESIGN

H. E. SMITH (G6UH)

The design discussed here will be of great interest to those looking for yet another two-metre converter which will work well and is relatively simple to construct. It incorporates some novel features which are nevertheless well proven in commercial VHF practice. Provided the main receiver used as IF/AF amplifier is fully effective on the HF tuning range of 24-26 mc approximately—and many receivers are not—this converter will give a very good account of itself—Editor.

WHEN the writer commenced on the design of the converter described below, it was with the determination that the finished model should embody all the following features :

- (1) No highly expensive valves or components used in its construction.
- (2) Maximum sensitivity with low noise.
- (3) A very high order of stability.
- (4) Manually controlled oscillator injection to ensure 100% efficiency on weak signals.
- (5) Manual tuning of RF and mixer stages, to give peak performance on any part of the band.
- (6) A circuit design free from complications, and constructionally simple.

After some months of careful experiment with almost every type of input circuit known for VHF work, the system incorporated in this converter—a modified “Cascode”—is put forward as being far and away the best for high sensitivity coupled with low noise. If some parts of the circuit appear somewhat unorthodox to the experienced VHF man, the writer assures him that extremely careful measurements were made, and the general design as finalised appears to be the best that can be evolved around the valves used (keeping in mind point No. 1 of the specification).

In short, all the six requirements as called for above have been met, and here is a converter which is neither too expensive nor too difficult to build, with a performance which will be found exceptional.

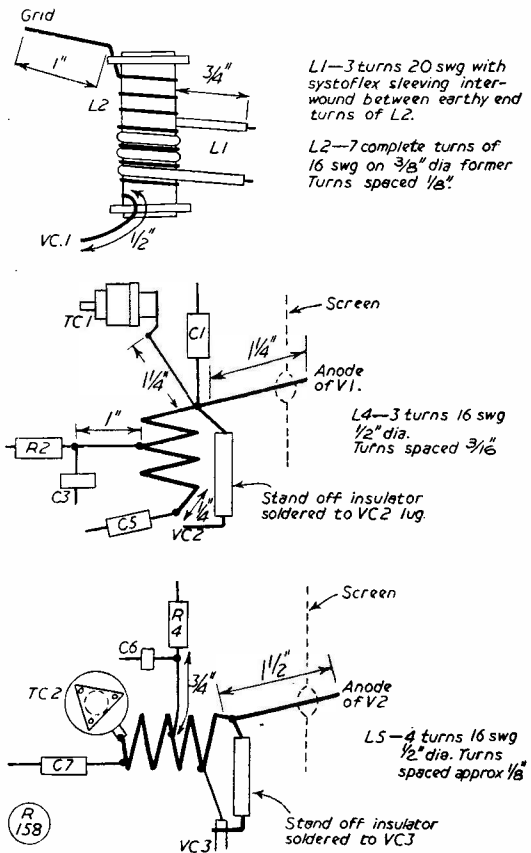
The Circuit

Those familiar with VHF circuits will recog-

nise the typical “cascode” appearance of the RF section. The grid coil of V1 is series tuned. This allows for a maximum of inductance, with a consequent larger signal voltage developed across it. L1, tightly coupled to the grid coil, provides good matching for a balanced feeder (100-300 ohms), while the co-axial socket can be used for feeders of between 50 and 75 ohms. In either case, the tuning condenser VC1 is adjusted for resonance on signals. Neutralisation is accomplished with L3 and C1 (see further notes on this adjustment).

The coupling circuit between V1 and V2 has a very high “Q.” L4 is effectively earthed to RF at its centre point and thus forms the anode coil of V1 and the cathode coil of V2, each half being resonated independently. The circuit is such that when VC2 is brought fully into resonance, such a high “Q” is developed that regeneration can be made to take place.

It is interesting to note that there is no deterioration of the noise figure as the regenera-



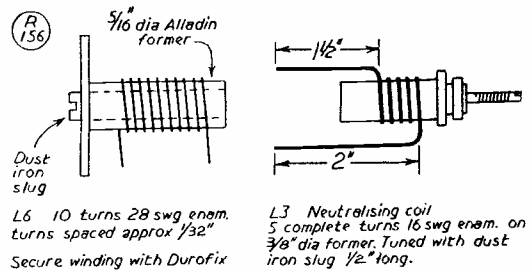
Details for making the RF coils L1, L2 (top); the second RF coil L4 (centre); and the mixer input coil L5 (bottom), showing the appropriate connection layout and the physical dimensions achieved in the author's model.

tion is built up (see RF measurement figures). L5, second RF anode and mixer grid coil, is also earthed to RF at its centre point, tuned by VC3, and coupled to the mixer grid by a 3-30 $\mu\mu\text{F}$ TC2 trimmer adjusted to approximately 2/3rds full mesh. This arrangement serves to improve the impedance match into the mixer and to offer a high impedance to any IF signals which may have filtered through.

The IF coil L6 itself is well decoupled, with its output fed into a cathode follower stage. This provides for further attenuation of IF signals and at the same time allows good matching to the main receiver. (The arrangement shown is for operation into a 50-ohm coaxial aerial socket on the main receiver. For 75-ohm input, the cathode resistor R10 could well be increased to 150 ohms.)

The Oscillator

The oscillator is an overtone circuit operating on the fifth overtone mode, together with a x4 harmonic amplifier. This particular circuit was selected because any crystal works well in it, and there is no necessity to use special overtone crystals. 6 mc was chosen as the most suitable frequency to use, as it brings the oscillator output close to 120 mc, thus giving an IF of

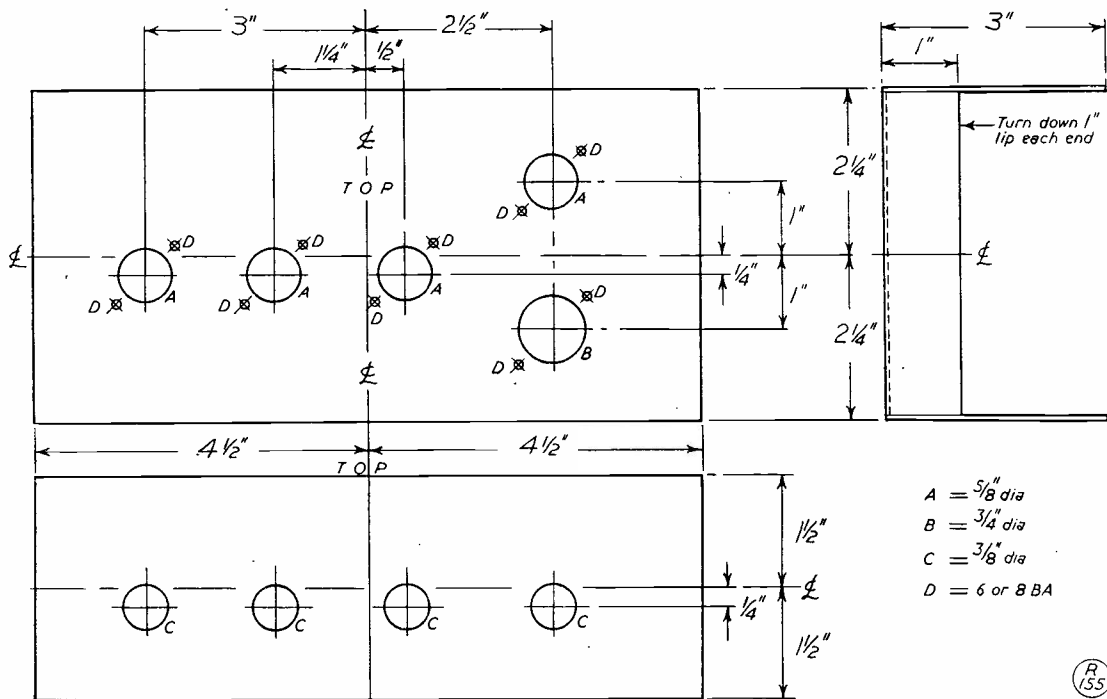


Windings for L3 (right), the neutralising coil for the first RF stage, and L6 (left) the slug-tuned mixer coil, which should be peaked at about 25 mc.

about 24-26 mc. An added advantage of this type of oscillator is that no beats are present on any frequency lower than the fifth overtone, so there is no trouble from "birdies" or unwanted beats in the required IF range. Oscillator injection is via a 2.2 $\mu\mu\text{F}$ condenser C7 to the junction of L5 and TC2, and the actual level of voltage injected is controlled by de-tuning L8 on the parallel condenser VC4.

Chassis

Efforts have been made to keep the chassis details to a simple pattern, with no involved mechanical operations. The drawing shows



Chassis dimensions and main drilling details for the Converter as designed and constructed by G6UH, and of which photographs will appear in our next issue. The experienced constructor of VHF receivers will be able to proceed on the information given here, or may even wish to use a shell already at hand.

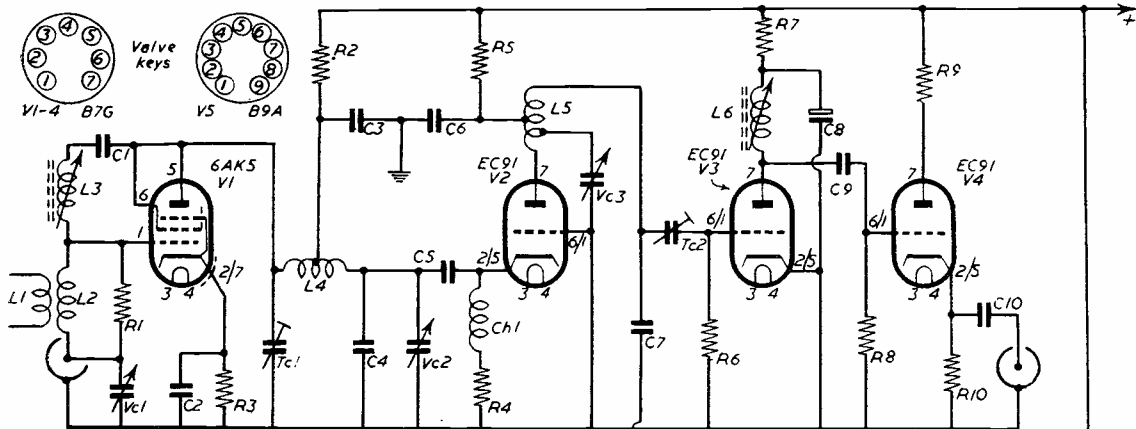
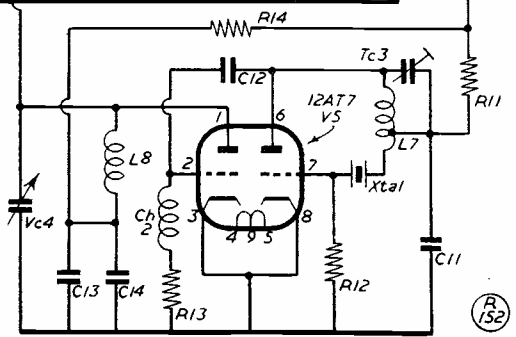


Table of Values

Circuit of the CC Two-Metre Converter

- | | |
|---|---|
| VC1, VC2, VC3, VC4 = Polar 25 μ F. with $\frac{1}{4}$ in. spindle | C12, C13 = 50 μ F silver mica |
| TC1, TC2, TC3 = 3-30 μ F concentric trimmer | C14 = 0.1 μ F tubular mica |
| C1 = 150 μ F silver mica | Heater By-Pass Capacities |
| C2, C3 = .003 μ F tubular (Hunt's midget type) | V1 and V2 = .003 μ F tubular (Hunt's midget) |
| C4 = 12 μ F silver mica | V3 = 270 μ F silver mica |
| C5 = 270 μ F silver mica | R1, R13 = 100,000 ohm $\frac{1}{4}$ -watt |
| C6 = .01 μ F tubular | R2 = 10,000 ohm $\frac{1}{4}$ -watt high stability type |
| C7 = 2.2 μ F silver mica | R3, R5, R7, R9, R10, R14 = 100 ohms $\frac{1}{4}$ -watt |
| C8 = 4 μ F electrolytic | R4 = 68 ohms $\frac{1}{4}$ -watt |
| C9 = 100 μ F silver mica | R6, R8 = 470,000 ohms $\frac{1}{4}$ -watt |
| C10 = .05 μ F tubular | R11, R12 = 2,300 ohms $\frac{1}{4}$ -watt |
| C11 = .005 μ F tubular | |
- Ch1 = 13 inches of 26 swg. enamelled copper wire, wound on a ceramic $\frac{1}{4}$ -watt resistor (1,000 ohms or above)
 Ch2 = 50 turns of 30 swg. DSC wire wound on $\frac{1}{4}$ -watt resistor as above
 Heater chokes as Ch1
 Xtal = 6 mc, standard ex-AM type



Circuit of the two-metre converter designed by G6UH, using a neutralised triode-connected 6AK5 in the RF stage followed by an EC91 as a grounded-grid RF, with an EC91 mixer. V4 is a cathode follower, for accurate matching into the main receiver. A 12AT7 is used as oscillator-multiplier; with a 6 mc crystal, the IF tuning range is approximately 24-26 mc, depending on the multiplied crystal frequency at the 5th overtone. A degree of regeneration can be obtained on VC2 and the input is peaked on VC1.

the principal drillings and layout of valveholders and tuning condensers. A sketch of the screen dimensions is also given. Two of these screens are required, and as only one wire passes through each, almost the whole of the wiring can be completed without difficulty and the screens fitted last of all. Some may like to fit a base plate, but this is not at all necessary as the unit is exceptionally stable and free from any body capacity effects (except when one's hand is placed right on the crystal).

Wiring

The LT wiring is No. 20 SWG tinned copper with systoflex sleeving. Earthing points are made to the chassis near each valveholder, but an earthed LT lead is also run from valve to

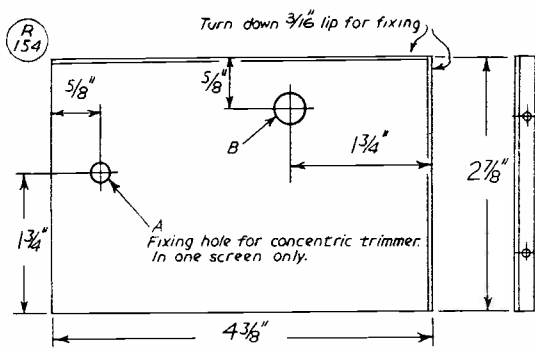
valve. This minimises earth current effects, which may cause instability.

A separate earth lead is taken from the input socket to the rotor of VC1 to ensure a positive connection, as a poor earth on VC1 will give rise to a great deal of noise. The heater chokes should be mounted at least an inch apart if placed parallel to each other.

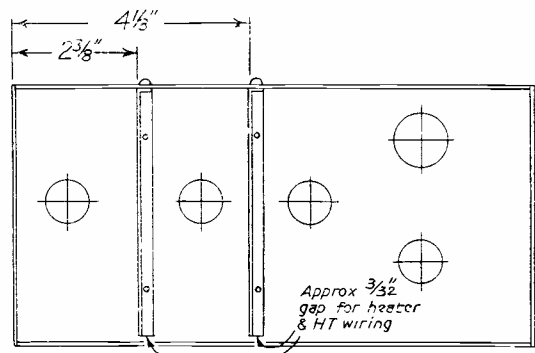
As far as possible, keep all LT and HT wiring well clear of any RF component.

Inductances

Follow the sketches very closely and keep rigidly to the lead lengths specified, because, as every VHF man knows, the lead connecting a coil to its associated component is actually part of the inductance. In the case of L4, for instance, the associated leads form nearly one quarter of the required inductance. The coils are mounted directly on to the tuning condensers. Small stand-off insulators with a brass



INTERSTAGE SCREEN
Two identical except for drilling "A". Drill "B" to take 1/4" grommet.
Material: Dural or aluminium 3/64 or 1/16.



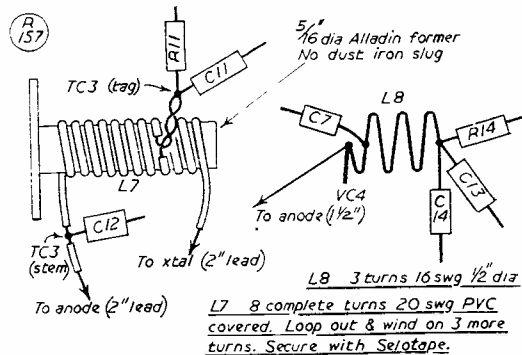
Detail and positioning of the screens, this being an underside view of the chassis. It will be noted that a minimum of wiring is taken through the screens (see text).

fixing foot and tinned lug are quite useful for this purpose. The foot is soldered on to the stator connection of the condenser, and the lug used as a soldering point for the coil.

Setting Up For Operation

When the converter is ready for test, connect HT and LT, and output to main receiver. Set main receiver to around 30 mc. (Note. The 5th overtone is not exactly 5 times the frequency of the crystal, but plus or minus a few kc.) Adjust TC3 until a strong beat is heard on the receiver. Check that this is a pure crystal controlled note. If it is not possible to hear any oscillation throughout the whole of the range of TC3, the crystal may be an inactive one. The remedy is to increase the turns on the crystal section of L7, i.e., 4 turns between HT tap and crystal instead of the three shown in the drawing.

Having obtained oscillation on the correct frequency, connect aerial feeder and set VC1, 2 and 3 to minimum capacity. Set the main receiver to 25 mc and adjust the trimmer in



Winding data and connection layout for L7, the CO coil (left), and L8, which resonates around 120 mc and is air-tuned by VC4, in effect a pre-set control (see circuit diagram).

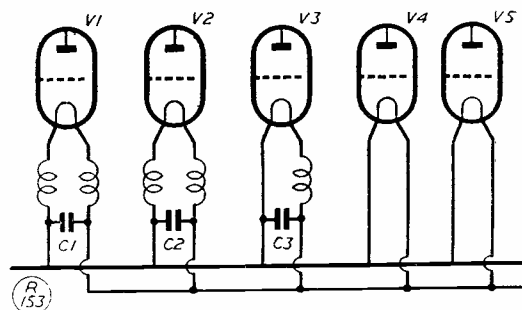
the neutralising coil until no self-oscillation occurs when VC1 is rotated 180 degrees, with the other two tuning condensers, VC1 and VC2, set to minimum. Adjust TC1 for maximum hiss level.

Peak up L6 (by adjusting the dust-iron trimmer) for maximum noise. Adjust VC4, the tuning condenser across L8, and note the rise in hiss level. Leave this set at the point of loudest hiss (maximum oscillator injection).

Signals should now be heard when the main receiver is tuned over the 24-26 mc portion of the band. Peak for maximum signal on VC1, VC3, and VC4. VC2 is only used to peak up on very weak signals. For correct setting of VC2 and VC4, tune in a weak signal, peak up on VC1 and VC3. Now adjust VC4 for maximum response and finally, carefully turn VC2 towards maximum capacity until the signal level rises. If the capacity of VC2 is increased too far, self-oscillation will occur.

Gain and Noise Figures

The writer never had a great deal of confidence in performance figures given for par-



Heater wiring for the two-metre converter, in which C1, C2, and C3 is 270 μF, and C1, C2, and C3 are .003 μF, and C3 is 270 μF. Details for the heater chokes are given separately.

ticular types of VHF converters—especially in regard to noise factor. The noise diode is a fickle piece of gear, quite capable of producing different readings from day to day, and when measurements of gain are made with signal generator and valve voltmeter, it is rarely possible to repeat readings taken at low levels.

However, the following checks on the Converter described here were made several times and the figures as given are average readings:

Overall Noise Factor	—3.9 dB
Gain. Aerial to Mixer	
Grid	—26 dB (VC2 min. cap.)
Gain. Aerial to Mixer	
Grid	—33 dB (VC2 half-mesh)
IF Attenuation	—50-55 dB

Signal-above-Noise Comparisons :

(Made on Weak Signals only)

- (1) Converter 6J6 P/P RF. EC91 GG, 6J6 P/P Mixer: Noise S4, Signal S5
- (2) Converter EC91, EC91 GG. 6J6 P/P Mixer: Noise S4, Signal S5.5
- (3) Converter Described Here: Noise S3, Signal S6 plus

Tests were carried out during the same

listening sessions, using only carriers capable of producing S5 signals on Converter (1). Observations were repeated several times, and on different stations. It is evident that the new Converter shows a satisfactory improvement over the other types, which are typical of those used at many amateur stations.

Power Supply Requirements

A fully-stabilised HT supply is essential. This should be capable of delivering 25-30 mA at 120-150 volts. If the input voltage is too high, mixer noise will increase and the performance of the converter will be adversely affected.

During several weeks' of testing, from the writer's location at Cowes, Isle of Wight, the Converter as described has consistently outperformed the other two "front ends" available for comparison; they have been in use for many months and were thought to be a little better than most. Northerly GDX stations, over 200 miles from Cowes, can be resolved on the new Converter, whereas they are little more than audible carriers on the others. And all this on a 3-element indoor Yagi.

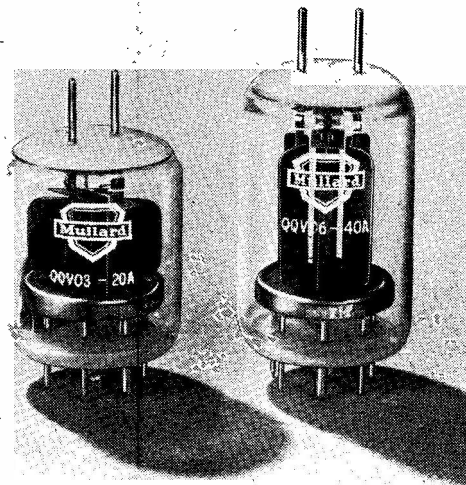
MULLARD VHF DOUBLE-TETRODE TRANSMITTING VALVES

The well-known advantages of screen-grid valves for high frequency amplification has led to the widespread use of tetrode valves in radio transmitters. In order to preserve the good performance of tetrodes at very high and ultra-high frequencies, special types of construction are necessary. Some recent Mullard double-tetrodes, incorporating such features as internal neutralising, operate efficiently at frequencies as high as 600 mc.

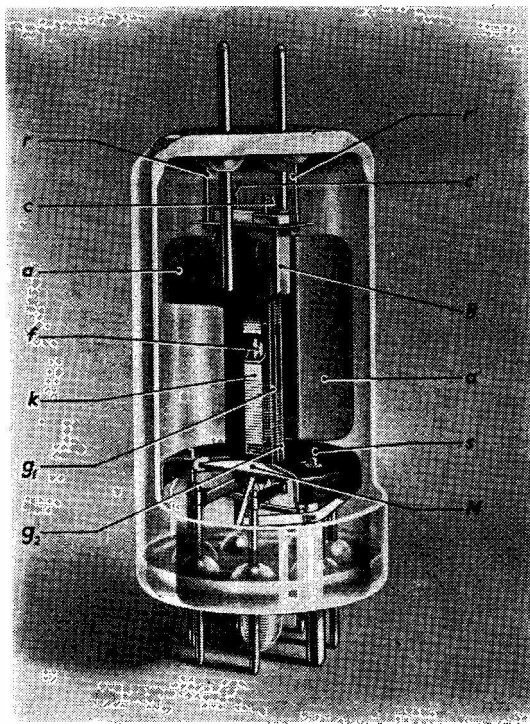
The design of transmitting valves for use at frequencies above 150 mc presents a number of problems. Stray capacitances and inductances inside the valve envelope affect operation more and more as the working frequency is raised. Despite these difficulties, a special construction now used in Mullard double-beam tetrodes makes possible efficient operation at frequencies up to 600 mc.

For high frequency operation, the screen grid valve has the very important advantage over the triode that its anode-grid capacity can be made very small. In a typical case, it may be a hundred times smaller in a tetrode or pentode than in a triode of comparable ratings. In high frequency transmitters, tetrodes and pentodes may, therefore, be operated in conventional circuits without neutralisation. As the working frequency is increased, however, the effect of stray inductance in the screen and cathode circuits becomes marked. Inductance in series with the cathode gives rise to degenerative feedback, which results in a

lowering of the valve input impedance. This causes a waste of drive power. Inductance in series with the screen grid can give rise to positive feedback.



The new Mullard double tetrodes QQVO3-20A and QQVO6-40A. These valves have an exceptional VHF performance and require very low driving power.



This cut-away view shows the construction of a Mullard VHF tetrode, of the type discussed in the accompanying notes. In this illustration, *r,r'* are the electrode support rods; *c,c'* are the built-in neutralising capacities; *a,a'* are anodes; *B* is the beam plate; *M* the mica electrode support plate; *k* the cathode; *g1*, the control grid; *g2*, the screen grid; and *S*, the internal screen.

which may result in instability. Even when the effective length of the screen and cathode leads is made as small as possible by the use of short-lead decoupling condensers connected at the valve socket, the self-inductance of the internal cathode and screen leads remains, and this is sufficient to cause losses and instability at very high frequencies.

The earliest remedy to this problem was to incorporate two screen-grid valves in one envelope, with the screens and cathodes connected together by low-inductance straps, the centre point of a strap being brought out as a pin connection. The two halves of the valve were operated in a balanced push-pull circuit, and since equal and opposite radio frequency currents flowed in the common screen and cathode leads, their inductances were rendered unimportant.

However, the existence of two separate electrode structures side-by-side in the envelope necessitated rather long grid and cathode straps, and these possessed sufficient self-inductance to cause undesirable feedback at still higher frequencies.

In the current range of Mullard VHF double tetrodes, an improved method of construction is used to reduce lead inductance to the absolute minimum, and thus permit operation at frequencies as high as 600 mc. This construction is shown in the exploded

view. It will be seen that a single indirectly heated cathode is employed. This is of roughly rectangular shape, and only the long sides, which face the grids, are coated with emissive material. In effect, there are two separate cathodes, interconnected by the short sides of the rectangle, which act as very low inductance straps. A single screen grid is placed round both grid-cathode systems, completely eliminating the effects of screen-lead self-inductance. In practice no screen decoupling condenser is needed and the screen can be connected to its high tension supply *via* a choke or resistor.

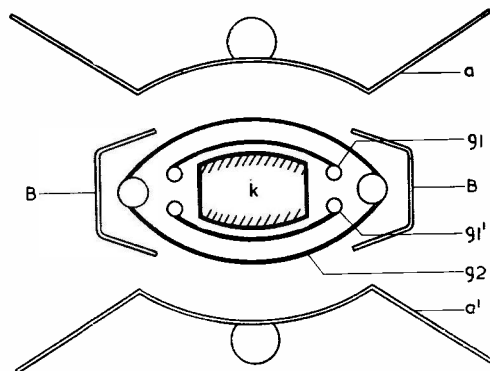
Neutralisation

Since this type of construction virtually eliminates the effects of screen and cathode lead inductance, the only remaining cause of instability at VHF is the small residual grid-anode capacity. It is possible for an amplifier to become unstable at certain high frequencies as a result of feedback through this capacitance. The effect is easily eliminated in a push-pull stage by connecting neutralising condensers from the anode of each valve to the grid of the other. If, however, these are connected externally, the presence of stray inductance in anode and grid leads, and the leads of the condensers themselves, can upset neutralisation at high frequencies.

In Mullard VHF double tetrodes, the effect of the grid and anode lead inductances in respect of neutralisation has been eliminated by incorporating neutralising capacities inside the valve. These take the form of small pieces of wire, connected to each grid support, each extending to a position near the anode of the other tetrode. The result is a true direct electrical connection of electrode to condenser without intervening stray inductance, and neutralisation is effective at all frequencies.

The double tetrodes in this Mullard range include types QQV03-20A and QQV06-40A. The QQV03-20A (CV2799) has a maximum frequency (at full ratings) of 200 mc, at which a typical load output is 39 watts under CW conditions. At reduced ratings, an output of 15 watts can be obtained at 600 mc. These figures assume circuit transfer of 80 per cent.

The QQV06-40A (CV2797) is a larger valve, with



Diagrammatic cross-section through a Mullard VHF double tetrode, showing electrode layout.

an anode dissipation of 20 watts per anode—twice that of the QQV03-20A. Under CW conditions it gives at full rating a load output of 72 watts at 200 mc. With reduced ratings, outputs of the order of 45 watts at 500 mc are obtained.

Constructional Features

These valves have certain interesting constructional features apart from the special electrode configuration described above.

Since VHF radio is extensively used by aircraft, specially robust construction is necessary. These valves are, therefore, manufactured with envelopes of hard glass, the top and the base being of sintered glass. The use of the latter enables the anode seals to be pre-formed, and thus ensures the exact location of the anodes. Two short supporting members are also moulded into the glass top, and these locate the rest of the electrode assembly accurately with respect to the anode. These supports have the further advantage that they reduce vibration of the screen assembly, but their design is such that there are no detrimental effects on the high frequency performance of the valve.

The anodes are of molybdenum coated with powdered zirconium, which reduces secondary emission, improves radiation of heat, and acts as a getter with the important advantage that its ability to absorb gases increases as the temperature is raised. The anode lead-out wires are made thick in order to reduce the adverse effects of self-inductance mentioned above.

A smaller single-ended Mullard double tetrode has been developed for use up to 225 mc. A number of the special features of the types described above have been incorporated in this valve, which is a miniature all-glass type on the noval base, designated the QQV03-10. It has a rated anode dissipation of



An interesting size comparison for the Mullard QVO3-10, which is a double RF tetrode with many applications in low-power and driver stages.

5 watts per anode, and will deliver 10 watts output at 200 mc, CW. This valve is suitable for use as an output stage for mobile equipments, and as the driver valve for the QQV03-20A and QQV06-40A.

TELEVISION STATION FOR NORTH OF SCOTLAND

The BBC has now acquired a site for the projected North of Scotland Television Station, to be known as Rosemarkie. The site is some 11½ miles north-north-east of Inverness and covers an area of about six acres. It is situated 680 ft. above sea level.

The new station is expected to be ready for service by the end of 1956.

The transmissions will be in Channel 2 (vision 51.75 mc, sound 48.25 mc) horizontally polarised. The site will also be suitable for VHF transmission of the Home, Light and Third programmes when it becomes possible to extend this system to this part of Scotland.

BAND III ADAPTORS

The Stella Radio & Television Co., Ltd., announce that modification kits, priced at 6 gns., will be available for Band III reception on their standard TV receivers. The modification consists of a plug-in type of front-end adaptor, utilising the receiver's existing power supplies.

MULLARD VALVE PRODUCTION

Upwards of 35 million radio valves a year are now being produced by Mullard Ltd., for which something like 250,000 miles of special wire is made at the firm's Blackburn plant, visited on April 14 by H.M. The Queen and the Duke of Edinburgh, during their tour of Lancashire.

MULTICORE INTRODUCE SOLDER THERMOMETER

A last-minute exhibit included on the Multicore Solder stand at the Radio Components Show at Grosvenor House was a solder thermometer. This simple form of pyrometer will enable users of soldering irons and solder baths to determine quickly the temperature of the solder on the iron or in the bath. The instrument is completely self-contained and comprises a meter movement which is connected to a thermo-couple mounted at the end of a tube attached to the meter. A scale is graduated in degrees Centigrade and Fahrenheit, and the maximum temperature to which the instrument will register is 400°C (752°F).

AMATEUR RADIO

PART II

TOOLS AND MATERIALS

For The Beginner

By A. A. Mawse

FROM the problem of learning the Morse code, which was dealt with last month in the first of this series, we must now turn to a number of other general considerations. As these all have a direct bearing on the construction of equipment, on the standard of appearance, on efficiency in operation, and also in some instances in knowing what to use, it is advisable to take up a little space on these subjects before getting down to specific constructional jobs.

I hope, therefore, that those of you who have got beyond this stage will bear with me for the sake of the chap starting right from scratch, since it is so easy—as I know to my own cost—to get off on the wrong foot and waste time, money and effort on constructional work which, after a short life, has to be scrapped in favour of second thoughts. We come, then, to the first point.

Tools

Many of you will already possess a fairly comprehensive range of tools, but some advice to those less fortunate will not be out of place. Quite a small selection will suffice, providing you are prepared to spend longer on the job, but the wider the range available, the greater the time saved and, to some extent, the more professional-looking will be the finished job. I am therefore giving two lists, the first which I regard as essential, and the second which would be advantageous if the money can be spared.

ESSENTIAL TOOL LIST

Electric soldering iron with $\frac{1}{16}$ in. or $\frac{1}{8}$ in. pencil bit	A large, medium, small and pocket screwdriver
A quantity of resin-cored solder	A foot-rule
A set-square	A centre punch
A pair of screw dividers	A hand drill, $\frac{1}{4}$ in. chuck
A pair of cutting pliers	Assortment of twist drills
A pair of long-nosed pliers	A good knife
A hack-saw and blades	A $\frac{1}{2}$ in. flat file
A hammer	A $\frac{1}{2}$ in. half-round file
A cold chisel, $\frac{1}{2}$ in. tip	A rat-tail file
A carpenter's brace	A hole cutter ("Lufbra" type)

DESIRABLE ADDITIONS

A bench vice	A "King-Dick" adjustable spanner
A pair of tin shears	A small hack-saw with blades
Micrometer or vernier gauge	A wider selection of files

This second list, of course, can be added to more or less indefinitely.

In addition, a small stock of working materials

should be laid in: Sand and emery paper; insulated tape; cheese-headed 2, 4 and 6 BA bolts, nuts and washers; solder tags; aluminium sheet up to about 16 or 18 ins. square; some $\frac{1}{4}$ -lb. reels of enamelled wire in 16 to 24 SWG; lengths of insulated sleeving. It is a great time saver to have a selection of sundry resistors and condensers handy. These are advertised in the pages of *Short Wave Magazine*, in a range of assorted sizes and values, for a very reasonable sum. Many of you will, at some time or another, have purchased surplus equipment, not because of its specific value to you, but because it looked a cheap "buy." This equipment, if carefully broken down, will yield a rich store of useful bits-and-pieces which should be stored in the budding "junk-box" for subsequent use. Here is a tip worth remembering if you have difficulty in unscrewing the nuts and bolts on such equipment: These were usually treated with "goo-goo" to prevent them from coming apart under conditions of vibration; place the heated soldering-iron bit against the nut; hold it there until the "goo-goo" starts to fry, and then quickly get to work with screwdriver and pliers before it has time to cool and re-set. In nine times out of ten it works like a charm.

General Design Considerations

In the earlier days of Amateur Radio the most popular form of construction was what was known as "bread board." In this, a suitably sized wooden baseboard was prepared, and all the components were then assembled thereon, held in place with wood screws and the wiring put into place "haywire" fashion. Whilst this form of construction is undoubtedly the easiest and calls for practically no tools, it has many disadvantages, and its only present-day application is in those instances when a highly experimental layout is to be tried. Being quickly and cheaply assembled, it will usually indicate whether or not the idea is worth pursuing in a more permanent form.

The next development was the chassis form of construction, with or without a front panel carrying the controls, made from aluminium generally, because of its ease in working. A chassis is like an upturned, shallow box without a lid. The various components are suitably disposed on the top and the greater part of the wiring is carried out underneath. This makes for a much neater arrangement and also carries with it the benefit of shielding; at the same time, it still allows scope for any subsequent modification in design which might eventually be required.

Largely as a result of commercial practice, the rack-and-panel form of construction came into vogue just after the War, and many excellent examples of this very attractive layout have appeared from time to time in the *Magazine*, in "The Other Man's Station" series—from which, by the way, very useful ideas can be gleaned on the general subject of station layout and construction. I do not recommend rack panel, however, for the beginner, as it is altogether too rigid from the experimental angle, apart from being somewhat costly.

The advent of TV with its attendant TVI problem, and the development of miniaturised equipment and valves, has more recently produced a spate of Table-Top all-enclosed designs. There is also an air of finality about this form of construction, besides calling for some pretty tricky work with a soldering iron. Moreover, again, it is by no means the cheapest form of construction, since you are, in one go, deprived of the undoubted advantage of making use of material still available on the surplus market. Most of us these days are limited in the amount of money we can afford to spend on our hobbies, and whilst this will vary as between individuals, it seems sensible to me to plan along lines which will enable that money to be spent to best advantage.

Consequently, in most of the pieces of equipment I shall be describing, standard-sized components will be used, with a bias towards readily available "surplus" gear and the plain chassis form of construction. At the same time, I shall *not* be giving blue-prints, so that for those who wish to do a bit of embellishing there will be plenty of scope so long as the basic idea is adhered to fairly closely.

Resistors and Condensers

All radio circuits consist very largely of these useful items. If we pause and consider for a moment, the wide range of values in resistors alone—from something under 100 ohms to values in excess of 2 megohms—in relation to the vast range of electronic equipment produced, from normal broadcast sets and TV receivers to the requirements of the Services and of industry as a whole, one gets, perhaps, a glimmering of the astronomical quantity of such resistors which are turned out annually, in this country alone. Now, if every value was obtainable, the stock to be carried would be fantastic. Moreover, as in most manufactured articles, the closer the tolerance to which it has to be made, the greater the percentage of throw-outs and the greater the production cost. Fortunately, except for special applications, the precise value of any given resistor or condenser in a radio circuit is not very critical. Suppose a decoupling resistor of 2000 ohms is specified in a particular application: It will not appreciably affect the working of the circuit if that resistor is anything between, say, 1600 and 2400 ohms—or, in other words, a tolerance of 20%. This fact has enabled the manufacturers to exploit what is known as the "preferred value basis," in which a range of basic numbers have been chosen, each one differing by approximately the same percentage from

TEST METER, POWER PACK AND A GDO

Next month in this series A. A. Mawse will describe, with illustrations, the construction of a useful wide-range Test Meter, of the type which is absolutely necessary for the efficient station. This will be followed by full details for building a good general-purpose Power Pack, suitable for running the first transmitter. Following this, comes another essential item of test gear—a Grid Dip Oscillator, which also will be fully described and illustrated.

Editor.

its neighbour, and to standardise on 20% tolerance. These basic numbers and the possible range covered by the admissible tolerance are shown in the table herewith.

Preferred Value

Table

BASIC NO.	POSSIBLE RANGE
10	8 - 12
15	12 - 18
22	17.6- 26.4
33	26.4- 39.6
47	37.6- 56.4
68	54.4- 81.6
100	80.0- 120.0

From this it will be seen that the whole range is covered. Larger values are arrived at by multiplying the basic numbers by 10; 100; 1000, etc. By this means, practically the whole requirements of the radio industry can be satisfied at the lowest cost by a relatively small number of stock sizes.

Where the requirements cannot be met by the use of 20% tolerance values, some thirteen basic values are available in 10% tolerance and some 25 values in 5% tolerance, but, of course, at an increasing cost. In circuit design when no tolerance is specified, it is usual to understand that 20% is intended. All values are obtainable in $\frac{1}{4}$ - and $\frac{1}{2}$ -watt rating, and the lower ones in 1-, 2- and 5-watt ratings. From the formula: Watts equals current squared times resistance (or $W = I^2R$), it is a simple matter to work out the required rating of any resistance, choosing one which is nearest but above the actual consumption. Where very close accuracy is required, as in voltmeter construction, it is often possible to make use of two or more resistors in series or parallel, using the cheaper 20% variety, the variations ironing themselves out so that the total combined value comes out very close to what is required. Incidentally, you will frequently see the expression "K" applied to a resistor in circuit drawings. Thus, 10K or 2.2K. The "K" simply means "1000," so that the two examples become 10,000 and 2,200 ohms respectively. [over

Most of what has been said over applies also to the smaller range of values in condensers. Talking of condensers, one is apt to become somewhat confused about their values. The unit of capacity is the Farad, which, of course, is enormous. Consequently, in the early days of radio, the microfarad or mfd. was chosen as being more convenient. In radio-frequency applications, however, this again became too cumbersome and figures like "0.0001 mfd." began to appear. This led to the pico-farad or $\mu\mu\text{F}$ or pF (pronounced "puff") coming into use. This is one-millionth of a microfarad, which, in turn, is one-millionth of a Farad! All very confusing! Simply remember that 100 $\mu\mu\text{F}$ is the same as .0001 μF . It is customary to express values up to 1000 $\mu\mu\text{F}$ in $\mu\mu\text{F}$, and higher than that in decimals of μF , and in audio circuits or high tension smoothing circuits in whole numbers of μF .

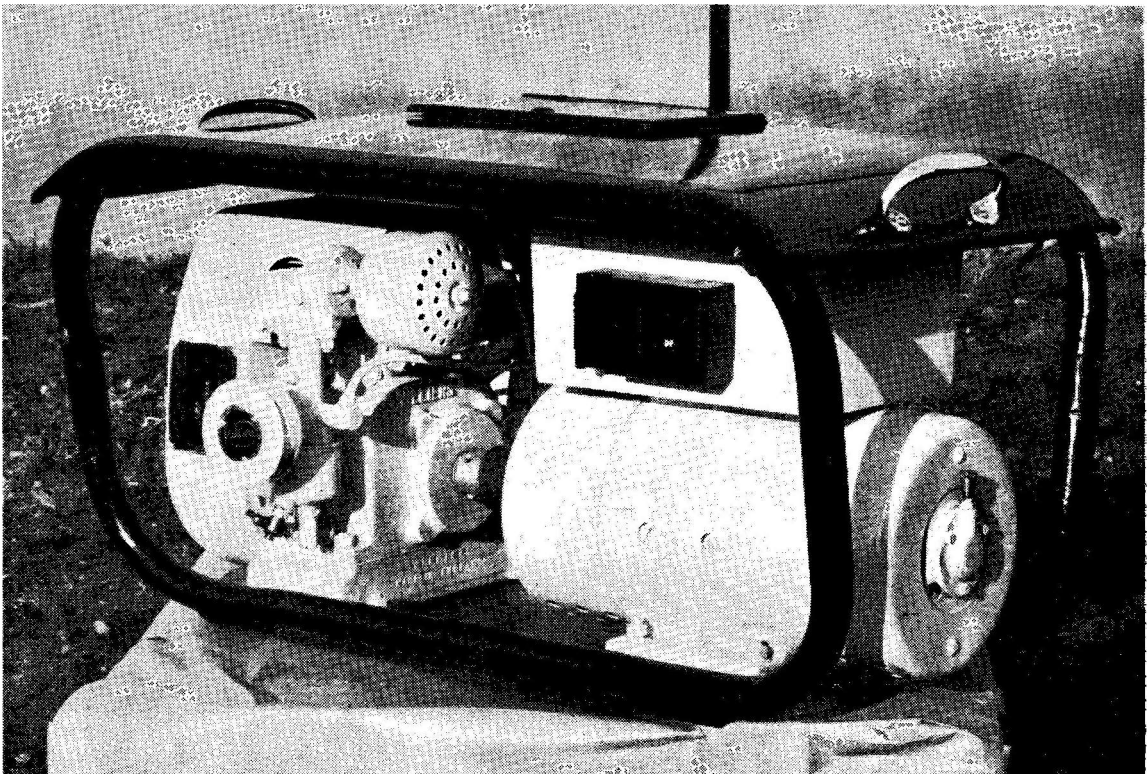
Essential Equipment

Before you can build a transmitter and, what is more important, get it working, you *must* have a certain limited amount of basic measuring equipment at your disposal, which in any case you will at all times find extremely useful. I am afraid, however, that this month my available space is already exhausted, but next month I will describe how to

build a reasonably-priced amp-volt-ohmmeter. An instrument of this kind is an absolute "must," whether you make your own or buy one of the excellent instruments you will see advertised in these pages by Pullin or the Automatic Coil Winder Co.

* * * *

By the way, how is the Morse coming along? If you were able to absorb last month's article on the subject of learning the Code at home by your own efforts, you should be pretty confident on the alphabet-and-numbers by now. Do not worry, at this stage, about the punctuation marks (or the accented letters). Only about four or five signs are regularly used, or needed, in amateur practice. As to where to find the Morse Code printed in full, here are some references: *Wireless World Diary*, 1955, pp.16-17; *Radio Amateur's Handbook*, 1954 or '55 Editions, pp.13-14; *Short Wave Listener*, March 1953; and the *Handbook for Wireless Operators*, Appendix I, pp.95-96. This last is a Stationery Office publication which, while being intended for the guidance of the commercial operator, gives a good deal of useful information from the Amateur Radio point of view—such as the Q-Code in full, the permitted abbreviations and correct procedure signals, and the speech code for spelling out words or indicating call-signs when on telephony.



Neat, transportable, 500-watt AC generating set manufactured by A. G. Morrison, Ltd., Loughborough, Leics. It can be handled easily by two men and starts automatically by remote control.

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Dead-line for June Issue : MAY 13)

ALL Club Secretaries, particularly those of the smaller Clubs, are constantly faced with one problem which overshadows all the others—How to Keep the Members Interested. Very often the secretary himself has to bear the burden of arranging the Club's future programme, and if he has visions of climbing out of the usual run of Informal Talks, Junk Sales and Quizzes, he has an uphill fight.

Some of the smaller Clubs have no members who feel themselves sufficiently qualified to talk on any subject at all, and if one particular man finds himself a self-appointed Brains Trust he may well begin to wonder whether the Club members are not getting tired of the sound of his voice.

An extension of the same problem is felt by speakers themselves. There is so little "audience reaction" at the average Club meeting that a lecturer has no means of knowing whether he is talking above everyone's head, or whether he is being too elementary and causing slight resentment at the fact that he is "talking down" too much.

Several Clubs have tried to bring their non-vocal members into the picture by trying an occasional evening on which everyone is asked to speak for five minutes on his pet subject. Very often the result of this is a very poor attendance, the shy ones all having other urgent engagements that same night!

The fact is that every member of the average Club is capable of making some sort of contribution occasionally. It is very seldom that one does not find some odds and ends of radio knowledge that would make an interesting basis for discussion—even among the most silent back-benchers.

Think this over, secretaries—and read it out to your members if you suffer from difficulties of this kind.

It is interesting to note the wide scope of lectures and talks throughout "Clubland," not to mention the various devices which are tried out in the cause of novelty. One extremely good idea is reported from **Bournemouth**. Each member was invited to bring along his two favourite records, to make up a recital which was held after the regular meeting on April 1. We can see several possible variants of this idea! At the next meeting, on May 6, G2HIF will be talking on The Application of Electronics to Atomic Energy, and on June 19 a party will be travelling to Rowridge, I.O.W., to see the TV station there.

The April talk at **Purley** was given by G2KU, on

the subject of his recent experiences in Brunei as VS5KU. The previous meeting was a Junk Sale.

Clifton are running the first D-F Contest in the 1955 series on Sunday, May 8. This will be held in the vicinity of Farnborough, Kent, and G3GHN/A will be operating with low power on 3504 kc between 1100 and 1600 hrs. Reports will be welcomed. At recent meetings a Junk Sale was held, and G3IXL gave a talk on SSB Techniques. On May 20 Mr. L. Barnes will cover the subject of Tape Recording.

At the AGM at **Cambridge**, G5IG was elected President, G2FOW Chairman, G5DQ Treasurer, and Mr. F. A. E. Porter Secretary. On April 22 there was a Junk Sale, and the next meeting is on May 20, at the Jolly Waterman, Chesterton Road.

Grafton will be holding their annual Field Day on Hampstead Heath on June 12 and 13. Prepara-

NAMES AND ADDRESSES OF CLUB SECRETARIES REPORTING IN THIS ISSUE

BARNSELY : P. Carbutt, G2AFV, 33 Woodstock Road, Barnsley.
BOURNEMOUTH : J. Ashford, 119 Petersfield Road, Boscombe East, Bournemouth.
BRADFORD : F. J. Davies, 39 Pullan Avenue, Bradford 2.
CAMBRIDGE : F. A. E. Porter, 38 Montague Road, Cambridge.
CLIFTON : C. H. Bullivant, G3DIC, 25 St. Fillans Road, London, S.E.6.
COVENTRY : J. H. Whitby, G3HDB, 24 Thornby Avenue, Kenilworth.
DORKING : J. Greenwell, G3AEZ, 7 Sondes Place Drive, Dorking.
EAST GRINSTEAD : R. A. Burnett, 19 Stockwell Road, East Grinstead.
GRAFTON : A. W. H. Wennell, G2CJN, 145 Uxendon Hill, Wembly Park, Middx.
HUDDERSFIELD : L. Beavers, G3JLF, 59 Reed Street, Marsh, Huddersfield.
LEEDS : B. A. Payne, 454 Kirkstall Road, Leeds 4.
NEWARK : J. R. Clayton, 160 Wolsey Road, Newark.
PURLEY : E. R. Honeywood, G3GKF, 105 Whytecliffe Road, Purley.
SLADE : C. N. Smart, 110 Woolmore Road, Birmingham 23.
SOUTHEND : J. H. Barrance, M.B.E., G3BUJ, 49 Swanage Road, Southend.
SOUTH MANCHESTER : M. Barnsley, G3HZM, 17 Score Street, Bradford, Manchester 11.
SOUTHPORT : N. Horrocks, G2CUZ, 32 Sandbrook Road, Ainsdale, Southport.
SPEN VALLEY : N. Pride, 100 Raikes Lane, Birstall, near Leeds.
STOCKPORT : D. Hall, 13 Hallam Street, Heavily, Stockport.
STOKE-ON-TRENT : A. Rowley, G3JWZ, 37 Leveson Road, Hanford, Stoke-on-Trent.
SURREY (CROYDON) : S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon.
SUTTON AND CHEAM : F. J. Harris, G2BOF, 143 Collingwood Road, Sutton.
TORBAY : L. D. Webber, G3GDW, 43 Lime Tree Walk, Newton Abbot.



The Malta Amateur Radio Society annual meeting was supported by, back row, left to right, ZBI's: 1DK, 1CU, 1TD, SWL Bird, 1FMW, 1JRK, 1AY, 1LU; Middle row; 1GBF, 1BF, 1JG, 1BT, 1CH, 1JY, 1EB, SWL Grech; Seated, front; 1KA (ex-G5KA), 1E, 1AUV (president), 1BZ (secretary), and 1CA. This group represents 70% of the total number of radio amateurs in Malta, G.C.

tions are going ahead. Recent lectures have included G5RV on New Ideas in TVI Suppression, G3JFM on a Miniature Top-Band Transmitter, G3JZX on TV Servicing, and G5CD on VHF.

Dorking recently held their AGM, preceded by the Annual Dinner, celebrating the end of a year of satisfactory progress. The Club Tx, G3CZU, is now on Two Metres, and a series of portable expeditions on this band is planned for the summer. This Club, by the way, was formed in 1946, and for the past eight years has met every Tuesday evening at 5 London Road, Dorking, where workshop and library facilities are provided.

East Grinstead, which also held its AGM recently, has only ten members, but is in a sound position financially, and the individual interests cover practically the whole range of electronics. The Club shares a hall with other Clubs at present, but hopes to have its own premises in due course. A transmitter is being built, and they hope to have it on the air this year.

South Manchester are running their D-F Contest on June 12, the start taking place at Club Headquarters. All wishing to take part are asked to get in touch with the Hon. Sec. (This contest will be a qualifying round for the National D-F Final).

Stoke-on-Trent elected new officers at their AGM, and drew up a programme for some weeks ahead, including talks on Amplifiers, Oscilloscopes and a Double Superhet. Five members visited the **Cannock** Club on April 7, and also went to G3ABG's station, from which they worked three members of the Club who were operating mobiles on the Top Band.

Southport have just acquired a new Clubhouse at the Sea Cadets' Camp on the Esplanade (approached by bus from town to the Palace Hotel). Work is at present going on, rigging up all the gear and furnish-

ings. There are no mains, but it is hoped to raise some power by wind-driven generators and by a gas-driven generator (gas and water *are* laid on!) Club night is Thursday, but other nights and week-ends are being used for constructional work, and any "keen types" will be welcomed.

Southend judged the exhibits of home-built gear for the Hudson and Pocock Cups on April 1, and the winners were Messrs. A. D. Asher and J. L. Goss. The runner-up prize was won by Mr. C. W. Cragg, and all these trophies were presented at the Hamfest held the following day. The Peck Cup was also presented to Mr. R. K. Seabrook for the best D-F performance in 1954. About 100 guests were present at this Hamfest, coming from points as far apart as Battlesbridge, Brentwood and Burnham-on-Crouch.

At **Bradford**, one member is professionally engaged in the manufacture of electronic equipment and has offered workshop facilities, with test gear, to assist members with the construction of their own apparatus. A successful year was reported at the AGM on March 22, when officers and a strong committee were elected.

A new Club has been formed in **Huddersfield**, meeting on the first Wednesdays at the C.W.S. Fraternity Hall. On April 6 there was a good turnout to hear a talk by G2BMC on Frequency Measurement. Over twenty licensed members have been enrolled already, and it is hoped to start a Club Tx and to provide all the usual facilities. (See panel for Hon. Secretary's name and address.)

Dead-line for next month's reports is **Friday, May 13**. They should be addressed to: "Club Secretary," *Short Wave Magazine*, 55, Victoria Street, London, S.W.1.

The lecture on Transistors given by G3CCA at Newark attracted a large attendance. Other recent talks have been on Valve Voltmeters (A. Hall) and NFD Suggestions and Reflections (G3ITG). The Annual Dinner was held on April 3.

Stockport held the AGM in March, and the former Secretary has now been elected President. (See panel for new Secretary's QTH). **Surrey** also had their AGM and now report a membership of 70, with meetings well attended. Judging recently took place for the entries in the contest for the "Coronation-Year Committee Cup," presented by G3BCM. First prize was shared by G3BCM and G3BFP, the runner-up being G3GKF.

Sutton and Cheam are visiting the BBC Television Centre and Lots Road Power Station, and expect to "look down" on all their rivals in NFD, for which an excellent lofty site has been obtained.

Torbay re-elected all their officers at the AGM, with the addition of G2CWR as hon. auditor. The President referred to the sound position of the society, small in numbers, but representative of the area. A hearty welcome was extended to G3GMQ, a sightless amateur from York, who will be in the district for a few months.

CLUB NEWS IN BRIEF

SPEN VALLEY: May, 15, Annual Outing; May 18, Visit to Spencer Wire Works; June 1, Lecture, High-Quality Sound (G4RQ).

BARNESLEY: May 13, Practical Demonstration of IF Crystal Filter Operation (G5KM); May 27, NFD—Final Arrangements.

BRADFORD: May 10, Design of Equipment (G3IBN); May 24, 10,000 mc (Mr. G. F. Craven).

CLIFTON: Every Friday, at 225 New Cross Road, London, S.E.14.

BOURNEMOUTH: First Friday of the month, at The Cricketers' Arms, Windham Road, Bournemouth.

SLADE: May 13, Amateur Radio Direction-Finding (Mr. N. B. Simmonds); May 27, Past and Present in Amateur Radio (G5BJ).

EAST KENT: Meetings on alternate Tuesdays, at The Two Brothers, North Gate Street, Canterbury.

COVENTRY: May 9, Receiver Servicing (G3HDP); May 23, Frequency Modulation (G6WH); June 2, Night on the Air.

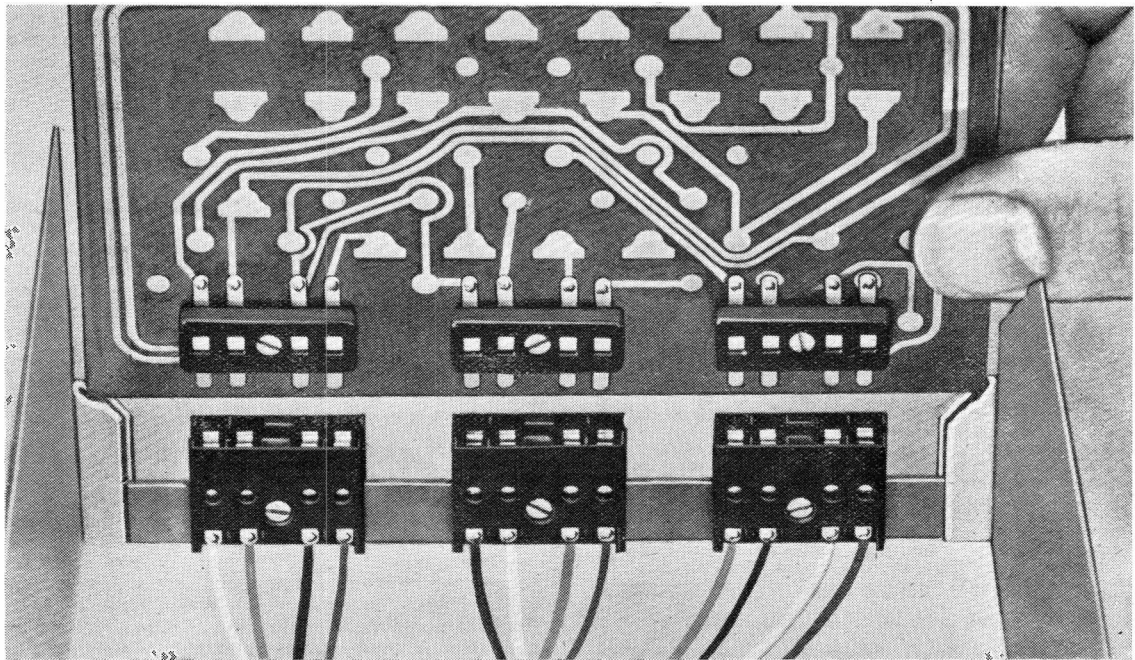
LEEDS: May 11, Field Day Discussion; May 18, Modulation (G6XT); May 25, Visit to Phonetics Department, Leeds University; June 8, Talk on Home-Built CR100.

NEWARK: First Sunday of month, 7 p.m., at Northgate House.

SUTTON AND CHEAM: May 17, at The Harrow Inn, Cheam Village. G2DD on VHF.

SURREY (CROYDON): May 10, 7.30 p.m., at the Blacksmiths' Arms, South End, Croydon.

TORBAY: May 21, 7.30 p.m., at the Y.M.C.A., Torquay.



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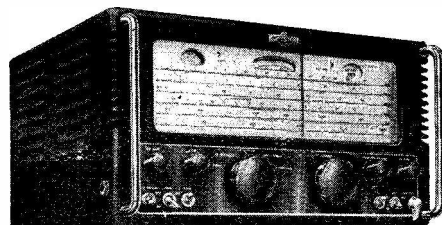
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OFFERS for Army 12 Tx, first-class condition; bargain if buyer can collect. Any evening after 6 p.m. or week-end. Exchange considered.—Offers, with s.a.e., to: H. J. Lawn, 20 Croft Road, Godalming, Surrey.

BC-221, good condition. American buyers refused because modified for modulation; small handles missing; coax socket instead of antenna terminal. Price. £19 (o.n.o.).—K. H. Parkes, 159 Belgrave Road, Longton, Stoke-on-Trent.

FOR SALE: Rotary Converter; 230v. DC/230v. AC; 50 cycles; 150 watts; splendid condition; £5.—S. W. Morse, 18 School View, Banbury.

EIGHT-VALVE Superhet two-metre Receiver, less cabinet; needs only power supply and speaker (or phones) to go; coax input; BFO; excellent results; £8. Prefer buyer collects. I need a portable typewriter.—G. A. Jeapes, 129 Cambridge Road, Trumpington, Cambridge.

WANTED: AR88D Mains Receiver. AC; ready cash for guaranteed faultless set. All letters answered. Will collect if in Home Counties.—Sicely, 16 Borough Lane, Saffron Walden, Essex.

OFFERS, PLEASE. FOR: Eddystone absorption wavemeter (Cat. 696); Eddystone split stator 50 + 50 mmF; New Zealand ZC1 Mk. II Tx/Rx with manual; 24 mF. 550v., WKG (six); 807 ceramic bases (twelve); 0-3 amp. thermo-couple (two); Labgear 150-watt coils DSL-7-14-28, with swinging link base; AVO Meter 7, perfect; 813; 813 with transformer; 866's; Wilcox Gay with manual (unmodified); 5RV low pass filter; Vitavox mc hand mike with transformer; HK257B/4E27.—Box 1583, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

£7. 10s. OFFERED for Power Supply units, Type Mk. II (Cat. No. ZA3081); in good condition, please.—G. V. Allen, 107 Union Road, Sheffield, 11.

WANTED: BC-348L for spares and breakdown, etc. (part power plug at rear), etc.; cabinet and valves not required. Wanted also: Coil Box, metal, for 19in. rack mounting HRO; good price paid.—G. V. Allen, 107 Union Road, Sheffield, 11.

S 750, BC221, B2 complete; very good condition, with operating desk and ancillaries. Unique opportunity for enthusiast to acquire complete listening station. Delivered Yorkshire or near. The lot, £60, or separate prices on application.—Box 1584, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: SX28, in good condition; no modifications. Also Panda CUB. **FOR SALE OR EXCHANGE:** AR88D (perfect), Hallicrafters S20R, S19R Buddy.—Box 1585, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Panda 32ft. tower, 10-20 beams CW rot. mech. and display; dismantled; buyer collects; £55 or offer (cost £95).—M. Swinbank, 28 North Park, Eltham, S.E.9. (ELT. 2183).

RECEIVERS: CR100 (B28), £17 10s.; Eddystone 358X, 40 kc-31 mc, £13; both FB condition and performance.—95 Priorswood Road, Taunton, Somerset.

SMALL ADVERTISEMENTS, READERS—continued

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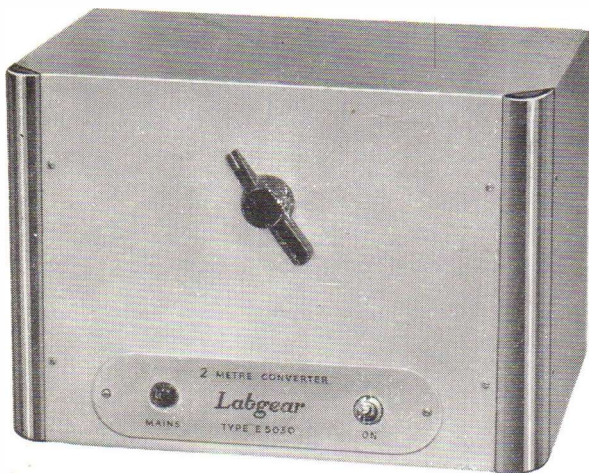
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