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WORLD WIDE COMMUNICATION

H. WHITAKER G3SJ

10 YORKSHIRE STREET, BURNLEY Phone 4924

MODULATION INDICATOR. Type 2. 10A/10971. In die cast cases size $1\frac{1}{2} \times 6\frac{1}{2} \times 7\frac{1}{2}$ in. Frequency range 2400 kc. to 6250 kc. in two switched bands. Direct reading of modulation percentage up to 100% in 3 in. 0/500 microammeter. Phone jack for monitoring. No direct attachment to Tx is required. Switch is set to "HF." The coupling coil is set to read "HF" on meter, switch is then thrown to "Modulation" and percentage is read off direct. Only power required is a $1\frac{1}{2}$ or 2 v. cell for diode. Complete with calibration chart for use as wavemeter. Easily modified to cover other bands if desired. Carr. paid £5. The diode valve can be replaced by a crystal diode in which case no cell is required.

WAVEMETER Marconi. Type W1252. 230v/50cy operation. Frequency range 22 to 30 Mc. 5 valves. Muirhead precision dial with vernier, and complete with individual calibration chart. In copper lined wood cases $15\frac{1}{2} \times 9\frac{1}{2} \times 9\frac{1}{2}$ in. Carr. paid £8.

1154 TX. Brand new and boxed, complete with all valves in original transit cases. Carriage paid £5.

POWER SUPPLY UNIT TYPE 45. 1200 volts D.C. at 200 Mills, input 230v. 50cy. in ventilated steel case. Metal rectification, fully smoothed and bleedered. This is the HT Unit for the 1154 Tx. £7/10/- carr. paid. Weight 60 lbs.

POWER UNIT TYPE 46. The low tension unit for the 1154 Tx. Ventilated steel case, metal rectification throughout, input 230v. 50cy. Output 6.3v. 12 amp. plus 250v. 120 mills. Price £3/15/-. Carr. paid. A pair of the above units £10/10/- carr. paid. 1154 Tx. and both Power Supplies £15. carr. paid.

POWER SUPPLY UNIT TYPE 247. Input 230v. 50 cy., Output 550v. at 300 Mills, plus 6.3v. at 3 amps. In grey steel cases $11 \times 10 \times 9\frac{1}{2}$ in., with pilot light. 5U4 rectifier required. £3/19/6. carr. paid.

TRANSFORMERS. Woden. Immediate delivery from stock Modulation U.M. 54/-, U.M.2 73/6, U.M.3 90/-, U.M.4.215/-, Mains, DTM 11 39/-, DTM 12 48/6, R.M.S. 11 30/-, R.M.S. 12 40/-, D.T.M. 15 75/-, DTM 17 109/6, DTM 18 172/6, Drivers, DTI 34/-, DT2 39/6, DT3 34/-, Filament, DTF 12 2 1/2 v. at 10 amp at 38/6, DTF 14 5v. 4 amp at 31/6, DTF 17 7 1/2 v. 5 amp at 37/6, DTF 18 5v. 3 amp 6.3v. 4 amp 38/6, DTF 20 10v. 10 amp at 59/6, Chokes, DCS 14 12hy 350 mills 102/-, DCS 17 20hy 60 mills 28/9, DCS 18 20hy 150 mills 41/6, DCS 20 20hy 350 mills 140/-, Swinging. PCS 13 5/25hy 350/50 mills 58/6. All the above Woden are at pre-increase prices. G.E.C. 1131 spares, Plate 1100/0 1100 at 450 mills 4v. for rectifiers 70/-. Filament 4v. 5 amp, 4v. 5 amp 4v. 5 amp at 17/6, 7.5v. 4amp, 7.5v. 4 amp, 7.5v. 8 amp, 6.3v. 4 amp twice, 4v. 3 amp. at 30/-. Modulation pp TZ40s to PP 35Ts at 70/-. Plate 300/0/300 300 mills 4v. 4 amp. 30/-. All the above primaries tapped 200/250v. Chokes. 10hy 250 mills. 15/-. Swinging 5/15hy 450 mills 20/-.

PLATE TRANSFORMERS. Input 100/250v. 50cy. Output 2000/0/2000 at 450 mills. Porcelain stand offs. Carr. paid £6. Chokes suitable for the above. 5kv Wkg. 15 hy at 400 mills. 30/-. Swinging U.S.A. Radio Receptor Co. made for Kenyon 9/60 hy at 450 mills 45/-. 10 Kv insulation. Plate transformers Radio Receptor Co. U.S.A. Input 100/250v. by rotary switch. Output 1100/0/1100 450 mills, 2 1/2 v. 10 amp for 866s, 12v. 14 1/2 amp ct and 0/10, 11 and 12v. at 2 amp, plus 30v. at 1/2 amp for relays etc. £5 Carr. paid.

MODULATION TRANSFORMERS. Parmeko 450 watts P.P. 805s to P.P. 813s Plate or plate and screen modulation 40/-. Thermador U.S.A. P.P. 805s to 4000, 5000, or 5500 ohm load Completely screened and potted, Porcelain stand offs 60/-.

METAL RECTIFIERS. Selenium. 400v. 225 mills 1/2 wave. 14/-, each. Pair for full wave 26/-, 4 for bridge 50/-.

OUTPUT TRANSFORMERS. Halicrafter P.P. 6v6s High and Low Impedance outputs, 30/10,000 cy. 55-CO 19, at 7/6. Collins potted P.P. 6L6s 7.5 or 15 ohms 20 watt 22/6. Woden P.P. 6L6s to 500 ohm line 22/6. Pentode output to 2 1/2 ohm speech coil and high Imp. fone winding 7/6. Rola 7000 ohm to 3 ohm speech coil 5/6.

RESISTORS. New and Unused Erie and Dubilier. We have secured another fine parcel of these and offer as follows: 1/2 watt 8/6 per 100, 1 watt 12/6 per 100, 1 watt type 9 insulated 15/- per 100, 1 watt standard type 15/- per 100, 2 watt 20/- per 100, 5 watt 25/- per 100. All well assorted values between 100 ohm and 6.8 Meg. Or sample 100 as follows, 20 1/2 watt, 25 1/2 watt, 20 1 watt insulated, 20 1 watt standard, 10 2 watt, 5 5 watt, with a range of least 30 different values at 14/- post free.

WIRE WOUND. 5 watt. Values in ohms. 15, 20, 25, 50, 75, 100, 150, 175, 200, 250, 500, 750, 1000, all with wire ends at 6/- per doz. assorted.

OSCILLOSCOPES. By well known British Manufacturer. In black crackle steel cases, size $12 \times 8 \times 6$ in. For A.C. mains 230/200v 50cy. Tube size 3 in. (green). Hard valve time base continuously variable from 5 to 250,000 c.d.s. Push-pull "x" deflection circuit with T.B. wave form brought out to separate terminal for wobulator work or synchronising. Provision for fly back suppression. Push-pull "Y" deflection circuit, level from 15 to 300,000 c.d.s. All usual controls and provision for using a D.C. volt-meter to measure the amplitude of an A.C. waveform. Separate synchronised amplifier and no control interaction. Complete with all test leads and instruction manual. They are brand new and boxed in original cartons, and represent an un-repeatable bargain at £19/10/0. Carr. paid.

CRYSTALS. 1000 kc Valpey, Bliley or Somerset, standard 3 in. pin spacing, 20/-. R.C.A. 100kc sub-standards 20/- Western Elec. 500 kc Ft 243 holders with 3 in. pin spacing, 7/6. Full range of Western I.F. freqs. 450, 465 kc, etc., 12/6 each. Amateur and Commercial bands. G3 SJ Xtals are precision lapped, and acid etched to final freq. Are available in either Ft 243 holders, 3 in. British, 3 in. U.S.A. or 3 in. P.5 holders. Your own choice of frequency 2 Mc to 10 Mc inclusive. We will despatch to within 1 Kc of your chosen frequency at 15/- each, accurately calibrated with freq. clearly marked. Slight extra charges for decimal point freqs. We also undertake the calibration, or re-grinding of your own crystals at extremely reasonable and nominal charges.

This month's special offer. 7290 Kc 3 in. 10x type standard British holders, G.E.C., Standard, etc. at 7/6 each.

CONNOISSEUR LIGHT WEIGHT PICK-UP. Connoisseur standard light weight pick-up complete with input transformer, brand new and boxed. List price £4/10/5 inc. tax. To clear £1/6/10 each. Available in quantity for export.

7B TX. G.E.C. INPUT 230V 50cy. Crystal Osc. and Doubler, Det 19, Push Push Doubler Det 19, Push Push Doubler Det 19, Power Amp. Det 19, KT66 Modulator. Standard rack and panel complete with power supply. 2 U52 Rectifiers. All stages tuned Grid and anode. Link coupled throughout. Completely enclosed, weight approx. 80lb. Relay for push to talk. Provision for remote HT switch. Frequency coverage approx. 100 to 120 Mc. Easily adapted for 44. Oscillator will function on 8 mc xtals. All stages are meter jacked. Filament and HT pilot lights, Microphone jack. This is a complete Tx with all valves, and beautifully built. Input about 50 watts. Tune/Operate switch for tuning up on low power. This is a really exceptional bargain at £8 Carr. Paid. 30/- extra Ireland.

THIS MONTH'S BARGAIN. R.C.A. 4C 27 VALVE. BRAND NEW AND BOXED. Rarely seen in this country. 6.3v 150 watt anode dissipation. Full rating at 750 Meg. Anode radial fin cooled. Surplus price of this valve in the States 58 dollars 75c. Our price 75/-.

VALVES. RG3 1250 note the price £3. 836 vac equivalent to the 866 20/-, 813 £4/10/0, 805 27/6, 826 UHF Triode 7.5v heater 4 amp., 1250v plate, 125 Mills, maximum frequency full rating 250 mc. 30/-. Taylor T200 £6. 450TH £6. VU111 HV rectifier 4v heater 4.5 Kv. at 50 Mills, 4/-. Cosnar VS110 voltage stabilizer 6/6. 6SG7 met. 6SA7, 6L7, 6K7G, 5Z4, 80, all at 8/-, 6H6, 3/6. 12SR7, 12SF7 6/-.

STATION LOG BOOKS. A quality production. 300 pages cream laid paper, section sewn, opens completely flat like a ledger. Stout heavy cover, 18/- post free. Sample leaves on request

SUIXZ reports having heard G4AU, 6HD and GW3ZV on the band, and doubtless will have done more by the time these notes appear. EK1CW was, of course, very active, although he could not be on the air for all of the tests. His results are summarised in one of the tables. 'CW tells us that EK1AO was unable to be on this time, having recently been ill. We all missed him and hope that he will soon be on the air again, particularly on the Top Band.

Conclusion

From this short summary of happenings, readers will have gathered that the Tests were far from being a waste of time. The main trouble appears to have been a very high noise-level on the American side, but much useful work was done, and a fair amount of knowledge acquired for the benefit of any future series of Top Band DX Tests.

We should like to thank all those who have sent in logs or letters from this side. Without their support such an enterprise as this would, of course, be impossible to co-ordinate or describe.

Naturally, too, our fullest thanks go to Stewart Perry, W1BB, for once more holding the fort on the other side. He was our chief co-operator and was responsible for most of the publicity given to the tests over there. For that, however, we also have to make grateful acknowledgments to the Editors of *CQ*, *QST* and the VOA Amateur Radio Programme.

And so ends another series of Top Band Transatlantics. We cannot yet announce the next similar event — it may not be worth organising tests for next winter—but we shall certainly keep you posted in the matter of Top Band DX and everything pertaining to it, month by month in "DX Commentary."

THE LATEST "CALL BOOK"

The Winter 1951-52 issue of the *Radio Amateur Call Book* is now available, running to over 400 pages and listing all known amateur stations throughout the world by country, call-sign, name and address. The G listing (British Section) totals nearly 20 pages and includes all G calls appearing in the "New QTH" feature in *Short Wave Magazine* up to and including the November 1951 issue. The price of the *Radio Amateur Call Book*, the world's only comprehensive directory to amateur stations, is 21s. post free, of Gage & Pollard, Publishers' Agents, 55 Victoria Street, London, S.W.1.

NO COMMENT!

"My good friend Ruddi Karvup, UA3-11692, has asked me to convey, via ur goodself, his regret on hearing of the increased cost of *Short Wave Magazine*. Ruddi is quite sure that G6FO, formerly a trusted comrade, is now playing into the hands of the Imperialist war-mongers and that the additional price-of-three-cigarettes, instead of going to the underpaid and over-worked staff, will be used to finance espionage in the peace-loving Soviet Union. When the masses rise, as Ruddi Karvup says they surely will, one of the first things they must do is to bring down the cost of *Short Wave Magazine* to the pre-war 6d. per copy."

VHF SIGNAL STRENGTH METER

This is a useful instrument now available from E.M.I. Sales & Service, Ltd., Hayes, Middlesex. It provides a ready means of measuring signal strength in any locality and of checking aerial performance. The instrument covers the VHF range 40-70 mc. and

incorporates a signal generator which can be used independently for circuit work over this range. Completely portable, it has its own vibrator power supply energised from a 2-volt accumulator, with a built-in mains unit for re-charging. The most important application of the E.M.I. Signal Strength Meter is in connection with the installation of TV aerial systems (all present and projected BBC TV frequencies are covered) and the alignment of TV receiver circuits.

CARDS IN THE BOX

There are cards at our QSL Bureau for the operators listed below — which we are unable to deliver as we are without their addresses. Please send a large stamped addressed envelope to: BCM/QSL, London, W.C.1, with name and call-sign, and the card(s) will be forwarded on the next fortnightly G clearance. And if you want your call-sign address to appear in "New QTH's," and subsequently in the *Radio Amateur Call Book*, please mention that at the same time. It should be noted that BCM/QSL, London, W.C.1, is a full and sufficient address for our Bureau from any part of the world, but it should be used for QSL purposes *only*, and not for any other correspondence.

G2CVB, 2HNQ, 2HSU, 2XD, 3AAD, 3AEO, 3BOU, 3DHT, 3ETQ, 3EYB, 3FBG, 3FYM, 3FYR, 3GD, 3GFR, 3HOU, 3HPJ, 3HPP, 3HPU, 3HSH, 3HTU, 3HUJ, 3HUX, 3HVO, 3HVX, 3HYY, 3HWC, 3HX1, 3HXM, 3HXO, 3HXP, 3HXR, 3HXS, 3HXL, 3HYO, 3HYY, 3HZF, 3HZR, 3IAL, 3IBM, 3IMU, 3IRW, 3ISA, 3IST, 3KJJ, 3RR, 4BF, 4MD, 6OY, 8PT, 8ZL, GM3IAZ.

Two-Metre Transmitter

FOR STATION OR
PORTABLE/MOBILE
OPERATION

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

Here is another nice design for the two-metre band. The mechanical layout is particularly ingenious, and could well be adopted for many other types of equipment. By using two narrow chassis, mounted vertically with the valves horizontal, two completely different sections can be accommodated behind the same front panel. In this particular arrangement, the RF section tuning elements are mounted right on the chassis, resulting in very short wiring leads. The whole appearance is neat and compact.—Editor.

THE basic requirement at G3AST since the opening of the two-metre band has been the construction of a transmitter for use on Two that not only can give good service in the station, but also be portable enough to allow /A or /P operation with minimum inconvenience.

In the light of these requirements it was decided that the transmitter should be in the 10-watt class, which is a popular size. It should be economical to construct, and finally, economical on current consumption, as a large part of its life would be devoted to portable/mobile operation. Bearing the portability in mind, it is logical that the transmitter should be of moderate dimensions, but not so diminutive that special bits are required for the soldering iron.

While no doubt a greater proportion of "surplus" parts could have been used in the transmitter, the author decided that components should be chosen to suit the transmitter and not allow the transmitter to be modified to suit what surplus components should happen to be available. Where surplus has been used, the reference numbers have been quoted in the parts list.

A modulator for a transmitter of the size to be described is of such modest proportions that the small additional outlay incurred was considered to be well worth the extra operating pleasure.

Living accommodation at G3AST makes it necessary that the transmitter be rack mounted,

but it has been possible, with a little thought, to fit both modulator and transmitter behind one standard 19in. panel only 10½ins. high.

In the interests of economy, only one meter is employed for the whole transmitter, this being available to each circuit in turn by meter switching.

The Transmitter Circuit

Above all, it was considered essential that the transmitter should be constructed on lines that would give a minimum of trouble to get working. In this respect it was also considered desirable that a minimum of tuning controls be employed—VHF tuning condensers being a very expensive item.

A few preliminary experiments showed the superiority of the Mullard EF91 valve when used as a frequency multiplier, and in consequence two valves of this type have been employed as triplers. The simplest crystal oscillator that has no tuning controls is, of course, the Pierce, and a 6C4 triode operating in this manner yields a prolific output at the 8 mc crystal frequency. The oscillator is a popular circuit and must be well known to the majority of amateurs. The 22,000-ohm resistor in series with the RFC in the anode feed of this valve is essential; its omission will result either in "birdies" or a cracked crystal.

The first multiplier, EF91, triples the crystal frequency to 24 mc. The anode circuit in this stage allows a very high LC ratio and is superior to the more orthodox form of coupling. The 2,200-ohm resistor in the anode supply affords a certain amount of self-balancing and reduces regeneration with later stages to a minimum. It was not considered necessary to provide a balancing capacity to earth to compensate for the difference in output capacity of V2 from the input capacity of V3.

The second tripler employs a similar circuit with the exception that the output in this case is push-pull, and the anode feed is via an RFC suitably damped with a 1,000-ohm resistor to avoid regenerative effects with later stages. The output from V3 is more than ample to drive a 6J6 double-triode as a push-push doubler to 144 mc. The output from the 6J6 is sufficient to light a small lamp if inductively coupled to L3 by means of a loop.

With such an ample reserve of power available from the 6J6 stage, it was found possible to dispense with a tuned input circuit to the PA, resulting in extremely docile operation together with very flat neutralising characteristics. Actually the input circuit is broad-banded

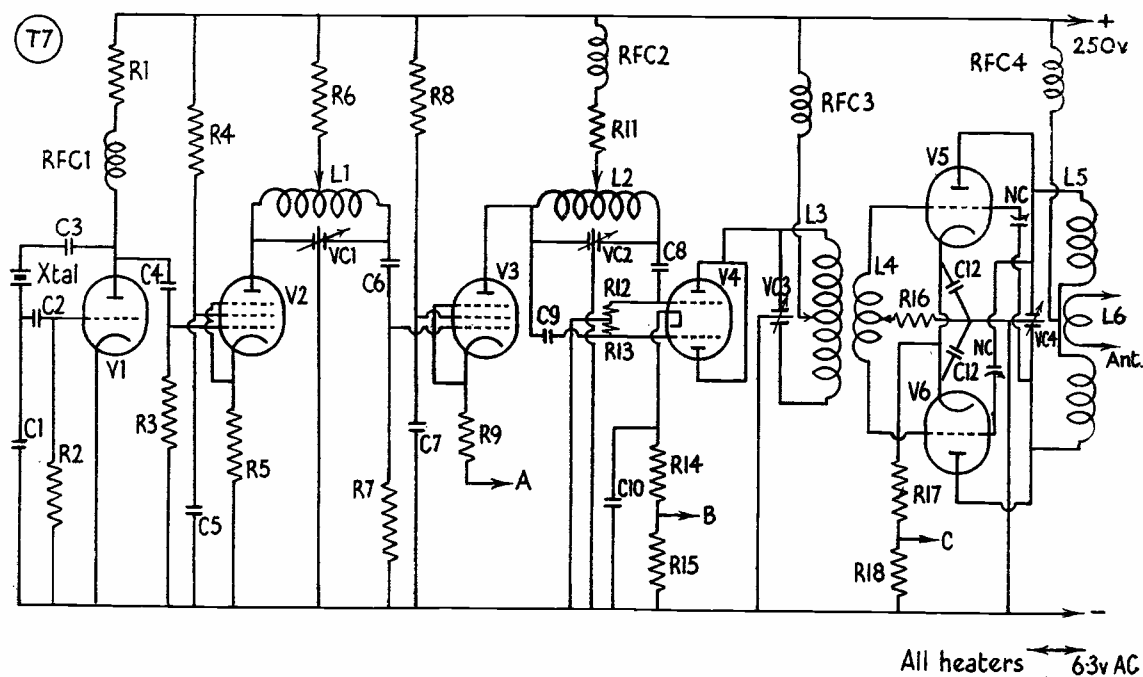


Fig. 1. Circuit of the RF section of the G3AST Two-Metre Transmitter. All values are given in the table.

with the input capacity of the valves, and simplifies the circuit considerably.

The power amplifier stage employs a pair of 6C4 power triodes, which, while not as sensitive as tetrode valves, afford a useful measure of simplicity, and will handle an input of 10 watts indefinitely without overheating. The output link is 300 ohms, but is easily modified to suit the aerial system to be used with the transmitter.

All the valves except the crystal oscillator are equipped with protective cathode bias, limiting anode current should excitation fail. If the oscillator fails, the anode resistance is sufficiently high to afford a considerable measure of protection. All metering is done in the cathode leads, by means of a meter shunt inserted in series with each cathode resistance. As in the case of the push-pull amplifier, the meter shunt is rather high compared with the remaining resistance, provision is made in the

Table of Values

Fig. 1. RF Section of the G3AST VHF Transmitter

C1 = 15 μ F, ceramic	NC = Neutralising condensers (see text)
C2, C3, C6, C8, C9 = 47 μ F, ceramic	V1, V5, V6 = 6C4
C4 = 100 μ F ceramic	V2, V3 = 6F91, 6F12 or 6AM6
C5, C7, C10 = 1000 μ F, mica (TCC CM20N)	V4 = 6J6 or ECC91
VC1, VC2 = 25/25 μ F split stator, Eddystone Type 583	R1 = 22,000 ohms
VC3, VC4 = 15/15 μ F split stator, Eddystone Type 476	R2, R3, R4, R7 = 47,000 ohms
RFC1 = 1.25 mH, Eddystone Type 1010	R5, R15, R18 = 100 ohms
RFC2, RFC3, RFC4 = VHF RFC, A.M. ref. 10c/5741 (or similar)	R6 = 2,200 ohms
	R8, R12, R13 = 33,000 ohms
	R14 = 800 ohms
	R9, R11, R16 = 1,000 ohms
	R17 = 240 ohms
	(All resistors $\frac{1}{2}$ -w. carbon except R14, 1-watt).
	Xtal = 8 mc, standard make
	Meter = 0.50 mA, Weston S.20

COIL VALUES

- L1 = 24 turns 18 SWG enam., 5/8 in. dia. centre-tapped.
- L2 = 9 turns 18 SWG enam., 3/8 in. dia., centre tapped.
- L3 = 4 turns 18 SWG enam., 3/8 in. dia., centre tapped.
- L4 = See sketch, Fig. 3.
- L5 = 2 turns 18 SWG enam., 5/8 in. dia., centre tapped.
- L6 = 2 1/2 turns 18 SWG enam., 3/8 in. dia., inside L5.

meter selector switch to short out the shunt in the "operate" position.

The Modulator Section

The modulator follows a reasonably standardized design, and although a surplus (Collins) modulation transformer has been used, the limitations regarding fidelity have been

confined to that item. Should the constructor see fit to employ a modulation transformer with a higher primary inductance, the amplifier is capable of extremely good results indeed. The speech amplifier-modulator is designed to operate from an STC "Ball and Biscuit" microphone, which has rather a low output.

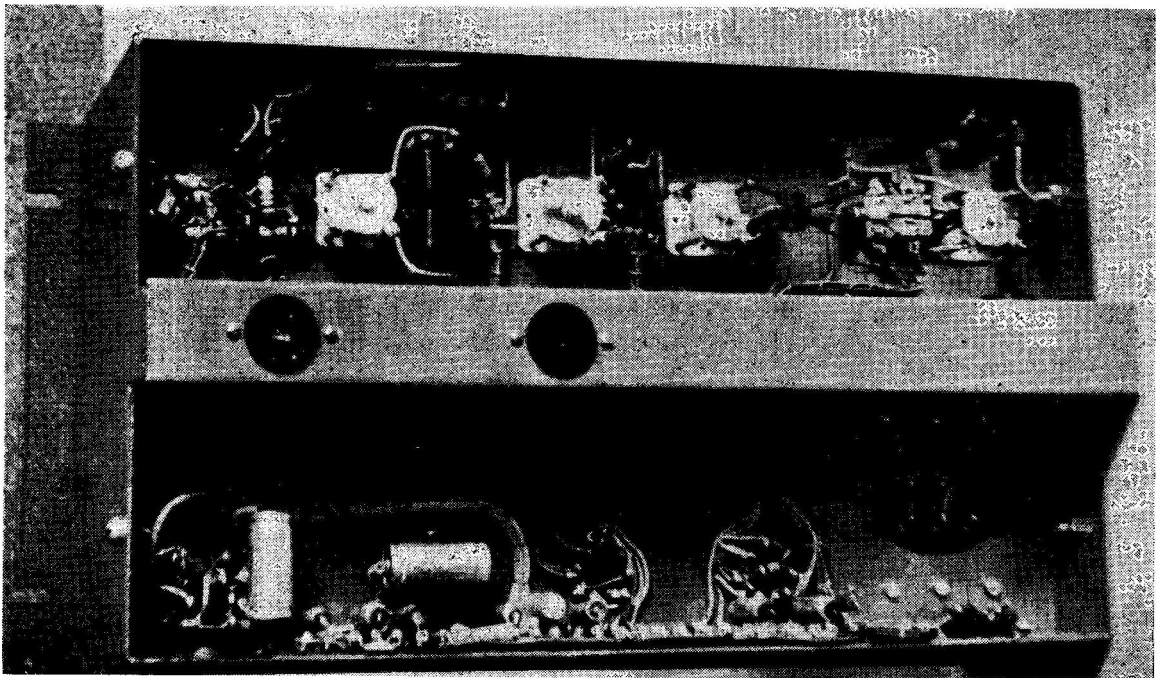
The microphone is matched into the first grid via a small step-up transformer. The Woden type MT.101 is very suitable for this application, but the author found that good results were obtained by using an output transformer removed from a B.Mk.II receiver. This transformer, which is very compact and easy to mount, is run "backwards," the microphone being fed to the headphone terminals while the primary, now the "secondary," is fed between grid and chassis of the first valve. A 22,000-ohm $\frac{1}{4}$ -watt resistor is placed across this winding to provide damping of spurious resonances.

The first stage is a high gain amplifier employing a 6J7 valve. It is essential that the top cap of this valve be screened, as the random pick up at this point renders the modulator unusable without it. The American type of shield for the top cap, which picks up the earth connection from the metal valve body.

is most effective and results in a very neat appearance.

The gain control is placed between V1 and V2, as it is not advisable to insert it earlier in the circuit. The following valve, a 6J5, is an orthodox voltage amplifier, and feeds to V3, which is a cathode coupled paraphase phase-splitter of the kind which is fast becoming popular. The asymmetrical anode loads in this stage are essential to preserve output balance, and being 5% tolerance, should be adhered to. The valve employed is a 6SN7, although a 6N7 will function satisfactorily in this application with minor circuit changes.

The output from the phase-splitter is adequate to drive a pair of 6V6GT valves in Class-A. As only 250 volts HT is available, the screens of these valves are coupled directly to HT+. (Voltages above 250 should be avoided as it is possible to exceed the screen dissipation of the valves.) The output of the 6V6 valves at maximum drive is ample to modulate the input to the power amplifier, with very little distortion. In order to render the output stage less critical to changes in reflected anode load caused by aerial loading variations, or changes in grid drive, a certain amount of voltage feedback is looped over the



Rear view of the Two-Metre Transmitter showing general arrangement of the two chassis sections, with the RF side on the top deck (in this photograph). The valves are of course in the horizontal, extra depth being allowed between chassis and front panel for this purpose. The other photographs should be related with this view.

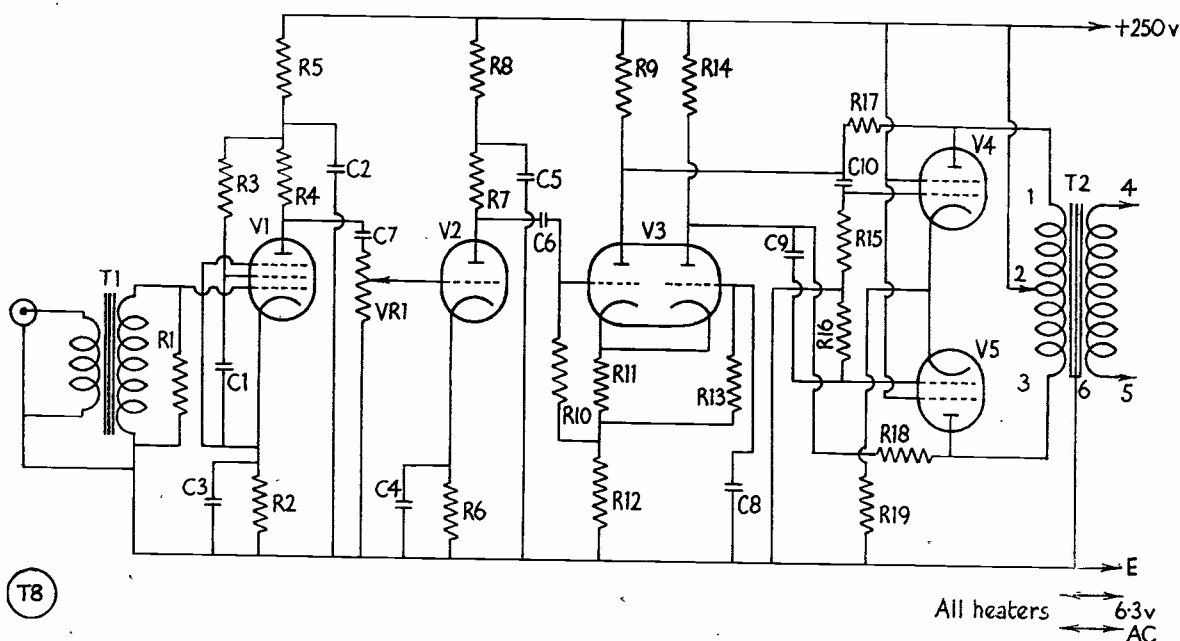


Fig. 2. The Modulator section of the transmitter described by G3AST.

6V6 stage. This feedback circuit consists of two 500,000-ohm resistors connected between the 6V6 anode and the anodes of the 6SN7. Constructors should ensure the right "sense" in making these connections, as a cross connection will result in violent regeneration, or even damage to the modulation transformer.

The inclusion of a feedback loop over the 6V6 valves lowers their anode impedance and causes them to simulate triode valves. The resulting loss of sensitivity is compensated by adequate reserve in the remaining amplifier.

Installation

Both units are of identical size, each chassis being 17ins. long, 5ins. wide and 2ins. deep. By placing the chassis together side by side, a standard chassis 17ins. x 10ins. x 2ins. is formed, or alternatively, by employing special adaptor plates, the familiar two-tier form may be used.

As both units are independent of one another, each may be operated separately. The modulator, for instance, may be used to modulate the Top Band rig, while the RF section may be used by itself, as a driver unit for a high power final, or 420 mc tripler.

Construction

In the interests of rigidity, it is essential that steel chassis be employed. Both units

Table of Values

Fig. 2. Modulator Section of the G3AST Transmitter

C1 = 0.25 μ F	R9 = 56,000 ohms, close tolerance
C2, C5 = 4 μ F, 450v., TCC	R10, R13 = 1 megohm
CE18PE	R12 = 10,000 ohms
C3, C4 = 10 μ F, 25v., TCC	R14 = 68,000 ohms, close tolerance
CE30C	R15, R16 = 220,000 ohms
C6, C7 = .05 μ F	R17, R18 = 500,000 ohms
C8 = 0.25 μ F, Dubilier	R19 = 250 ohms, Welwyn AW-3111
Type 418	
C9, C10 = 0.1 μ F, TCC	
CP37N	
R1 = 25,000 ohms	
R2 = 1,200 ohms	
R3 = 1:2 megohms	
R4 = 100,000 ohms	
R5, R8 = 22,000 ohms	
R6, R11 = 1,000 ohms	
T1 = Wearite Type 210, or Woden MT. 101	
T2 = Woden UM-1, or Collins 677-2010-00 (20w.)	
R7 = 47,000 ohms	
	(All resistors $\frac{1}{2}$ -w. insulated carbon, except as stated. "Close tolerance" to be taken as within 5% of required value).
	V1 = 6J7, or 1620
	V2 = 6J5
	V3 = 6SN7
	V4, V5 = 6V6, or 6V6-GT.

have been folded up from 20 SWG mild steel sheet, and welded at the corners. This construction results in a chassis that is extremely rigid and free of torsional flexing that can mar the stability of any transmitter. The construction and assembly of the modulator is really left to individual choice, but those wishing to adhere to the author's layout will be able to gather the relative disposition of the various components from the photographs.

It is recommended that after all holes and cut-outs have been made in the chassis, both items be sandblasted, to remove the objection-

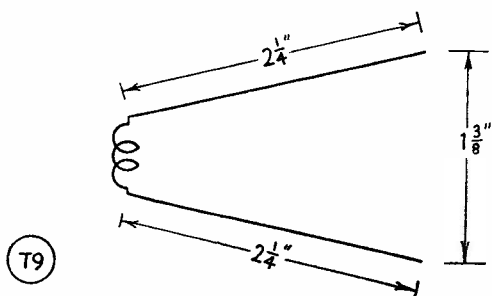


Fig. 3. Details of coil L4 for the G3AST design. Of 16 SWG enamelled, in two turns of 3/8in. diameter and centre-tapped, it should be mounted at the centre of L3. The valves V5, V6 (see Fig. 1.) are placed so that the ends of L4 can be soldered direct to their respective grid pins.

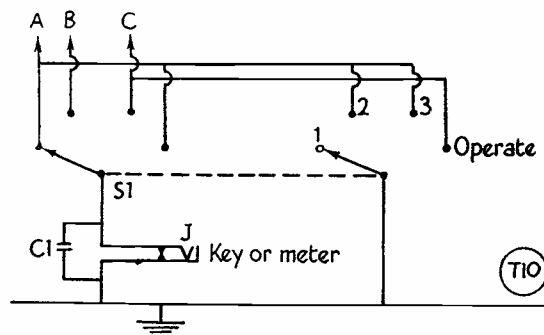


Fig. 4. Circuit showing details of meter switching in the G3AST Two-Metre Transmitter. S1 is a two-pole 4-way wafer switch; C1 .005 μ F mica; and J a close-circuit jack.

able scale found on sheet steel, and finished by plating with either cadmium or dull nickel. Contrary to popular belief, the dull nickel plated finish is much cheaper than cadmium and can be accomplished for about six shillings. To lend a professional appearance to the transmitter both chassis have been given one coat of grey stove enamel, although the colour is of course of secondary importance, contributing little more to the corrosion resistance which is effected by the plating.

The RF section needs rather different treatment, as this chassis cannot be expected to contribute any earthing busbar facilities. On this account, a copper busbar one inch wide runs nearly two-thirds of the length of the chassis. Being mounted on the centre line, this 20 SWG copper strip is held in place by the tuning condensers themselves and needs no additional fixing. To ensure that all valve holes and fixing centres on the busbar coincide with chassis holes with a minimum of marking out, it is a good thing to fix the two together by one attachment hole each end and drill all the remainder through both thicknesses at the same time, thus ensuring mating of the parts on final assembly.

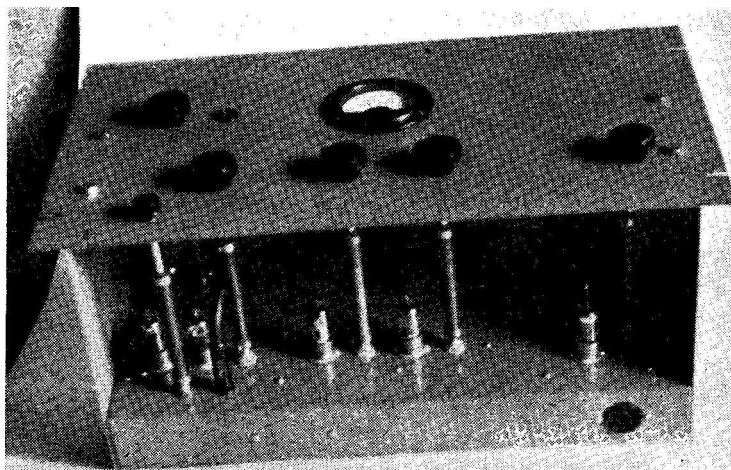
The choice of 20 SWG copper for this application is about optimum, as any thicker gauge would necessitate using an alcohol torch to make the soldered connections due to the rapid conduction of the heat away from the joint.

No difficulty was experienced in making all joints on this strip with the popular type 65-watt soldering iron.

All earth connections must be as short and direct as possible. All DC leads may be cable formed for the sake of neatness, it being immaterial if they are a trifle long.

The power amplifier has the same treatment, a separate piece of 20 SWG copper being placed beneath the two valves, as with the multiplier stages. Short, direct connections for RF and by-passing are even more essential at 144 mc than in earlier stages, and the amplifier should be constructed with this factor in mind.

The tuning condensers are mounted as shown in the photographs, in preference to the more orthodox position on the front drop of the



RF section of G3AST's Two-Metre Transmitter—see rear view photograph (top) for general under-chassis layout. The single meter is switched for checking any circuit.

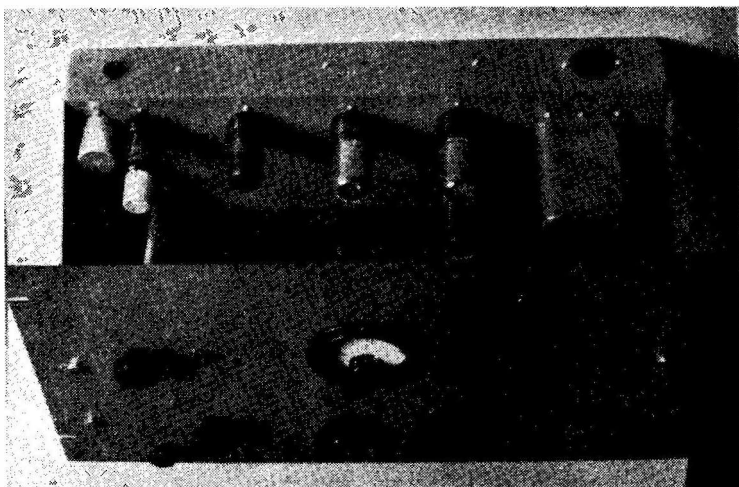
chassis, in order that symmetry may be preserved in the various circuits right up to the PA. The neutralising condensers, which are mounted in the wiring by short lengths of 16 SWG wire are 3-30 $\mu\mu\text{F}$ ceramic "postage stamp" trimmers. These may be used quite satisfactorily if the moving plate is pruned right back level with the adjusting screw, using a pair of shears. Care should be taken during this operation to ensure that the mica is not damaged, as a short across the plates will "write off" either output valve in very short time. Very little capacity is required for neutralising, and the condenser plates are almost at their widest position.

As the tuning condensers are mounted vertically on the chassis, as is the gain control, it is necessary to orientate both chassis (side by side) in a vertical plane, with the valves pointing towards the front panel, which is attached to both chassis by means of two special brackets. Eddystone rigid couplers connect the knobs on the front panels to the condensers in the rear via standard panel bushes.

Keying is accomplished in the cathode of the second tripler V3, which will leave the oscillator running at all times. The valves may be left indefinitely in the "Key up" condition without overheating, as the cathode resistors reduce the respective anode currents to a safe value.

Tuning Up

The meter is switched to position 1, which is in the cathode of V3. VC1 is then tuned for maximum current. Switching the meter to



Looking at the front panel and down into the audio section of the transmitter, with the input transformer visible at the extreme left of the chassis.

position 2 will show 6J6 cathode current. This is adjusted to maximum by tuning VC2. Position 3 indicates PA cathode current. This reading should be adjusted to maximum by VC3, and optimum dip by VC4, in that order. Final trimming for the "last ounce" may be accomplished in conjunction with the dummy load brilliance, or F.S. meter. Position 4 shorts out R18 and opens the cathode return of V3 for keying.

Performance

The unit was given a "baptism of fire" on the two-metre Field Day, 1951, on which occasion the performance was in all respects beyond reproach.

Since that time it has evoked interest as a simple reliable two-metre transmitter free of snags and vices, that any newcomer to Two may be confident to use as a starting point on which to "cut his teeth."

EMERGENCY RADIO EQUIPMENT ON DEEP-SEA SHIPS

G3HJG (Urmston, Manchester) writes to ask us to make it clear that vessels such as the *Flying Enterprise* do carry emergency power supply in the radio room in the form of a bank of 24-volt accumulators, which can run the main installation or a separate transmitter and receiver for working on 500 kc (600 metres, the International Calling and Distress Wave). While we are glad to add this further explanation to the note

entitled "The W2ZXM/MM Epic" on p.721 of our February issue (which implied that the whole of the ship's regular equipment was out of action), the fact is, of course, that it was these emergency batteries that Captain Carlsen, W2ZXM, made use of to power his own equipment during the early stages of the rescue attempt. Had he not been a competent operator himself, he would not have been able to adopt such an expedient.

LAST month's article by G5UM, "Yagi made Easy," raises some points which may not be clear to newcomers to this type of beam aerial. The presence of the parasitic elements lowers the radiation resistance of the radiator. In general, the closer the spacing the lower the resistance. It is for this reason that some sort of matching device is required if the beam is to be fed with any of the usual types of feeder. The folded dipole, such as G5UM employs, is one of these methods, and the impedance step-up which it effects is determined by the relative diameters of the two segments and by their spacing. With the diameters used by G5UM, the step-up ratio will be about 6 if the centre-to-centre spacing is around $1\frac{1}{2}$ to 2 inches. If closer spacing is used, it is difficult to calculate an accurate figure, as the proximity of the two conductors affects the current distribution in them.

Taking these figures, it should be clear that the folded dipole, in question, will be a good match for 70-100 ohm feeder line if the impedance of the beam itself is around 15 ohms. There is no easy method of calculating this beam impedance, and it is dependent on many factors, including length and spacing of elements, and these, in their turn, are dependent on the method of their mounting. One well-known handbook quotes a figure of 18-ohms, but adds a note to the effect that "it may vary considerably." Personal experience is that it is usually well above this figure. In the early days of 2-metre work, a Yagi was built with folded dipole feed, the dimensions being based on figures taken from this same handbook, and was used at G2XC for several months. Results were disappointing. Stations were worked, but it was felt that signal strengths were not as good as they should have been from the particular location. Finally, the impedance matching was suspected. Unfortunately, with a folded dipole there is no easy method of adjustment, and a new beam was designed with different method of feed. However, before dismantling the old beam some field strength measurements were made, and then a dipole erected in the same position

VHF BANDS

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

Matching the Driven Element—

Further Notes on The Mechanism of Propagation—

Period of Much Better Conditions—

Station Reports and News—

and another set of readings obtained. The "beam" (so-called) was found to be 8 dB down on the dipole! We know of others who have discarded their folded dipoles and replaced them with direct feed at the centre of the radiator from 52-ohm coaxial cable and have obtained vastly improved results. Indeed, if the director spacing is increased to 24 inches, this appears to provide an excellent match. It is our firm opinion that much of the bad name the Yagi has obtained during recent years among many VHF operators is due to its use with badly-adjusted "matching" systems.

It is not the intention by the foregoing to deter any intending constructor from building this "Easy Yagi," but rather to shed some additional light on the subject—and to suggest that if, after initial trials, one does start "checking for standing waves" and finds some, then it may be worthwhile experimenting with some adjustable matching system. For experimental purposes, at least, your conductor has found

the delta-matching system as flexible as any. 300-ohm ribbon, with the last 12 inches fanned out and clipped on to the radiator, provides an easily-adjustable device which will quickly enable one to discover the maximum capabilities of any Yagi. If the neater folded dipole, or T-match, is not giving equal results, then it is obviously incorrectly designed. And do not forget that adjusting the beam may affect transmitter tuning. (Apologies to those who, knowing all this, have been bored by it!).

Propagation

The recent comment in this column on the mechanism of abnormal 2-metre propagation brought several letters from readers, some still suspicious of your conductor's ideas that ducting was *not* the answer to the great majority of our DX contacts on that band, others (somewhat reluctantly, we thought) admitting that perhaps, after all, it was not so simple a matter as they had thought. However, at least one correspondent is with us wholeheartedly. G3EGB (Chippenham), who is busy with a research into 2-metre propagation and the weather, writes: "May I ask you to debunk the use of the term 'duct'? For a duct to be effective at two metres, we require an inversion or moisture lapse to continue at more than the known critical rates through a depth of at least 700 feet. The meteorological implications of this are fantastic." After that there would appear to be little more "debunking" left for us to do, but we would refer those interested back to the February 1947 issue of *Short Wave Magazine*, where, on page 751, we had our first effort at removing this word from two-metre terminology. (The Editor seems to have had other views on that occasion!)

Returning to G3EGB, he further says that, while not wishing to appear intolerant or bad-tempered, he does find it surprising that many amateurs who are sufficiently interested to attempt a correlation between barometric pressure and propagation conditions are not also sufficiently interested to ascertain the present knowledge of the subject. As has been men-

tioned in this column on more than one previous occasion, there is a tendency for the right conditions for VHF DX to be found more frequently in anticyclonic weather than at other times. There is, however, no direct relationship between anticyclones (i.e. high pressure) and VHF DX, as anyone who attempts to forecast conditions will soon find out. The frequent coincidence of high barometer reading and 2-metre DX is really the clue which, if followed up, leads to the meteorological phenomena which are the real determining features. As G3EGB points out, the most significant of these features are obtained by making a vertical analysis of tropospheric conditions.

In connection with this matter of propagation and the weather, would any readers who would be willing to summarise their logs for 1951 by listing all the dates on which they were active, and against each writing a one-word description of VHF conditions (bad, fair, good or excellent) please let us know? Do not send any lists, just the information that you would be willing.

Conditions

It was W. S. Gilbert (of Gilbert and Sullivan fame) who wrote: "For such a beastly month as February, twenty-eight days, as a general rule, are plenty," and most 2-metre enthusiasts would, prior to 1952, doubtless subscribe to these feelings. It was therefore a pleasant surprise that February, 1952, with its extra day, belied the adjective "beastly" and put on a VHF performance which would have done credit to many a summer month. Those who were hibernating missed it all, but sufficient stations were active to enable many pleasant contacts to be made. Even your conductor got on the band again in time for much of it and was glad to be able to renew acquaintances with many old friends as well as several newcomers to VHF. The latter half of the month was probably the better, but G3VM (Norwich) reports working PE1PL on February 12, 13 and 14. On the 27th PE1PL was S9 plus with G3VM. Several stations worked ON4BZ at various times. G3EHY

TWO-METRE ACTIVITY REPORT

G3WW, Cambs.

WORKED: G2AVR, 2BN, 2DUS, 2FQP, 2FVD, 2HCG, 2MQ, 2TP, 2UQ, 2WJ, 2XC, 2XV, 3AJP, 3BK, 3BNC, 3CCP, 3CJY, 3DMK, 3DUP, 3EEL, 3EHY, 3ELI, 3GGJ, 3GHI, 3GOP, 3HBN, 3HCU, 3HZF, 4MW, 4PV, 5AM, 5DS, 5YV, 8DV/A, 8IL, 8OU, ON4BZ.

HEARD: G2FTS, 2HTZ, 2IQ, 2MU, 2PU, 3CGQ, 3EDD, 3HBW, 6RH, 6XX, 8HY. (February 23 to March 1).

G3HBW, Wembley, Middlesex.

WORKED: G2DUS, 2FZU, 2HCG, 2XC, 2XV, 3BK, 3CCP, 3FUL, 3FZL, 3GBO, 3HBN, 3HXO, 5DS, 5UM, 5YV, ON4BZ.

HEARD: G2FTS, 2PU, 2FQ, 3ABA, 3BNC, 3EHY, 3FGT, 3FUW, 3GVC, 4MW, 8IL.

G3EHY, Banwell, Somerset.

WORKED: G2ATK, 2BN, 2BZ, 2COP, 2DFO, 2FZU, 2HDZ, 3ABA, 3BK, 3BW, 3DJQ, 3ECA, 3FIH, 3FMI, 3FZL, 3GHC, 3GHI, 3GZM, 3HAB, 3HAZ, 3HCT, 3HSD, 3HXS, 3HZF, 3IAI, 3MA, 3WW, 3YH, 4HT, 5BM, 5DS, 5ML, 5YV, 6NB, 6TA, 6YP, 6YU, 8HK, 8KL, 8OU, GW2ADZ, 3FYR, 8UH. (February 10 to March 9).

G2FNW, Melton Mowbray, Leics.

WORKED: G2ATK, 2BN, 2COP, 2FJR, 2FZU, 2HIF, 2HOP, 2MV, 2UQ, 2UQ/P, 2XS, 3BK, 3CGQ, 3CHY, 3EDD, 3EEL, 3EGE, 3ELI, 3FUW, 3GHI, 3HMH, 3HAZ, 3IAI, 5ML, 5YV, 6XX, 6YU.

HEARD: G2BFT, 2BVW, 2FMO/A, 2FTS, 2HCG, 2HDZ, 2XV, 3ABA, 3BLP, 3CXD, 3EHY, 3FGT, 3HNS, 3HXS, 3VM, 4FO, 4HT, 5RW, 5SK, 6NB, 6UH, 6XY, 8DV/A, 8QY, 8VZ, 8YQ, GW2ADZ, 5MQ. (February 10 to March 9).

Wimblington,

G3VM, Norwich, Norfolk, (NGR 63/182101).

WORKED: G2BN, 2FJR, 2FVD, 2HCG, 3AJP, 3BK, 3EDD, 3GDR, 4HQ, 4KO, 4PV, 5YV, 6YP, 8SY, ON4BZ, PAOFB, PE1PL.

HEARD: G2FQP, 2FUB, 2PU, 2XV, 3EHY, 3GBO, 3GHI, 3WW, 6NB, 8HK, GW5MQ.

G5DS, Surbiton, Surrey.

WORKED: G2DUS, 2HDZ, 2IQ, 2MQ, 2PU, 2UN, 2XV, 3ABA, 3BK, 3BNC, 3BUN, 3CCP, 3DAH, 3DIV/A, 3EHY, 3GBO, 3GVC, 3HAB, 3HBN, 3HXO, 3HXS, 3WW, 4GR, 4MW, 5YV, 6NB, 8CK, 8HK, 8KL, 8OU, GW2ADZ.

HEARD: G2AHP, 2AIW, 2BN, 2DFO, 2DXU, 2FNW, 2FTS, 2FVD, 2FZU, 2HAZ, 2HCG, 2LW, 2MV, 2NH, 2TP, 2UQ, 2WS, 2XC, 2XS, 2YC, 3AEX, 3ASG, 3ATC, 3BLP, 3BVG, 3CGQ, 3CJY, 3CUA, 3CWW, 3DUP, 3ECA, 3EFP, 3ENI, 3EYV, 3FAN, 3FD, 3FQS, 3FSG, 3FTR, 3FUL, 3GDR, 3GGJ, 3GHO, 3GMZ, 3GSE, 3GSO, 3HAZ, 3HCU, 3IAI, 3IIR, 3MI, 4HT, 4KD, 4MR, 5CD, 5ML, 5OL, 5RW, 5SK, 5TP, 5UF, 5UM, 6JP, 6KB, 6LR, 6QN, 6RH, 6TA, 6TS, 6UH, 6VU, 6YP, 8DV/A, 8HY, 8LN, 8SM, 8VZ. (February 11 to March 9).

G4MR, Slough, Bucks.

WORKED: G2ATT, 2FQP, 2FTS, 3GCE, 3ECA, 3FAN, 3HVO, 4MW, 5OL, 6GR.

HEARD: G2DGY, 3ABH, 3BK, 3FNW, 3FUL, 3HAB, 3HXS, 3GBO, 5DS, 8HK, 8VZ. (February 9 to March 8).

G2XC, Portsmouth, Hants.

WORKED: G2AHP, 2FTS, 2FVD, 2HCG, 2HDZ, 2NM, 2TP, 2UN, 2WJ, 2XV, 3CGQ, 3ENI, 3FAN, 3HAB, 3HBW, 3HCU, 3HXS, 3WW, 4HT, 5LQ, 5SK, 6GR, 6NB, 6TA, 6YU, 8DV/A, 8IL, 8OU.

HEARD: G2BN, 2IQ, 2MC, 2YC, 3ANB, 3BNC, 3GHO, 3GOP, 3HAZ, 3HVO, 3VM, 6AG, 8HK. (February 25 to March 12).

G2FVD, Morden Park, Surrey.

WORKED: G2BN, 2FQP, 2IQ, 3AUS, 3BNC, 3CCP, 3EDD, 3EYV, 3FQS, 3GBO, 3GOP, 3GVC, 3HAZ, 3VM, 3WW, 8IL.

HEARD: G2DGB, 2FZU, 2XV, 3ABA, 3ABH, 3CFK, 3EHY, 3GWB, 4GR, 4MW, 6YU, GW2ADZ. (February 20 to 26).

G2HDZ, Pinner, Middlesex.

WORKED: G2BZ, 2DL, 2DUS, 2FTS, 2FZU, 2PU, 2XC, 3ABA, 3BNC, 3CGQ, 3EHY, 3FAN, 3FQS, 3FSG, 3GSE, 3HAB, 3HBN, 3MI, 4GR, 5DS, 5YV, 6GR, 8DM, 8KL, 8LN, 8OU.

HEARD: F8MW, G2FQP, 2UQ, 2XS, 2XV, 3BK, 3CJY, 3EDD, 3GHO, 3GOP, 3GZM, 3HAZ, 3HVO/P, 3HXO, 3IAI, 3VM, 3WW, 4AP, 4MW, 5BM, 5ML, 5SK, 5UF, 6YU, 8IL, GW2ADZ. (February 11 to March 4).

G3HAZ, Birmingham, Warwick, NGR 42/023790.

WORKED: G2ATK, 2BFT, 2COP, 2FJR, 2FNW, 2FQP, 2FVD, 2FZU, 2HIF, 2HOP, 2PU, 2YC, 3ABA, 3ASG, 3BK, 3BLP, 3CCP, 3CGQ, 3CHY, 3DJQ, 3DUP, 3EDD, 3EGE, 3EHY, 3FGT, 3FUW, 3GHI, 3GZM, 3HCT, 3HXS, 4CR, 4GR, 4HT, 5MI, 5RW, 6NB, 8DV/A, 8HK, 8IL, 8KL, ON4BZ.

HEARD: G2AOK/A, 2DFO, 2HCG, 2UQ, 2WS, 2XC, 3CVK, 3ELI, 3FZL, 3GHC, 3IAI, 3NL, 3WW, 4MR, 5DS, 5LJ, 5SK, 5YV, 6CI, 6VX, 6XY, 6YU, 8IK, 8OU, 8QK, 8SY, GW2ADZ. (February 13 to March 12).

G8KL, Wolverhampton, Staffs.

WORKED: G2COP, 2FZU, 2HDZ, 3EHY, 3FGT, 3GZM, 3HAZ, 4MI, 5BM, 5DS, 5YV, 6TA, 6XY, 8IK, 8OU, GW5MQ.

HEARD: G2HOP, 2XV, 2YC, 3BPJ, 3CGQ, 3IAI, 5JU, 5LJ, 5ML, 8DV/A, 8QK. (February 1 to March 10).

(Banwell) raised G3BW (Whitehaven) on February 27 for the first time this year, while G5YV (Leeds) put an excellent signal into southern England on many occasions. On February 26, G2FVD (Morden Park) had a good contact with G3AUS (Torquay).

On 70 cm things were also good, G3EHY and GW2ADZ working over a 105-mile path on nine successive evenings at S7 to 9, while a mid-day contact was made on the 26th.

Around the Stations

Before starting on our monthly tour of VHF activity, we should

like to send, on behalf of all who follow this feature, best wishes for a speedy recovery to G5NF and GW2ADZ, both of whom are in hospital. We look forward to the early reappearance of their well-known signals on the VHF bands.

The South

On the Sussex coast, G2UN (Lancing) is active and has been heard working across the Channel, while G3FRG (Worthing) has made a few appearances and hopes to be regularly on Two by the time this is in print. He has an SCR522, which means QRT during TV, while the converter is

a modified RF27 which he lined up on G2XC! The beam is a 3-element Yagi — indoors at present — but a "City Slicker" is to be erected shortly. Further, an all-6J6 converter is being prepared with a BC624A as IF amplifier. G3FRG's present frequency is 144.138 mc, but he hopes to line up with the Zone Plan shortly.

G8LY (Lee-on-Solent) has built an auto-CQ sender, and a 70 cm Corkscrew which she hopes to get up on a mast soon. G3GOP (Southampton) is still climbing the Counties Ladder. He recently worked his 100th station. Among recent good signals heard in Southampton he mentions G2HCG, G3WW and G4GR, all heard during latter part of February.

Other news from the South Coast is that G3HVO continues active in Dorset and that G2XV hopes to be /P in that county during the Easter week-end.

G3EHY (Banwell) reports that he has more entries in his log this February than he had during some of the months last summer. He comments that the Met. Office "Upper Air Graphs" for the period show a very big temperature inversion during almost two weeks of the period under review. G5YV (Leeds) has been a solid phone signal with him practically every evening, and on Sunday mornings. A new county came the way of G3EHY out of the blue one night. A wisp of a signal was heard testing from the western shores of Cardigan, and, after much patient calling, G3EHY was rewarded by a contact with GW3FYR in Aberporth.

G2HIF (Wantage) failed to make his promised 20 hours of activity during the month, partly due to his one and only 832 passing out. Another 832 has now been obtained with the assistance of G3ERG and G3HDL, and so G2HIF is once again with us. G4SA is reported as moving QTH, but anticipating being back on Two shortly.

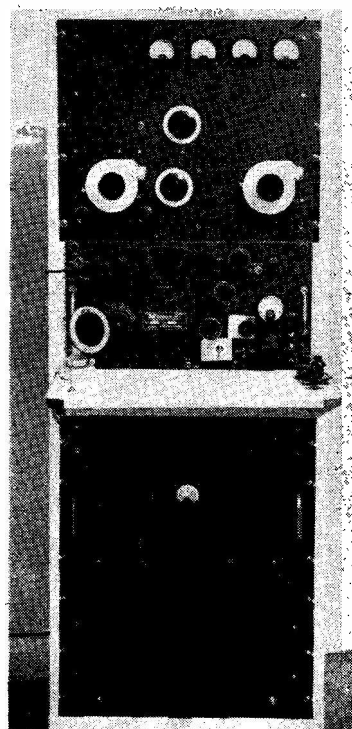
G3GBO (Denham) writes to correct us. Last month we quoted him as attempting to work an *impossible county* (namely, Northampton), whereas what he said was that he was attempting to

work G3DUP over impossible country. He had already worked Northants, but G3DUP is not so well placed as the other stations. G2HCG and G3BA, for working from Denham. Some 50% contacts have been made, but fading has been bad. Amongst signals heard by G3GBO in recent weeks have been F8GH, G3CSY and G3DIV. He is wanting a contact with Gloucestershire, and would welcome schedules with stations in directions from north to south-west, through north-west and west. These are difficult directions for him.

G3HBW (Wembley) has met with some success this month. ON4BZ was worked on March 8 under conditions which were no better than moderate. G3EHY has been up to S9 plus at times, but so far has not been raised. G2HDZ (Pinner) scored three new counties during the recent good spell. He sends a list of VHF CC members who owe him a card; he is surprised when he looks at this list to note how it consists mainly of the leading (?) VHF workers. (The question mark is his!) We gather he is losing no sleep over the matter, but feels that, in the interests of those still awaiting their 100th card, we should print a list of those people who do not hold to their obligations. We are beginning to think much the same, particularly as almost every list of offenders which reaches us contains the call of a founder-member of the Club, who is known to be a very keen collector of cards on the DX bands as well.

G2AHP (Perivale), after a few weeks' unavoidable absence from two metres, is once again "diligently searching" the band. He feels it is an easy task now for a station in the London area to obtain 100 stations (and the QSL's?) The new Tx at G2AHP has been tested and found TVI-proof.

G2FVD (Morden Park) found conditions good from February 20 to 26, and he had some good contacts. A contact with G3AUS on the 26th brought the following comment from the Devon station: "You want to be down here to know the meaning of inactivity."



The two-metre station of G2FVD, Morden Park, Surrey, is a very neat self-contained assembly, as this photograph shows. The transmitter sequence is EC52, 24 mc—EF50, 72 mc—TT11' 144 mc—832, 144 mc—p/p 8012's.

G8LN (Plumstead) found the week ending March 3 exceptionally good, while on March 8 there was a good path from London to the south-west. Regarding aerials, he feels the stacked array is superior to others, due to its wider beam. (At G2XC a sharply directional beam is preferred in order to reduce pick-up of noise from the main road.)

G3BLP (Selsdon) considers conditions have been much better than many have thought, to judge by their lack of activity. He has heard G5YV every evening since February 15. G3BLP wishes to explode two myths. One is that Two goes dead in the winter; while the second (which is heartily endorsed by G2XC) is the often-heard remark that it needs more audio power to modulate a two-metre carrier than for a low-frequency one. This belief is undoubtedly the cause of much of the splatter which is experienced from local stations. The splatter

is often worse from a 25-watt station than a 100-watt carrier, due to the comparatively easier task of over-modulating the former. Another point which G3BLP makes is that a 50-foot hill at 50 feet is just as big an obstacle on VHF as a 1000-foot hill at 1000 feet distance.

G3HCU (Chiddingfold) is another who sends a list of stations who have failed to reply to his QSL's. (The list is mainly old-timers, we regret to add.) G3HCU himself joins the VHF Century Club, G5DS (Surbiton), also writing on the subject of QSL's, finds the best response comes from the stations with 3-letter calls. (It is undoubtedly a fact that interest in QSL's is greatest in the newcomer, and tends to dwindle with time. However, old-timers should remember their own early enthusiasm and always send a reply for a card received.) G2KF (Edenbridge) continues active and has heard and worked a number of new stations. Several French stations, notably F8GH, have been heard at good strength. G2KF runs 18 watts to a 522, while the receiver is a 6J6 (G2IQ type). A 6-element stack at 25 feet is the aerial system.

The East

G5AM (Ipswich) is using an RK34 PA, and has a 6-element broadside array with its top at 35 feet. He is on the band most evenings from 7.30 to 8, and often

from 10.15 to 11 p.m. He would like schedules (any time of day or night, except Sundays). He prefers CW to phone, but is equipped for either. G5AM joins the Five-Band Club.

G3VM (Norwich) experienced conditions well above average for time of year, but activity was not great. On February 24 he heard GW5MQ well, and worked G5YV at S8. ON4BZ was raised on February 26, while PE1PL and PA0FB were worked the following day. G3WW (Wimblington) sends along a piece of his tubular feeder which was broken as a result of being trapped in the garden gate outside his shack. This explained the poor performance of the 5-over-5 and was a great relief to G3WW, who had suspected the fracture was up at the top (*i.e.* 58 feet above ground). In the meantime, an 8-element stack had been erected with the help of G3BK, and has provided some interesting signal strength comparisons. The stack is very broad from a directional point of view, and, when facing east-west, can be used to work into Middlesex as well. On east-west contacts the stack, although somewhat lower, gives slightly superior signal strengths. A Lazy-H is also being tried, at a relatively low height, with encouraging results.

The Midlands

G3HAZ (Birmingham) thinks it was quite a good month. A dozen or so new stations were worked, the best catch being ON4BZ on February 21. Regarding the Zone plan, he thinks it a pity that the London Zone is not 144.0-144.2 and 145.8-146 mc. He suggests that for contests the serial number should be the NGR in full (!).

G8KL (Wolverhampton), active once again every evening, heard a mystery signal on March 10 calling "G3WW de W5RP," and later calling G6YU! Anybody any information? G8KL says he would have liked to have called "W5RP de G8KL," but didn't dare! Instead, he called CQ hopefully but had no luck. His beam was east at the time.

The North

G2OI (Eccles) has been off the air, due to his beams being shattered in the January gales. A

45-foot pole, complete with two huge sleepers and concrete base, was hurled across the garden and the beams smashed. G3HII (Liverpool) has been having TVI troubles, particularly from his receiver. He worked G3EHY during the recent good spell, this contact being with a newly-erected "City Slicker." On the topic of QSL's, he thinks a lot of them go astray in the main Bureau. He recently received a card which was despatched to him last April, while another card which he sent in October has still not reached its addressee. He is now sending direct.

Across the Water

GC2CNC (Jersey) has heard nothing this past month, but continues trying hopefully. He asks for F stations to beam his way. GC2CNC is often on LF bands around 2245 GMT and can arrange immediate VHF schedules if required.

EI2W (Dublin) tells us that EI6W in Galway City (about 120 miles west of Dublin) will be operating on 145.278 or 145.35 mc before the end of April. EI2W will be starting up with his 32-element beam on April 1 at 2200 on 144.144 mc, and will answer all reports—and QSL 100%. He anticipates changing his QTH in May, and requests all stations who wish to write to him or send QSL's to post them to the IRTS QSL Bureau, 97 St. Stephen's Green, Dublin. (EI2W is, of course, the QSL manager for EI).

ON4BZ (Brussels) is using a new 16-element beam with in-phase feeding and an aerial coupler in the beam itself. The coax. is used only as a link, with ideal SWR. Results are excellent. The two last weeks of February produced some outstanding results for ON4BZ, contacts being made with DL, F, G and PA. He was, however, extremely disappointed with the number of G stations active during this good spell. ON4BZ will be on 144.925 mc every morning at sunrise whenever conditions are outstanding.

We were glad to hear once again from DL3FM (Mulheim-Ruhr), who is back on Two with a new converter; this has a triode-connected 6AK5 RF stage.

TWO METRES
COUNTIES WORKED SINCE
SEPTEMBER 1, 1951
Starting Figure, 14

Worked	Station
44	G3EHY
43	GW5MQ
37	G3BK, G3WW, G5DS, G5YV
36	G4HT
34	G2XC, G5MA
33	G4SA
32	G2NH, G3FAN
27	G2FNW, G2HDZ, G3VM
26	G2FVD, G8IL
25	G2AHP, G6YU
21	G2OI, G3BNC, G6CB
20	G2FQP, G4MR, G6TA
19	G3AVO/A, G3CWW, G3GHO, G3HCU
18	G8VR
17	G5ML
16	GM3EGW
15	G3GOP, G6CI

Note: This table will run for one year until August 31, 1952.

TWO METRES

ALL-TIME COUNTIES WORKED LIST

Starting Figure, 14
From Fixed QTH Only

Worked	Station
54	G2OI
53	G3BLP (522)
52	G3EHY (332), GW5MQ (186)
48	G2AJ (408)
47	G2NH, G3BW, G5WP, G6NB, G8SB
46	G4HT (476), G5BY
45	G5YV, G6XM (356)
44	G3ABA (222), G5MA
43	G2XC, G3WW, G3COJ, G5DF
42	G5BD, G5DS (329)
41	G3BA, G3DMU
40	G3BK, G3CGQ, G5BM, G8OU
39	G2IQ, G4SA, G5LI (285)
38	G3APY, G3VM (208)
37	G2FNW, G6YU
36	G3CXD, G6CB (312), G8IP
35	G2FQP, G3FAN, G8IL (212)
34	G3HAZ (113), G4RO, G5JU
33	EI2W, G2HDZ (238), G3FZL
32	G3AVO/A, G6CW, G8QY
31	G2AHP (249), G3HBW (115), G5RP
30	G2HIF, G5NF
29	G6CI
28	G2DLJ/A
27	G2FVD, G3DAH, G3GSE, G3HCU (145)
26	G3BNC, G3CFR (125), G3FIH G4MR (163)
25	G5SK, G8VR
24	G3FD, G3FXG, G3GBO (253), G8KL
23	G5PY, G6GR
22	G3AEP, G3BPM, G3CWW (221), G3GOP (100), G8IC, G3BDA
21	G3AGS, G5MR, G6XY
20	G3EYV, G6TA (123)
19	G3SM, G5LQ (176)
18	G4LX
16	G2AOL, G3FRE, GC2CNC, G3EGW
15	G2DVD
14	G3CYY, G3FEX

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

into ½-6J6 GG with ½-6J6 mixer, into a 6AK5 IF pre-amplifier, using a 6AK5 as CO with 22 mc crystal frequency multiplied to 132 mc. This, he says, "is doing a nice job." The old transmitter is still in use, and puts fully 100 watts of RF into a 12-element array, on 144-65 mc. DL3FM is also equipped to receive on 70 cm, but as yet the DL's are not allowed to transmit on that band. Since 1949, on the two-metre band, DL3FM has worked 23 DL's, 2 F's, 28 G's, 2 GW's, 11 ON's and 57 PA's, with HB heard. This makes a total of 123 different stations, almost all at over 100 miles, to all of which he has QSL'd—with only 82 cards to show for it. He is anxious to make VHF CC, for which, of course, he would be eligible if the

wanted cards turn up. DL3FM would also be glad to have an exact check with GM3ENJ on the latter's reception of DL4CK, as he (3FM) was working 4CK at the time on the same frequency. DL3FM's point is that 4CK normally has considerable difficulty in making his signals heard beyond local distances.

Seventycems

As a result of the IRTS annual dinner held recently in Dublin, G13GQB and EI5Z laid plans for the first EI/GI on 70 cm. It is hoped that this "first" will mature in the Spring.

G3HHY (Battersea) hopes to be on 70 cm from April 8 every day and evening until April 27, from his home QTH at Solihull, between Birmingham and Coventry. The transmitter will consist of a pair of CV6's coaxially plumbed to 210 mc, driving another pair of CV6's in the PA. He hopes G3HAZ may be interested in listening for him. So far, G3HHY's best DX has been car ignition at 500 yards!

G3EHY (Banwell), as mentioned earlier, has been obtaining some excellent results in conjunction with GW2ADZ, and on one occasion recently his signals blocked the receiver in Llanymynech. He feels it was a pity that during the good spell at the end of February it was impossible to find stations able and willing to carry out 70 cm tests.

G3CVO (Gerrards Cross), writing from Cambridge, says he will be

back in Bucks. soon, and the motto then will be "TV-on-70-cm-or-bust." He would like details of the Telefunken LS180 if anyone can oblige; he has a pair of them. Also, he requires data on the 4C27 if anyone can help. He asks for views on TV polarisation on 70 cm. If vertical was used it would reduce any possible interference with normal 70 cm sound work. He points out that most existing 70 cm receivers will be useless for TV reception, as they have too restricted a tuning range, and too narrow a band width.

G8LY (Lee-on-Solent) has completed a 70 cm Corkscrew and will have it up on a mast soon. She asks that all the "Corkscrew Gang" should use right-handed versions. Her frequency is 435.93 mc. G3GOP (Southampton) is equipped for 70 cm and would appreciate contacts and tests. G3FRG (Worthing) makes a plea for simple gear on 70 cm and says there is room for it in addition to CC work. He suggests that such a policy might help to populate the band.

In Conclusion

Several letters arrived rather late and, in some cases, this has meant that figures in the Counties Tables have not been brought up-to-date. Next month's letters, comments, claims, and everything else should be addressed to "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. to reach us by April 16 latest.

VALETE

Members of the Five Band Club and VHF workers generally will learn with regret of the death of Old Timer Laurie Vaughan, G2VH, on March 12. Laurie was first licensed as far back as 1911, and during recent years, both before and after the last war, his main interest was in VHF working. His location, in Southsea, was badly screened to the north by Portsdown Hill, and his signals may not have been often heard in the North, but many of those who operated in the South, particularly in the old five-metre days, will have contacted G2VH. During the last two or three years ill-health kept him off the air except at rare intervals. Your conductor's last contact with him was on Two Metres on August 6, 1951. He was a fine craftsman, and those of us who knew him personally know also that Amateur Radio is the poorer for the passing of Laurie Vaughan.

G2XC.

went to the chassis, feeling that a balanced feed to the mixer should be an improvement. Inductive coupling through a hairpin lying between the arms of the Lecher Line was tried, but was inferior to the original method, so the next step was to try and devise a balanced mixer circuit. The arrangement finally arrived at is shown in Fig. 2, using a pair of reasonably matched silicon crystals, as determined by the ratio of the front-to-back resistances. Using the method of local oscillator injection employed in the original model, an improvement in the strength of the received signals of one to two S-points was obtained, i.e., an improvement of some 6 dB.

The dimensions of the Lecher Line are the same as those given by G3EJL, but they are repeated here (Fig. 3) for easy reference—and also because of the misprint that occurred in the original article. For those readers who may have the original design in use already, the modifications consist of drilling two extra holes in the Line for the second crystal and for the other side of the aerial feed; it is also necessary to open out the plates of the condenser C8 slightly in order to compensate for the capacity of the second diode, which is of the order of $1 \mu\text{F}$. The crystals must be connected with the polarities shown in Fig. 2 in order to obtain output at the IF.

In conclusion, in case any reader should wish

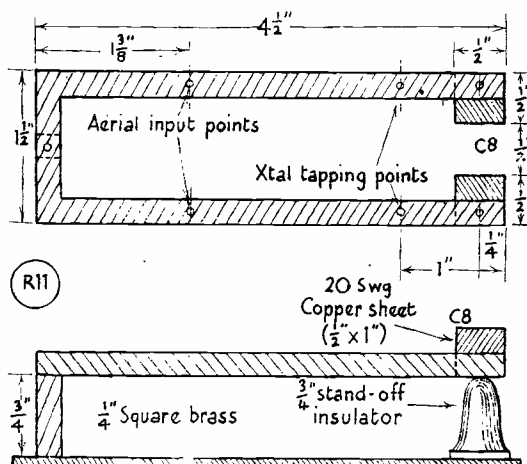


Fig. 3. Principal dimensions of the Lecher Line inductance for the 430 mc Converter. It is important that they should be equalled as closely as possible if resonance about the desired frequency is to be obtained.

to try this circuit, only having available one British and one American crystal, it should be noted that the polarities of the cartridges of the two nationalities are opposite! In the British design the larger diameter end is equivalent to the cathode of a valve diode, whilst in the American (1N21, etc.) pattern it is equivalent to the anode.

TO CLUB SECRETARIES

The Honorary Secretaries of all Radio Clubs are reminded that notes on activity, and notices for events forward, are welcomed for publication in the "Month with the Clubs" feature in *Short Wave Magazine*. The closing date for the next issue is April 16 for the May *Magazine*, due out on May 9. Club Notes should be addressed "Club Secretary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1.

TELCON AT MANCHESTER

On Stand 38 at the Manchester Radio Exhibition (April 23-May 3), the Telegraph Construction & Maintenance Co., Ltd., will be showing, among many other items, samples of their Telcon K.35B tubular twin 300-ohm feeder line which, being stable in varying weather conditions, is particularly suitable for amateur transmission and low-power RF feeder construction.

FOR QRP OPERATORS

Readers interested in the activities of the "QRP Research Society"—which exists to encourage the art of QRP, to organise suitable contests, and to publish for the benefit of members material relating

to low-power operating—should get in touch direct with J. Whitehead, The Retreat, Ryden's Avenue, Walton-on-Thames, Surrey. The society is at present running a marathon contest for the year to December 31, 1952, based on counties worked on the three bands 1.7, 3.5 and 7 mc.

EMITRON VALVES

Emitron valves and cathode ray tubes manufactured by Electronic Tubes, Ltd., High Wycombe, can now be supplied for maintenance and replacement purposes. The name "Emitron" has been registered with the British Radio Valve Manufacturers' Association, and Emitron valves and cathode ray tubes are recognised as officially branded BVA products. Orders and enquiries for lists should be addressed to: E.M.I. Sales & Service, Ltd., Hayes, Middlesex.

COUNTRY PREFIX LIST

Readers are reminded that we still have available a few copies of the *Country List by Prefixes*, printed on stiff card for wear-and-tear use at the operating position. The *List* is alphabetical by prefixes, and costs but 6d. post free. Order on The Circulation Manager, *Short Wave Magazine*, Ltd., 55 Victoria Street, London, S.W.1.

NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. call signs, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the quarterly issue of the "RADIO AMATEUR CALL BOOK" in preparation. QTH's are inserted as they are received, up to the limit of the space allowance each month. Please write clearly and address on a separate slip to QTH Section.

E17E, V. Stewart, 16 St. Alban's Road, South Circular Road, Dolphin's Barn, Dublin, Eire.

G2BJN, K. B. Roulston, 28/29 Church Gate, Loughborough, Leics. (Tel.: Loughborough 3535).

G3BOD, C. D. Jones, 38 Mason Street, Wolverhampton, Staffs.

G3CLJ, Capt. C. G. Stephenson (ex-D21I), 43 Hormead Road, London, W.9.

G3CNY, G. L. Blunn, 37 Burnham Avenue, Oxley, Wolverhampton, Staffs.

G3DOX, R. S. Cooke (ex-VS1AT), 7 Dickens Avenue, Finchley, London, N.3.

G13EPX/A, P. L. Doherty, 31 Marlborough Avenue, London-derry.

G3FRE, W. H. Frith, 46 Co-operative Street, Stanton Hill, Notts.

G3FUM, J. J. Milne, 3 Cottingham Close, Kingsclere, nr. Newbury, Berks.

G3HFL, W/O. G. A. Williams, 47 P.M.Q., R.A.F. Station, Locking, nr. Weston-super-Mare, Somerset.

G3HIV, A. C. Williams, 35 Kensington Road, Oakhill, Stoke-on-Trent, Staffs.

G3HNU, J. L. Mangnall, 77 Tanfield Road, Birkby, Huddersfield, Yorkshire.

G3HRB, J. Coatsworth, Jr., 36 Summerhill Road, South Shields, Co. Durham.

GM3HUT, F/Sgt. M. Doubleday, 42 St. Baldreds Road, North Berwick.

G3HUY, H. Ballard, 18 Dukes Avenue, Church End, Finchley, London, N.3.

GM3HVC, R. Collumbine, 4 Namayo Avenue, Laurieston, Falkirk, Stirlingshire. (Tel.: Falkirk 986).

G3HVN, S.Q.M.S. L. Littlewood, 16 Bombay Quarters, Deepcut, Aldershot, Hants.

G3HVU, J. L. Roberts, 34 Watson Road, Coventry, Warwickshire.

G3HXX, P. Nethercot, 12 Tyn-dalls Park Road, Clifton, Bristol, 8. (Tel.: Bristol 35932).

G3HXXN, S. R. Boakes, Cambridge Villa, Bristol Road, Cambridge, Glos.

G3HYR, B. V. Lockey, Patrington Road, Hollym, Withernsea, E. Yorkshire. (Tel.: Patrington 277).

G3HYT, M. Borchard, 98 Bannerdale Road, Sheffield, 7, Yorks.

G3HZG, L. Hickingbotham, 13 Canada Road, Slough, Bucks.

G3HZH, T. B. Good, 10 Woodlane Terrace, Falmouth, Cornwall.

G3HZI, C. L. Hatfull, 20 Boveney Road, Forest Hill, London, S.E.23. (Tel.: FOrEst Hill 1343).

G3HZJ, W. J. Walsh, 4 Meadowbrook Road, Dorking, Surrey.

G3HZM, M. Barnsley, 17 Cross Street, Bradford, Manchester, 11.

G3HZV, W. Fox, 4 Grove Cottages, Falmouth, Cornwall.

G3HZW, D. C. Mainhood, 12 St. Mildred's Road, Ramsgate, Kent.

G3IAC, T. Charlton, 17 Thelwall Lane, Warrington, Lancs.

G3IAF, M. J. Marlow, 158 Epsom Road, Merrow, Guildford, Surrey.

G3IAJ, A. H. Paul, 54 Northgate Road, Crawley, Sussex.

G3IAK, F. S. Miller, M.P.S., 93 Spring Gardens, Buxton, Derbyshire.

G3IAN, T. W. Langley, 2 Grinton Avenue, Welbeck Street, Prince's Avenue, Hull, Yorkshire.

G3IHW, M. Sands, Alonne, Fermor Road, Crowborough, Sussex.

G3IRS, Amateur Radio Club, R.A.F. Station, Locking, nr. Weston-super-Mare, Somerset.

G3IWD, J. W. Douglas, 54 Kingsway Park, Cherryvalley, Belfast.

G3IYL, Stella W. Fish, 107 Eton Road, Ilford, Essex. (Tel.: Ilford 2987).

CHANGE OF ADDRESS

G2CRF, L. H. McEwan (ex-GW2CRF), Derrydown, Trowlock Island, Teddington, Middx.

G2HL, J. Woodage, 68 Windsor House, Nash Street, London, N.W.1.

GW3AJZ, N. McKechnie, 5 Trewern Estate, Welshpool, Montgomeryshire.

G3DHM, D. Horne, 142 Barkerhouse Road, Nelson, Lancs.

G3DII, J. Bell, Pendle, Horton Drive, Weston Coyne, nr. Stoke-on-Trent, Staffs.

GM3EPX, P. L. Doherty (ex-G13EPX), Colwyn Hotel, 73 Dee Street, Aberdeen.

GM3EQY, D. A. E. Samson, 35 Quality Street, Davidsons Mains, Edinburgh, 4.

G3ESY, P. W. F. Jones, 94 Holme Lacy Road, Hereford.

G3FCW, G. Denby (ex-Y12KP), 1 Grange Road, Yeadon, Leeds, Yorkshire.

G3FIK, K. W. Perfect, 94 Twycross Grove, Ward End, Birmingham, 8.

G3FIX, J. R. Tinning, 22 Cranford Avenue, Lowfields, South Bank, Yorkshire.

G3FJL, J. Hall (ex-VU2XL), 24 Sherrard Road, Leicester.

G3FKH, D. Roberts, 233 Chelmsford Road, Shenfield, Essex.

G3FRN, G. N. Myatt, 12 Swan Street, Shroesley, Shropshire.

G3FUF, G. H. Sutherland, 259 Heywood Old Road, Bowlee, Middleton, Manchester.

G3GIQ, H. F. Lewis, 271 Popes Lane, Ealing, London, W.5.

G3GRA, C. J. Spencer, 97 Swan Way, Enfield, Middlesex.

GW3HDH, E. C. Taylor, 1 Stalbridge Terrace, Brynmawr, Breconshire.

G3SN, R. P. Ellis, 108 Park Road, Posloe Road, Exeter, Devon.

G3VG, J. Wood, 5 Beechwood Avenue, Farnborough, Kent. (Tel.: Farnborough 3769).

G3VM, F. W. Fisher, 156 Dereham Road, New Costessey, Norwich, Norfolk.

G5ZH, C. W. Plimmer, 200 Eastern Avenue, Southend-on-Sea, Essex.

G3FPS

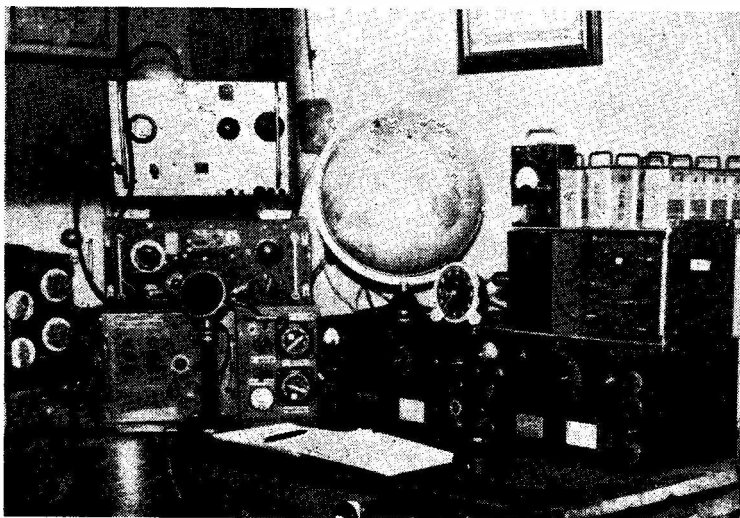
STATION G3FPS was licensed in 1949, and is operated by A. E. English at 13 Church Road, East Molesey, Surrey.

The main transmitter is Wilcox-Gay (807) VFO-controlled, into a 1622 doubler-tripler, with a pair of 807's in parallel in the final PA. This takes an input of 120 watts (CW only) on the 14 and 28 mc bands. The transmitter output is coupled to an aerial tuning unit, which is designed for all-band coverage.

As a second transmitter for the other bands, a rebuilt T.1154 feeds into the same aerial coupling network and is operated on One-Sixty, Eighty and Forty; all this side of the transmitting gear is fully band-switched. The T.1154 runs up to 10 watts input for CW or phone on the Top Band; on 80 metres the input is 35 watts and on 40 metres it is 40 watts, CW or phone. This transmitter is also VFO-controlled by a separate unit, not shown in the photograph.

The valve sequence in the modulator is SP61-SP61-6SN7-p/p 6L6, and the speech amplifier section can be switched to a 30-watt amplifier for gramophone record reproduction. The modulator unit itself can also be used as a section of the house inter-communication system, so that, generally speaking, the audio side is pretty versatile! Phone is used

The Other Man's Station



only on the three LF bands (160, 80 and 40 metres), the method of control being plate-and-screen, with a moving-coil microphone.

On the 14 and 28 mc bands, the 120-watt transmitter is operated CW-only, since the main interest at G3FPS is CW DX; so far, the score totals 83 countries worked with WAC and WBE certificates held—but G3FPS says "When conditions are back to normal I am going to try and improve the score."

On the receiving side, he has a pair of HRO Seniors, with a

Class-D Wavemeter for frequency checking. Three speakers are concealed out of sight. The aerial system is 132-ft. in the clear, switched to the receiving side through change-over relays. Finally, an interesting feature of the station—which is worth the consideration of all who are either getting going themselves or contemplating a rebuild—is that the whole of the equipment at G3FPS is completely screened, all power leads are filtered, and RF is piped everywhere in screened coaxial cable.

ABSTRACTS OF INTEREST

CURRENT TECHNICAL DIGEST

RADIO-ELECTRONICS, December, 1951

A "Low-Drift VFO," described by Otto L. Wooley, incorporates some original features, including oscillator keying which, it is claimed, does not suffer from the usual disadvantages. An electron-coupled oscillator circuit is used, but its power is kept extremely low, and the cathode is condenser-coupled to the oscillator coil, thus keeping DC out of the grid circuit and removing a possible source of heat and instability. Miniature valves (6AK5's) are used for oscillator, buffer and doubler, and the whole unit is very small and compact. It should be ideal for break-in working.

Each month we present brief references to useful practical articles appearing in the overseas radio press. These publications can be obtained on a sterling subscription basis on application to: Gage & Pollard, Publishers' Agents, 55 Victoria Street, London, S.W.1. We are informed that single copies of the periodicals mentioned can NOT be supplied.

RADIO & TELEVISION NEWS, December, 1951

An aerial system giving the benefits of a V-beam without taking up more space than many city-dwellers can afford is described by WOLBY. Known as the "LB-Vee," this runs two legs of either 103 or 67 feet, inclined at roughly 70 degrees. The writer's specimen is only 25ft. high at the vertex and 15ft. at the far ends, but it is used on seven bands with good results. A three-wire feeder system makes it possible to use these two wires separately or as a Vee, and it is claimed that the dimensions of the aerial plus those of the feeders make it possible to resonate the arrangement on

all bands with the simplest of tuning units. Full details of the tuning unit and the switching arrangements are given.

CQ, January, 1952

Amateurs interested in Screened-Grid Modulation will find much of assistance to them in an article on the subject by W6AJF. The writer has built and tested eight different systems during the past two years, and four of them are described in his article, together with the units with which they were carried out. Speech clippers, limiters, controlled-carrier circuits and a "series-gating circuit" are all fully discussed in relation to speech quality, general advantages and disadvantages, including BCI and TVI.

The Month With the Clubs

Eastbourne & District Group

February meetings were well attended, and many items came up for discussion. On March 6 the Film Strip on CRT's was shown. A Club Tx is being built, and will be on the air on meeting nights (every other Thursday) with the call G3GJT. Meetings take place at the Swallow Cafe, 333 Seaside, Eastbourne. (See panel for Secretary's QTH).

Ravensbourne

Amateur Radio Club

The members, under the supervision of the Chairman (G2DHV), are holding an exhibition of home-built equipment at the Lewisham Men's Institute, Holbeach Road School, S.E.6, on March 29. This exhibition may also be seen at the Downham Men's Institute, Durham Hill School, Downham, Kent, on May 17. Visitors will be welcomed. Radio classes are held on Wednesday evenings at both Institutes.

Edinburgh

Amateur Radio Club

They continue their weekly meetings at Unity House, Hillside Crescent, Edinburgh—Wednesdays at 7.30 p.m. Visitors and new members are always welcome. At the end of February a very well-attended dance was held, and this is to be an annual Club event. Forthcoming lectures: April 2, Television; April 16, Modulation; April 30, Telemetry.

QAU Club,

Jersey, C.I.

In spite of sustained silence for some time, this club is still active, and meets every Wednesday.

An interesting idea which might prove of use to other Clubs has come from the Thames Valley and the Sutton and Cheam Societies. These two Clubs have arranged an Inter-Society Contest for the Cullen Cup, 1952. The Transmitting and Receiving Sections run concurrently (between the hours of 1400 and 1700 GMT on April 6).

The rules are simple: Each Society gets together a team of transmitters. Contacts may be made with any station, on any band—with the sole exception of stations operated by members of either Club. Phone or CW may be used, and each contact scores one point.

Each Club's total number of points will be divided by the number of entrants in their team to decide the winning score. In the Receiving section the listeners' job is to log the greatest possible number of contacts made by the various competing members, thereby giving a valuable check on the transmitting logs.

These two Clubs, it seems to us, are to be congratulated on an excellent idea for a local Contest which needs very little pre-organisation, should give all the entrants plenty of fun, and will hurt no one in the process.

This month we acknowledge News Letters and publications of various kinds from Wirral, M.A.R.S., Brighton and the I.R.T.S. (Dublin).

Next month's deadline is FIRST POST ON APRIL 16, and the following month's will be first post on MAY 14. Address all reports to "Club Secretary," SHORT WAVE MAGAZINE, 55 Victoria Street, London, S.W.1.

And now follow this month's reports, from 31 Clubs.

Members GC2CNC and GC3FSN are dusting the cobwebs off their 2-metre beams, and hope to bring in GC2FMV. GC2CNC recently won the QRP Cup, and an overseas member, Peter Amy (serving with the RAF), is awaiting his call-sign. The GC's are looking forward to the summer season and hope to renew many old acquaintances.

Gillingham

Telecommunications Society

The club station, G3GTS, has been moved from its former address and is now located at 104 Jeffery Street, Gillingham. Responsibility for the Club Licence has been transferred from G2FAQ to G2HAU.

Acton, Brentford & Chiswick

Amateur Radio Club

This is a very active group, although the Secretary's recent illness has accounted for the absence of reports. A special meeting was held in January and a new constitution discussed and agreed upon—hence the new title. A club licence has been applied for, and it is planned to build a Tx. All interested are welcome to look in, any Tuesday at 7.30 p.m., at the

A.E.U. Rooms, 66-68 High Road, Chiswick, London, W.4. (Note panel for Hon. Sec.'s QTH).

Tees-Side

Amateur Radio Club

Tees-Side are to have a stand at the Model Engineers' Exhibition, to be held at Trinity Hall, Stockton-on-Tees, from April 14 to 19. A transmitter will be on the air, and members' gear will be exhibited. There will also be a QSL display. Meetings, every Thursday, 7.30 p.m., at the Joe Walton Boys' Club, Feversham Street, Middlesbrough.

Mid-Cheshire

Radio Society

At the March meeting the summer season's activity was arranged. The temporary Club HQ will be over Poole's Radio Shop, Davenham. At the next two meetings there will be a talk on the instruments used for lining up a TV Sound and Vision chassis, and a practical demonstration will be given. It is hoped to instal the Club Tx at the temporary HQ—and to make it TVI-proof! Meetings are on the first and third Mondays—all visitors welcome.

Wolverhampton

Amateur Radio Society

At the March meeting, members enjoyed a talk by G2FQR, entitled "My Solution to TVI." During the evening members were introduced to VK6DX, who was in Wolverhampton as the guest of G3BUU, following on three years of regular QSO's on the air! There is a Top Band Net every Thursday night, to which non-transmitting members listen, giving their comments at the next meeting. The future programme includes some station visits.

Spen Valley

Radio & Television Society

Forthcoming meetings: April 9, Junk Sale; April 23, Open Meeting; May 7, Introduction to FM. All meetings open at 7.30 p.m., at the Temperance Hall, Cleckheaton.

Brighton & District

Radio Club

Forthcoming events are as follows: April 8, Talk on Lecher Wires by Mr. Canning; April 15, RSGB Debate; April 22, G3EDG on the Class-D Wavemeter; April 29, Informal Evening.

Cambridge University

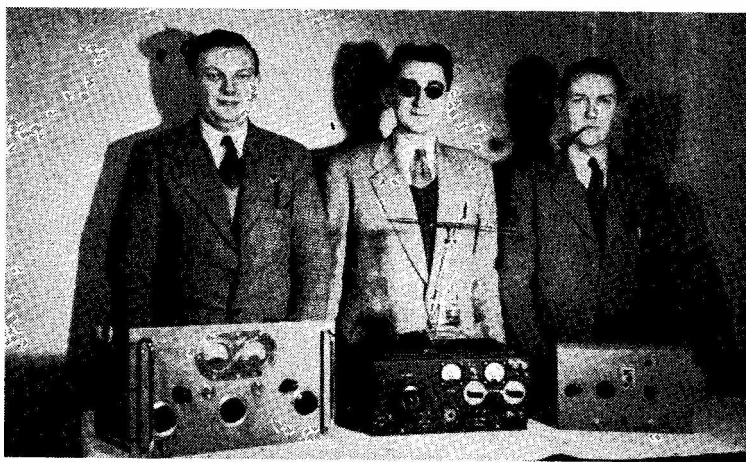
Wireless Society

Regular meetings and lectures have now finished until October, apart from occasional meeting in the Summer Term. Recent lectures have been on Transistor, Electronics, The Cyclotron, and Radiofacsimile. A "Spot the Error" series of lectures was also much enjoyed. The Club Tx G6UW is now almost complete in its new home in the Cavendish Laboratory, and will be on the air shortly. Membership now stands at 38, including 14 with licences.

Coventry

Amateur Radio Society

The Annual Dinner was held at the Opera House on February 29, when the winners of the year's contests were announced and prizes awarded. Club nights continue at the YMCA, Queen's Road, at 7.30 p.m. There is no meeting on April 14, but on April



For the Sheffield Amateur Radio Club's "Hallam Trophy" contest G3CGF (left) entered a 150-watt TVI-proofed PA; G3DRE put in a Top Band transmitter, built for the last MCC; and G3HTE (right) offered a Frequency Meter. The judging put G3DRE (centre) first, with G3CGF and G3HTE second and third. It is more than a matter of passing interest that Peter Jones, G3DRE, is a totally blind switchboard operator; the photograph indicates very well the degree of detail work in his entry, with the Trophy standing on it.

28 there will be a lecture on Communication Receivers.

Hartlepool

Amateur Radio Club

A licence has been applied for, and should be through by now. Gear for field day working has been in preparation for some time, and it is hoped to enter two stations. Raffles are held each week and have proved very successful; a Club Library is also in existence, and the tea-and-biscuits ritual at each meeting is proving popular.

Kingston & District

Amateur Radio Society

Meetings are well attended and the Club flourishes. Recent talks have included "Radio from an Airman's Point of View" (G3AQC) and "Getting Going on 70 cm." (G3IEE). Future talks will cover Power Packs, Batteries, Receivers; there will also be Junk Sales, Film Strips and so on at the regular fortnightly meetings. April 9 and 23 are the next, 7.45 p.m., at Penrhyn House, with a Morse class on April 18.

Slade

Radio Society

Two recent lectures, on The Generation of Electrical Power

and Nuclear Physics, were well attended. The latter aroused great interest, and it is hoped to arrange another on similar lines. May 11 is fixed as the date for the first D-F Test. At the April 25 meeting, Mr. R. Ledger, of the GEC, will talk on Electric Traction. Meeting-place is the Parochial Hall, Broomfield Road, Erdington, on alternate Fridays, at 7.45 p.m.

East Surrey

Radio Club

On February 21, Mr. Betts, a Committee member, lectured on the Telecinema and the use of stereoscopic projection gear. On April 17 he will lecture on Tape Recorders. Meetings are now held at the Old County Police Station, 19 London Road, Reigate, at 7.45 p.m. New members will be welcomed.

Eccles & District

Radio Society

At the March meeting, Mr. Rayson, the former Secretary, was presented with a clock in appreciation of past services. A popular feature is a series of short voluntary talks by members on any subject they choose. The Club visits *The Daily Express* on April 22. (Note new Secretary's QTH, in panel).

Hounslow & District Radio Society

At a recent meeting, Mr. Morris described and demonstrated a Top Band transmitter. At a Members' Night home-built gear was exhibited and discussed, and constructive criticism advanced by the more experienced members. The first half-hour of each Thursday meeting is now devoted to Morse practice.

Ixworth Radio Club

Recent lectures have covered FM and AM (by G3GIH) and a Portable Tx for 20 and 40 (by G8MU). The Top Band Tx, G3HWP, is now on the air on CW. New members will be welcomed, and details of future meetings may be obtained from the Hon. Sec. (name and address in panel).

Leicester Radio Society

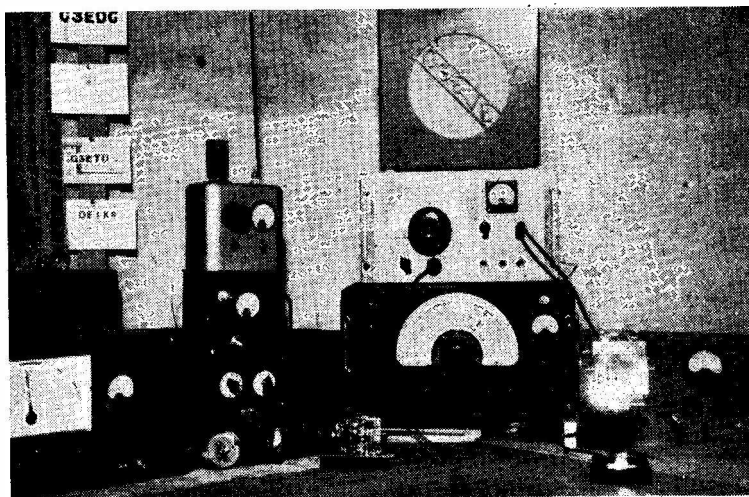
At the first March meeting G3CCA gave a talk and demonstration on his "Mini-Four" portable, which covers the Top Band and three fixed-tuned B/C stations. A Junk Sale was held on March 17. On April 7, G2BVW will talk on Tuned Circuits, and on April 21 there will be a "Free-and-Easy," to which new members are specially invited. A series of classes for the RAE is being started; members interested should contact the Hon. Sec.

Surrey Radio Contact Club (Croydon)

A Grand Junk Sale in March brought another very successful year to a close, and the AGM takes place on April 8 at the Blacksmiths Arms, South Croydon, 7.30 p.m. It is hoped that all members will attend, so that the majority view on Club policy and activities may be ascertained.

Wanstead & Woodford Radio Society

Members of this Club have shown great interest in VHF work, and the Club is on the air on 2 metres on the last Tuesday of each month. The April programme includes the following:



For a fortnight from January 26 last, Brighton & District Radio Club took part in a local Exhibition, with live operation on the 160, 80 and 20 metre bands practically daily, under their Club call G3EVE/A. This view shows the 80/160 corner, for which much of the gear was provided by G2FAD and G3GZT. The bug-key in the foreground is a home-made model built by G2FAD, who also constructed the crystal microphone (the chromium plating of which is reflecting the light). Above the R.1155, modified by G3GZT, is the two-band transmitter with built-in crystal calibrator.

April 8, Film Show; April 15, Practical; April 22, Junk Sale; April 29, Transmitting Night. A constructional contest has been arranged, for judging on June 3.

Watford Amateur Radio Society

The Annual Dinner and Dance will be held at the Hertfordshire Arms, St. Albans Road, Watford, on April 25. Tickets, at 11s. 6d., may be obtained from the Hon. Sec. A hearty welcome to attend is extended to all local amateurs, but early application is advisable as the numbers are limited.

Wirral Amateur Radio Society

The recent constructional contest brought forth entries of a very high standard. The judges finally awarded first prize to G3AKW, second to G3FXC, and third to G3EQE. The winning entry comprised a signal-generator, GDO, audio oscillator, power supply, phone monitor, CW monitor and field strength meter, all worked into a box 8in. by 8in. by 6in.! A Junk Sale has also been held. At future meetings it is proposed to give a series of talks for the benefit of the beginners and juniors.

W.F.S.R.A. (Bedfast Club)

Steady progress continues, chiefly with the provision of help and advice of all kinds to bed-ridden amateur enthusiasts. Help with the RAE is being given, and it is hoped to build up a network of Slow Morse transmissions. Small rigs suitable for operation in hospitals are also being worked on. The scheme for providing reading matter is already well-known, but more and more books and magazines of all kinds are still required.

Chester & District Amateur Radio Society

The Club has lost John Chittock, a popular member, who has gone to Canada. Construction of the new transmitter is under way, and it is hoped that G3GIZ will soon be on the air again with a new look. Future meetings include an auction on April 8, an informal discussion on April 15, and a lecture on Beam Aerials, by G4PF, on April 29. All meetings are at 7.30 in the Tarran Hut, YMCA Grounds, Chester.

North Kent Radio Society

From April, the Club will meet

at new premises—Congregational Hall, Clock Tower, Bexleyheath, on the second and fourth Thursdays. (Note change of Secretary—QTH in panel).

Army Apprentices School Amateur Radio Club

This Club hopes to make contact with its opposite number in Australia. At present the postal service is responsible—later it is hoped to start regular contacts on 20 metres. A competition is under way, with prizes for constructional entries and for Morse proficiency.

Worcester & District Amateur Radio Club

The average attendance of members keeps very steady, but there is room for improvement, and enthusiasts who have not yet "tried" the Club are asked to look in any Thursday evening and make themselves known. There is no obligation to join if the visitor does not wish to do so. Readers are asked to watch local shop windows for special Club announcements—a good idea, this.

Portsmouth & District Radio Society

Meetings continue every Tuesday, 7.30 p.m., at the R.M.

NAMES AND ADDRESSES OF CLUB SECRETARIES REPORTING IN THIS ISSUE

ACTON, BRENTFORD and CHISWICK: R. G. Hmdes, 51 Rusthall Avenue, Bedford Park, W.4.
ARMY APPRENTICES SCHOOL: A/T B. C. Stocker, "A" Coy., A.A.S., Arborfield, Reading.
BRIGHTON: R. T. Parsons, 14 Carlyle Avenue, Brighton 7.
CAMBRIDGE UNIVERSITY: M. Barlow, G3CVO, St. Johns College, Cambridge.
CHESTER: W. Lloyd, 124 Tarvin Road, Chester.
COVENTRY: K. Lines, G3FOH, 142 Shorncliffe Road, Coventry.
EASTBOURNE: W. A. Allwright, G2AON, 55a Latimer Road, Eastbourne.
EAST SURREY: L. Knight, G5LK, Radiohme, Madeira Walk, Reigate.
ECCLIS: A. Gray, 2 Egerton Road, Monton Green, Eccles, Lancs.
EDINBURGH: C. L. Patrick, 19 Montgomery Street, Edinburgh.
GILLINGHAM: C. E. Pellatt, G2FAQ, 101 Boundary Road, Chatham.
HARTLEPOOLS: L. M. Arrowsmith, 51 Alverstone Avenue, West Hartlepool.
HOUNSLOW: J. Clarke, 124 Springwell Road, Heston, Middx.
IXWORTH: P. G. Wright, Thurston Road, Bury St. Edmunds, Suffolk.
KINGSTON: R. Babbs, G3GVU, 28 Grove Lane, Kingston, Surrey.
LEICESTER: L. Milnthorpe, G2FMO, 3 Winsten Drive, Thurinaston, Leicester.
MID-CHESHIRE: W. Howarth, G3AKF, 2 Mervyn Road, Owley Wood, Northwich.
NORTH KENT: C. J. Leal, 1 Deepdene Road, Welling, Kent.
PORTSMOUTH: M. W. Pearce, G3BSR, 58 Hollam Road, Milton, Portsmouth.
QAU CLUB, JERSEY, C. I.: Miss Valerie Hunt, Woodshiel, Millbrook, St. Lawrence, Jersey, C.I.
RAVENSBORNE: J. H. F. Wilshaw, 4 Station Road, Bromley, Kent.
SLADE: C. N. Smart, 110 Woolmore Road, Birmingham 23.
SPEN VALLEY: N. Pride, 100 Raikes Lane, Birstall, Nr. Leeds.
SURREY (CROYDON): S. A. Morley, G3FWR, 22 Old Farleigh Road, Seltsdon, South Croydon.
TEES SIDE: H. Walker, G3CBW, 64 Ayresome Street, Middlesbrough.
WANSTEAD: J. Binning, G3AJS, 150 Upton Park Road, London, E.7.
WATFORD: J. A. Kane, 23 Oaklands Avenue, Oxhey, Herts.
W.F.S.R.A. (Bedfast Club): J. Beavan, G3GBL, 296 Fore Street, Edmonton, London, N.9.
WIRRAL: A. H. Watts, G3FNC, Woodend, 14 Grange Crescent, Hooton, Wirral.
WOLVERHAMPTON: H. Porter, G2YM, 221 Park Lane, Wolverhampton.
WORCESTER: J. Morris-Casey, G8JC, 4 Kennels Road, Station Road, Fernhill Heath, Worcester.

Barracks, Eastney (Signal School), and new members for either Junior or Senior section will be welcome. Past lectures have included The National Grid System (G2MN and G3GHQ) and Variacs

(Sam Howard). A Junk Sale and a Field Day discussion have also been held. On April 22, G6CL will be the speaker, and the last Tuesday will be devoted to the monthly general meeting.

IRISH RADIO TRANSMITTERS' SOCIETY

Our EI friends held their annual general meeting in Dublin on January 26 last, when the resignation of EI9N as Honorary Treasurer was regretfully accepted after no less than 15 years of long and arduous service to the IRTS. He left to his successor, EI9Y, a very sound statement of affairs. Other officers elected at this meeting were EI6F as President, EI3L as Honorary Secretary, and EI2W to the thankless job of QSL Manager. Six members were also elected to the IRTS Executive Committee.

GRANFIELD TROPHY OFFERED FOR VHF

As only slight support was received in 1951 when the Granfield Trophy was put up for LF band DX in the Cambridge area, it has been decided that this year it should be offered for VHF working. The Trophy will go to the member, ordinarily resident in the Area who, as the sole operator of his own station, obtains the highest aggregate published score in any three (but including one from the usual fixed QTH) of the five 144 mc Contests to take place during 1952.

Among those from which scores can be entered are the European VHF Contest on July 6, and the *Short Wave Magazine* Annual VHF Contest later in the year.

Entries for the 1952 Granfield Trophy Contest, which can be accepted only from members living in the "Region Five" area, must be sent to: R. F. G. Thurlow, G3WW, North House, Wimblington, Nr. March, Cambs., to arrive not later than one month after the result of the last of the 1952 VHF Contests is published.

R.E.C.M.F. EXHIBITION

This year's Exhibition to be held by the Radio & Electronic Component Manufacturers' Federation—the ninth in the series—will be at Grosvenor House, Park Lane, London, W.1. during the period April 7-9. There will again be more than 100 exhibitors, representative of what is now a great industry, showing a wide range of specialised products for radio, television, telecommunications and electronic applications. It should be noted that admission to this Exhibition is by ticket-of-invitation only.

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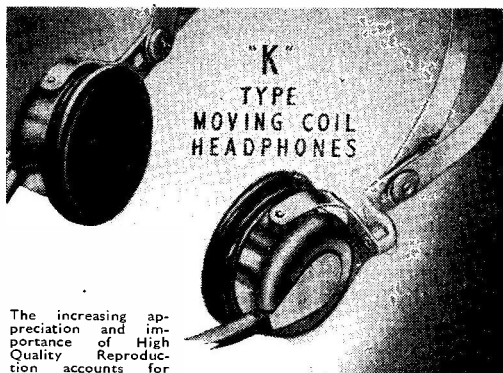
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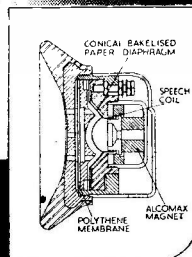
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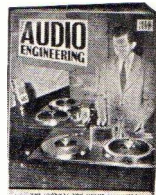
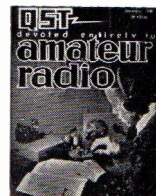


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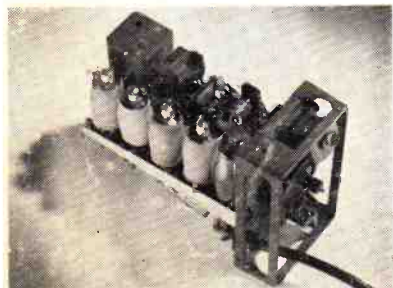
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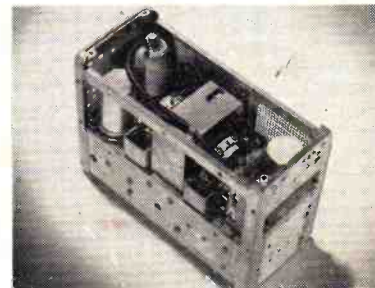


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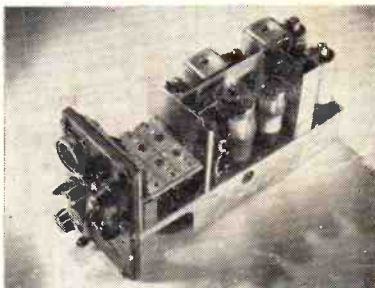
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10V.	250μA.	10V.	1A.	Maximum indication 20MΩ
25V.	1mA.	25V.	2.5A.	0—2,000Ω using internal batteries.
100V.	10mA.	100V.	10A.	0—200,000Ω internal batteries.
250V.	100mA.	250V.	—	0—20MΩ using external batteries.
1,000V.	1A.	1,000V.	—	0—200MΩ
2,500V.	10A.	2,500V.	—	

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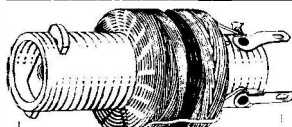
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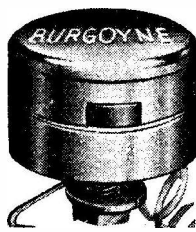
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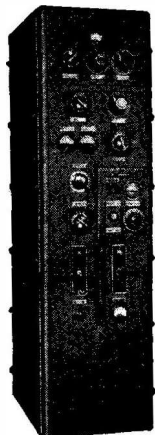
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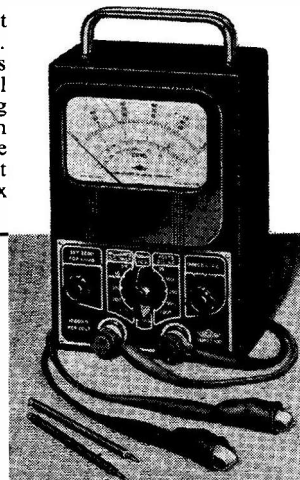
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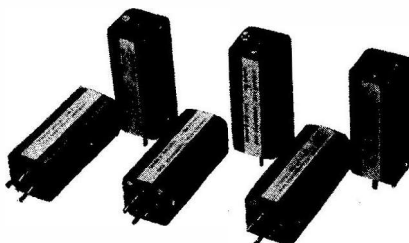
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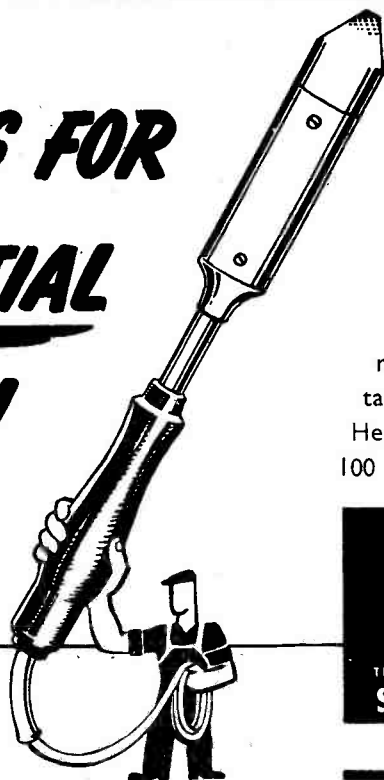
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SHORT WAVE MAGAZINE

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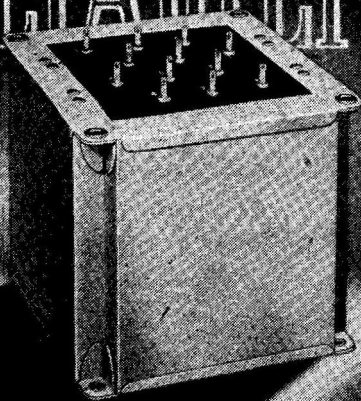
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FOR THE EXPERIMENTER AND THE RADIO ENGINEER

The SHORT-WAVE Magazine

E D I T O R I A L

Outdoors *With the prospect of long summer days before us once again, many operators will be planning for a little practical work under outdoor conditions—not only organised field days and VHF outings, but more regular activity with portable equipment.*

The General Post Office will issue on request, at a nominal fee, a /P amendment to the regular station licence, which will allow operation “in the field” anywhere within ten miles’ radius of a point designated by the licensee. This is a very valuable concession and a facility of which good use can be made. And it is astonishing how many likely sites can be found within ten miles of practically any given point.

The design and construction of compact and efficient portable gear calls for a high degree of technical skill, and the achieving of good results with inputs of a couple of watts or so to such apparatus can be a very satisfying reward. For those normally hemmed in by bricks and mortar, there is much interesting and instructive work to be done and experience to be gained with, for instance, different types of aerial; these can usually be prepared beforehand and slung up quickly at the /P site.

As we have said before, we say again, that amateurs generally ought to give much more attention to the practical problems of portable working—there is a great deal of useful knowledge to be gleaned and huge enjoyment to be derived from a day spent at a /P location.

For our part, we would be very interested to have accounts of their results, with details of the equipment used, from those of our readers who do go forth this summer under the /P banner.

*Austin Fobell
G6FO.*

Heterodyne Oscillator for Capacity/Inductance Measurements

ANOTHER USEFUL TEST INSTRUMENT

F. BUTLER, B.Sc., M.I.E.E., M.Brit.I.R.E.

We have for some time now been describing, with constructional details, home-built instruments of various kinds for meeting test and measuring requirements. This is another in the series, covering a wide range of capacity and inductance values. All necessary information is given for construction and calibration.—Editor.

MEASUREMENTS of L and C are usually made by bridge or resonance methods. At audio frequencies the AC bridge technique is most useful for inductances between 0.1 and 10 Henrys, and over the capacitance range 0.01 to 10 microfarads. It is often required to make accurate measurements of much smaller quantities than these, and it is then simpler to employ resonance methods. The principle is quite straightforward and is easy to employ at radio frequencies. According to one scheme the procedure in making a measurement is as follows:—

- (i) An LC circuit is coupled to an oscillator and tuned to resonance.
- (ii) The inductance or capacitance to be measured is then connected in series or in parallel with the LC circuit, which is consequently mistuned.
- (iii) The resonant condition is restored by retuning the variable element in the circuit. The unknown reactance is then determined from the observed change in setting of the calibrated variable component.

The precision with which a measurement can be made depends on the accuracy of calibration of the variable element in the LC circuit, and on the accuracy with which the state of resonance can be detected.

Fig. 1 shows one possible arrangement in schematic form. It is employed in the instrument to be described. The assembly consists of a fixed frequency oscillator, a VFO and a mixer stage, together with some form of beat detector which can be employed to indicate exact equality of the two radio frequencies. The main LC circuit of the VFO is provided with three terminals T1, T2 and T3 by which it is possible to connect any component in parallel with the tuned circuit. A coupling link is employed to join T1 and T2. By

removing this it is possible to connect any component to be measured in series with the inductive branch of the resonant circuit. The variable condenser C is calibrated directly in suitable units. It is arranged in practice that there is zero beat between the two oscillators when C is at its maximum setting.

The procedure in measuring an unknown capacitance is then as follows:—

- (a) Set the VFO to give zero beat with the fixed frequency oscillator.
- (b) Connect the unknown capacitance as at X on the diagram.
- (c) Reduce the setting of C to restore the VFO to its original frequency, i.e. until zero beat is again observed. The value of X can then be read directly from the calibrated scale of C.

In this way it is possible to measure X over the full range of variation covered by C between its maximum and minimum values. Larger values of capacity can be measured by joining the unknown in series with a smaller, known value of C. This involves some calcula-

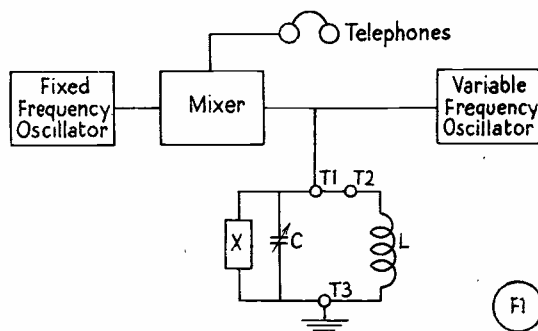
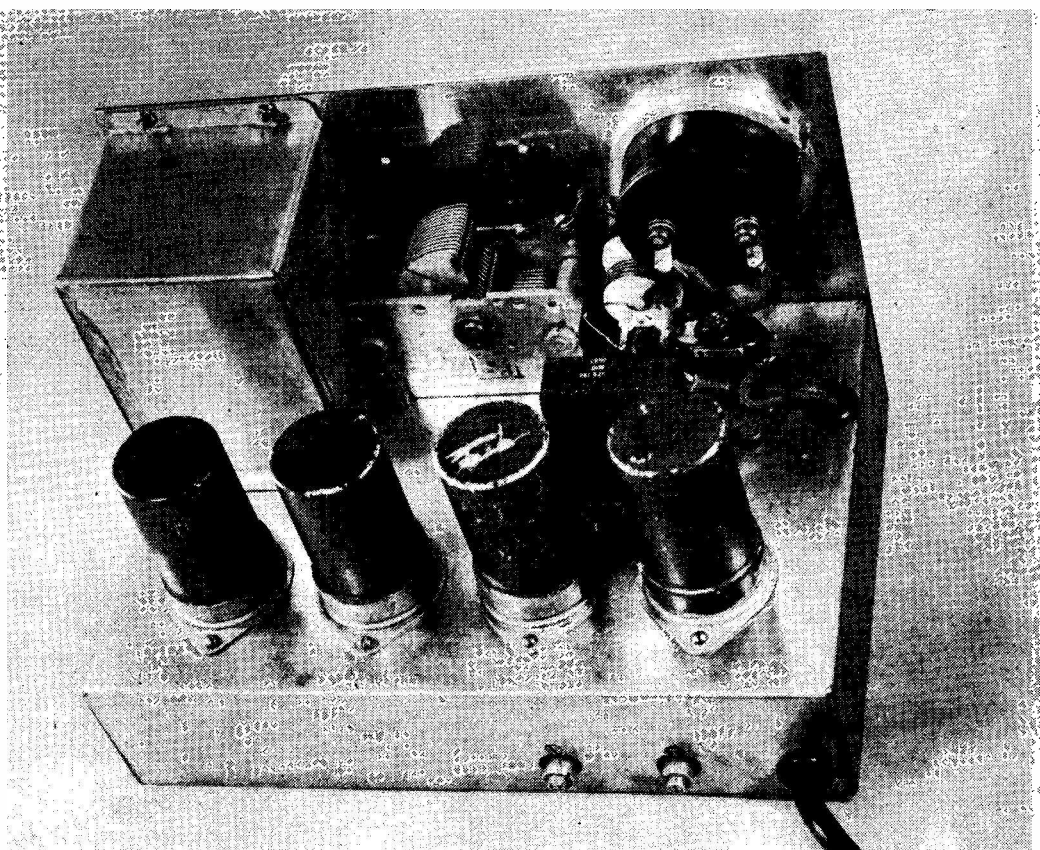


Fig. 1. Block schematic diagram of the heterodyne oscillator arrangement for capacity/inductance measurements—see text for discussion.



Half-rear view of the top chassis layout of the Tester.

tion, using the expression for condensers in series, given by :—

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}, \text{ or } C = \frac{C_1 C_2}{C_1 + C_2}.$$

Measurement of Inductance

Small values of inductance are best measured by opening the coupling link between T1 and T2 and then connecting the unknown between these terminals. The effect of this addition is to reduce the oscillator frequency, which can then be restored to its original value by reducing C, the dial of which can be directly calibrated in units of inductance. Naturally the figures on the inductance scale will not agree with the numerical markings on the capacity scale. It is probably simplest to put an arbitrary scale, reading 0-100 divisions, on the drive for C and then to make up separate graphs or tables of inductance and capacity corresponding to the dial readings. The question of scale calibration will be discussed after

giving constructional details of the complete equipment.

Theoretical Circuit

Fig. 2 shows the circuit diagram of the entire assembly, component values being given in the adjacent Table.

The fixed frequency oscillator is crystal controlled at 500 kc and employs the valve V1 in a somewhat unconventional circuit. (Any alternative arrangement may be employed with no significant change in performance.) A particularly stable oscillator is the modified Colpitts circuit developed by G. G. Gouriet and by J. K. Clapp.

The variable frequency oscillator employs the valves V3 and V4 in a cathode coupled circuit, the tuned LC circuit being shunt-fed from the anode of V4.

Both oscillators are coupled to the mixer stage V2. A transformer in the anode circuit of V2 delivers an audio-frequency output to a pair of telephones and to a beat detector in

the form of a rectifier voltmeter. Zero beat is indicated by silence in the telephones and by a sharp fall in the meter indication as the two frequencies approach equality. The circuit shown can be much simplified without seriously modifying the performance. It is easily possible to employ V1 as a combined mixer and crystal oscillator, and if desired a single valve oscillator may be used instead of the two-valve cathode coupled circuit. An electron-coupled arrangement is recommended. In this way, only two valves are required, but there is a greater tendency for the two oscillators to lock in frequency as zero beat is approached. This effect is only of importance when very precise measurements are to be made.

Practical Layout and Construction

The photographs show the general construction and component layout. The main components are laid out as shown in the chassis view. A separate power supply is used in order to cut down the drift in frequency of the VFO caused by heating effects.

The chassis and front panel are made from heavy gauge tinned sheet steel. Direct point-to-point wiring is used, and the VFO tuning coil and RF choke are enclosed in a screening box. Hand capacity effects can be rather troublesome, due to the close spacing between the main VFO tuning control and the two live RF terminals on the front panel. If desired,

a suitable screen could be fitted to the panel in order to minimise this effect.

Calibration Procedure

The simplest way of calibrating the capacity scale is to find the zero beat settings corresponding to a series of known condensers, con-

Table of Values

Fig. 2. Heterodyne Oscillator for Capacity/Inductance Measurement.

Resistances, (all $\frac{1}{2}$ watt rating).

R1, R5, R6, R13 = 47,000 ohms
R2, R15 = 200 ohms
R3, R9, R10 = 0.5 megohm
R4, R11 = 100 ohms
R7, R14 = 500 ohms
R8 = 1,000 ohms
R12, R16 = 4,700 ohms.

Condensers, (all 500 - volt working).

C = 0-500 μ F variable, ceramic insulation.
C1, C3, C5 = 10-50 μ F air dielectric trimmer with screw-driver adjustment.
C2, C11 = 0.1 μ F tubular paper dielectric.
C4 = 500 μ F tubular ceramic or silvered mica.
C6 = 8 μ F electrolytic.
C7, C12 = 0.001 μ F moulded mica.
C8 = 2 μ F paper dielectric.
C9 = 100 μ F moulded mica.
C10, C13 = 100 μ F silvered mica.

Quartz Crystal.

Q = 500 kc plate, mounted in 2-pin holder.

Valves.

V1, V2, V3, V4 = EF 50.
T = 7:1 step-down ratio, valve anode to 600 ohm line.
W = 5 mA selenium or copper oxide instrument rectifier.
Jack = Standard G.P.O. type.
Coils = L and L1: 200-250 μ H Litz-wound dust core coils with screwed slug.
RFC = 2.5 mH radio frequency choke.
T1, T2, T3 = Belling-Lee insulated terminals.
M = 2 mA full scale deflection.

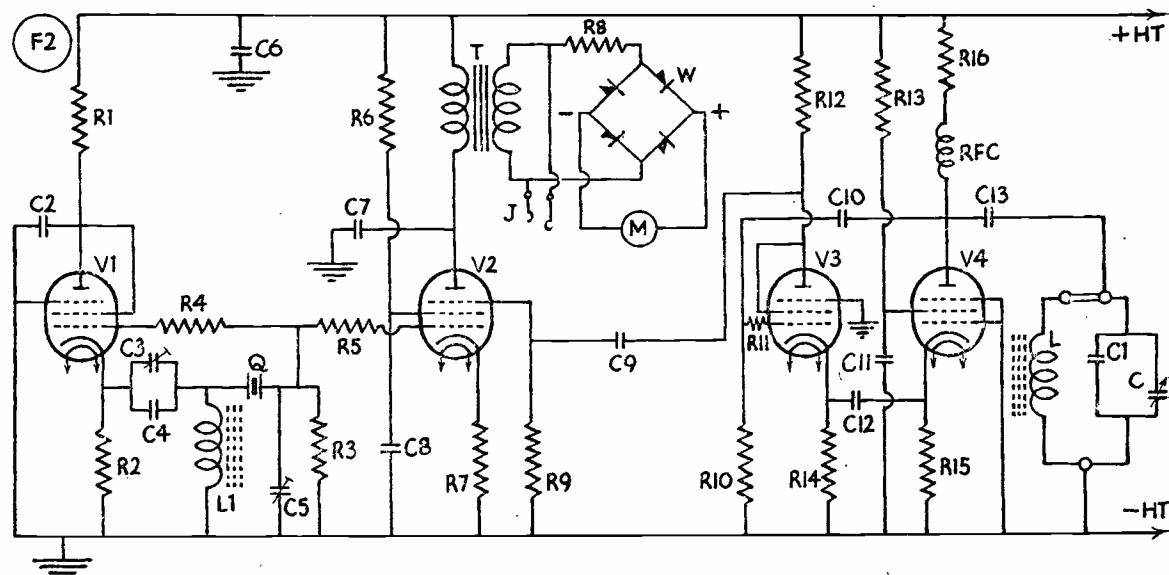
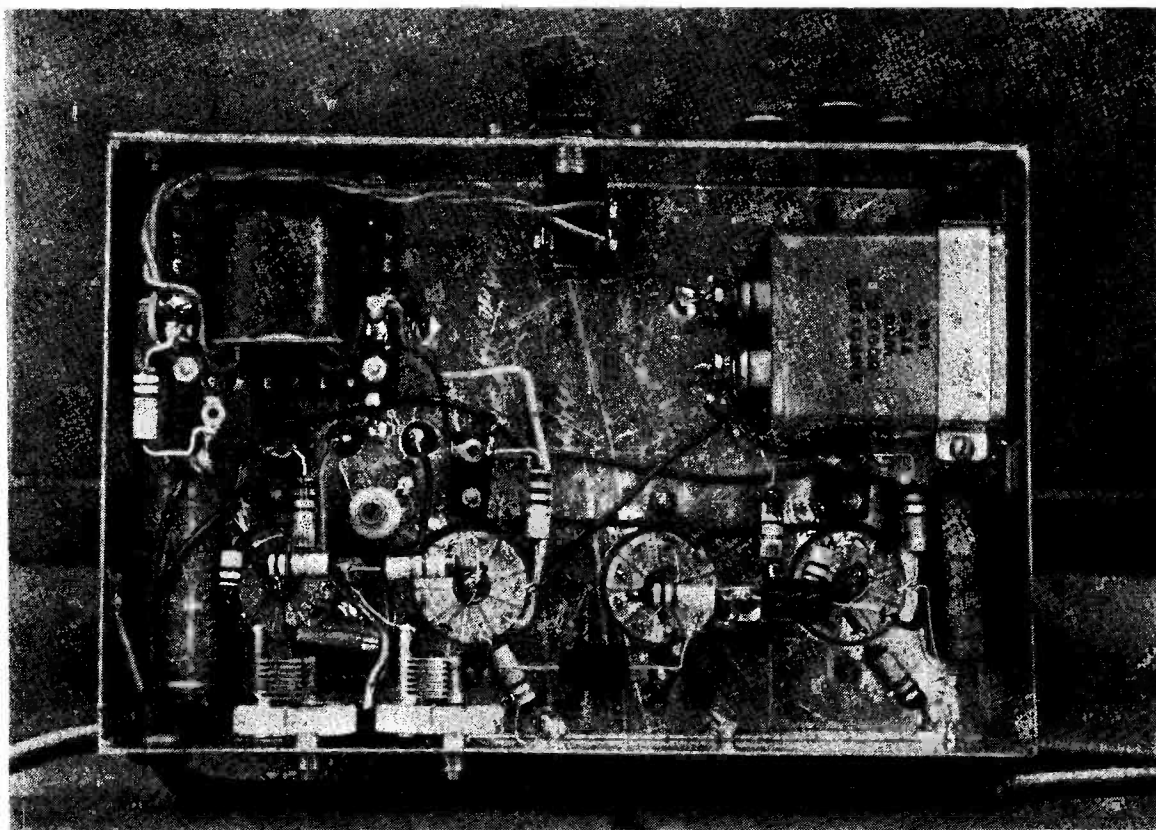


Fig. 2. Theoretical circuit diagram complete of the Heterodyne Oscillator and Bridge Unit for the measurement of Capacity/Inductance values over a wide range. See table for circuit values



Under-chassis view of the component layout for the Capacity/Inductance Test Unit described in the article.

nected in succession to the instrument terminals. A graph can then be drawn showing dial settings plotted against capacitance.

Standard inductances can be made by close-winding a single layer of enamelled wire on a glass former of accurately known diameter. The inductance need not be of any specific value. All that is required is that this value be accurately known. The calibration procedure is exactly the same as for capacitance measurements. The instrument as described will give direct readings of capacitance between 0-500 μF and of inductance between 0-1000 μH .

Supplementary Uses

In addition to its main functions of measuring L and C, the instrument is useful as a medium frequency signal generator or test oscillator, provided that the capacitance scale is calibrated in frequency. This can be roughly done by means of a receiver, or more precisely by using a heterodyne frequency meter.

The equipment can also be used as a rather primitive beat frequency oscillator. If the BFO is required for serious work it is essential that the audio frequency output signal has a good waveform, and to ensure this some attention must be paid to the design of the mixer stage. The bias and screen voltages need to be selected with care, and it is desirable to be able to vary the amplitudes of the two radio frequency voltages supplied to the mixer from the two oscillators. Some waveform distortion at low beat frequencies is inevitable, due to pulling between the oscillators. To avoid this, elaborate screening and decoupling are required, and most likely it would be necessary to use a buffer amplifier following the VFO.

Precautions When Measuring Inductance

The effect of self-capacitance in the coil is to cause its apparent inductance to vary with frequency. If the frequency is raised to a figure which gives parallel resonance with the inductance and self-capacitance of the coil, the

combined circuit behaves like a very high resistance. At still higher frequencies the circuit exhibits a capacitive reactance. These effects can be very misleading, but are not normally troublesome with coils having inductances below a few hundred microhenrys. It is possible to make allowances for errors due to coil capacitance, but it is a tedious matter to apply corrections. In any case, the errors do

not become serious until the operating frequency approaches the frequency of self-resonance of the coil and its distributed capacitance.

Acknowledgment

The writer is indebted to J. Kearney for assembling, wiring and testing the unit described above.

A Standing-Wave Meter

COVERING THE 3.5-28 MC BANDS

V. G. P. WILLIAMS, M.A. (G3FYY)

This is an interesting practical approach to the problem of measuring the SWR of RF transmission lines. The design, construction and calibration of a suitable instrument are fully discussed and the author shows that it is possible to produce an accurate indicating device which can be calibrated for line checking over an impedance range of 50-300 ohms.—Editor.

FOR some time the need has been felt of being able to measure the standing wave ratio (SWR) on transmission lines that should be flat. As no constructional article could be found for suitable apparatus in any of the handbooks, it was necessary to start from scratch, with only a theoretical diagram as a basis.

The points in mind were :

- (1). It must be simple and cheap to construct and calibrate, once the correct components had been ascertained.
- (2). It must be sensitive enough to enable it to be calibrated with resistors of 1 watt rating, owing to the difficulty of obtaining carbon resistors of high ratings in various values up to, say, 2000 ohms, together with the fact that large resistors would have appreciable inductance and capacity of their own which would tend to introduce errors in calibration.
- (3). It must be suitable for frequencies from 3.5 to 28 mc.

The Micro-Match principle was at first tried, but it could not be made sufficiently sensitive to meet requirements. Then the Maxwell

bridge was tried, with most promising results at the first attempt.

After many experiments with various values of components (and burning up one or two !) the values finally decided on are shown in Fig. 1. The condensers and resistors need not be close tolerance components but should be of good quality.

The formula for the balancing of the bridge (as shown by a zero reading on the meter) is

$$\frac{L}{C1 R1} = \text{line characteristic impedance.}$$

$C1 R1$

It will thus be seen that there is an infinite variety of values which can be used for L, C1 and R1, but the values chosen in this design proved best for the particular purpose in mind.

Principle of Operation

The principle of the bridge is that, when the Tx is connected to the output terminals, and a pure resistance equal to the characteristic impedance of the line is connected to the input terminals with the meter adjusted to full-scale reading by means of the potentiometer (or by altering the coupling of the swinging link on the PA tank) then, when the connections are reversed so, that the PA is feeding into the input terminals and the load is connected to the output terminals, the meter should show zero reading.

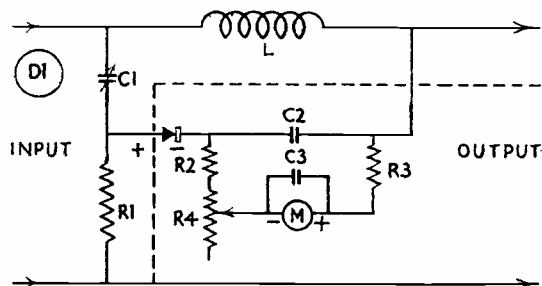


Fig. 1. Circuit of the G3FYY Standing-Wave Meter ; the dotted line indicates screening, and values are given in the accompanying table.

There will also be no reading if the output terminals are connected to a line which is terminated by a pure resistance which is equal to the impedance of the line.

But if it is terminated otherwise, causing power to be reflected back along the line, then this reflected power will give a reading on the meter.

The zero reading holds good only if all RF leads are kept short so that there is no appreciable inductance or capacitance in them, or in or between the components of the bridge. Also, the meter and rectifier must be screened from the RF side. In practice it is not easy to achieve this perfect balance at both 28 mc and 3.5 mc, and at all intermediate frequencies. But provided the null reading is not more than about 2% of the full scale reading, the performance may be regarded as satisfactory. The size of the condenser C2 appears to have some bearing on this point; one of 500 μF gives a perfect null on 3.5 mc, but results in far too heavy a rectified current at 28 mc, which may put the crystal out of action.

Circuit Values

The 50 μF condenser was found to be the best compromise, as it gave a null of absolute zero reading on 14 mc, and about 2% of full scale on 28 and 3.5 mc.

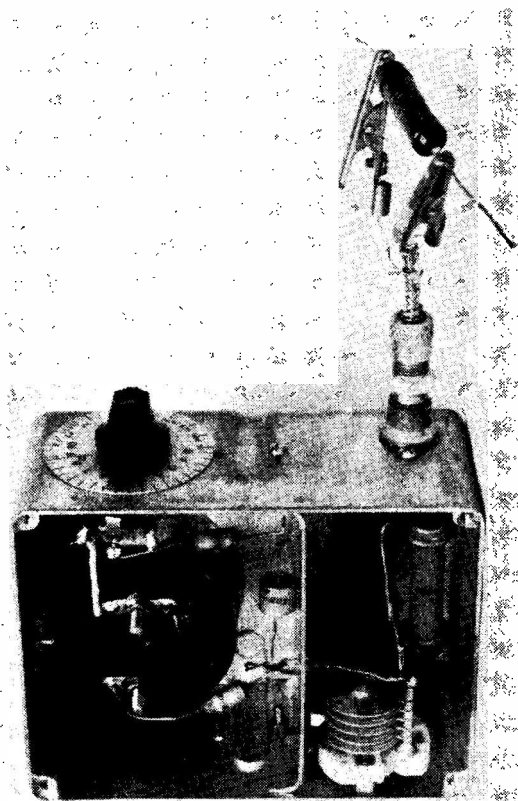
Similarly the resistor R1 is important: if too low a value is used and balance is obtained by increasing the size of C1, there is danger of the resistor R1 being overheated at 28 mc, owing to the much lower reactance of C1 at this frequency. A 2 watt 3,000 ohms resistor can take a maximum of 26 mA; but if the value be dropped to 300 ohms and balance is retained by increasing C1 to 250 μF (thus reducing the reactance of the latter to one-tenth), the 300-ohm resistor would not be able to take the increased current, as its maximum is 82 mA, not ten times the 26 mA of the 3,000-ohm resistor.

Although the potentiometer is not an absolute necessity, it is advisable to include it out of respect for the delicate microammeter; before switching on the Tx it is a comfort to be able to increase the potentiometer to maximum.

Table of Values

Fig. 1. Circuit of the Standing-Wave Meter.

C1 = 25 μF	R1 = 3,000 ohm 2w. carbon
C2 = 50 μF , ceramic	R2, R3 = 5,000 ohm $\frac{1}{2}$ w. carbon
C3 = .002 μF , mica	R4 = 100,000 ohm carbon pot./meter.
M = 500 μA meter	Crystal = 1N34
Coil L = 30 turns $\frac{1}{8}$ SWG, $\frac{1}{4}$ -in. i.d., 2 $\frac{1}{2}$ -in. long	



An impression of the Standing-Wave Meter designed by G3FYY and described in his article.

and thereafter to reduce it as required! Although it must be clearly understood that, when calibration is being effected, a note should be made of the potentiometer setting for that band, and that setting always used for measuring the SWR of any line on that band. For that reason the potentiometer is fitted with a dial calibrated in Kilohms; the setting will probably vary from one band to another, but should always be kept constant on any one band.

Construction

The photograph shows the general lay-out. The assembly is built up in an Eddystone die-cast box; a screen of aluminium strip is fitted across it to divide the RF side from the meter wiring. The meter is set slightly off centre to allow room for the potentiometer. A hole is drilled in the screen for the crystal, and another hole (bushed with a short piece of polythene tubing) takes the lead from C2 to the output end of L.

As the feed lines at G3FYY are 75 ohms co-ax, suitable co-ax sockets were fitted on the input and output side; but as the bridge is suitable for any line impedance from about 50 ohms to 300 ohms (with the values of components given in Fig. 1), midget stand-off insulators may be fitted instead of co-ax sockets, if preferred.

The condenser C1 can be mounted with a dial calibrated in ohms (of line impedance), but as it was intended only to measure 75 ohm lines, the spindle was cut off and a saw cut made in the stump to take a trimmer tool. This avoids the accidental upsetting of the adjustment of C1 when carrying out tests.

Calibration for 75-ohm Line

With a few 1-watt Welwyn resistors of 1% tolerance already at hand, two more of 150 ohms each were purchased.

The transmitter at G3FYY is a 25-watt rig, and as there is occasional operation on the Top Band, the Tx is fitted with a voltage dropping resistor which can be switched in to drop the input to about 7 watts.

With this reduced input, the RF output can be cut to well under one watt by swinging out the link on the PA tank. This was checked by noting the current when working into a 75-ohm dummy load.

It must be emphasized that this instrument, being designed for calibration with very low power, is only intended for measuring SWR with low power. Hence, the writer can take no responsibility for any damage which may result if a reader connects up a similar bridge to a 150-watt transmitter!

(1) In the calibration tests and in all subsequent measurements, one must take great care that the PA is accurately tuned; this can be done very effectively by adjusting the PA for maximum deflection on the SWR meter, as in para. 4 below.

(2) The photograph shows the co-ax plug made up for calibration purposes, to take the various 1-watt resistors. With the two 150-ohm resistors connected in parallel across this plug, the latter is inserted into the output socket. The lead from the Tx is plugged into the input socket.

(3) With the potentiometer well back, the Tx is switched on (at low power). If all is well, advance the potentiometer until a good reading is obtained. Then C1 is adjusted for minimum reading. *Once this setting has been found, no further adjustment should be made to it unless a line of different impedance is to be used.*

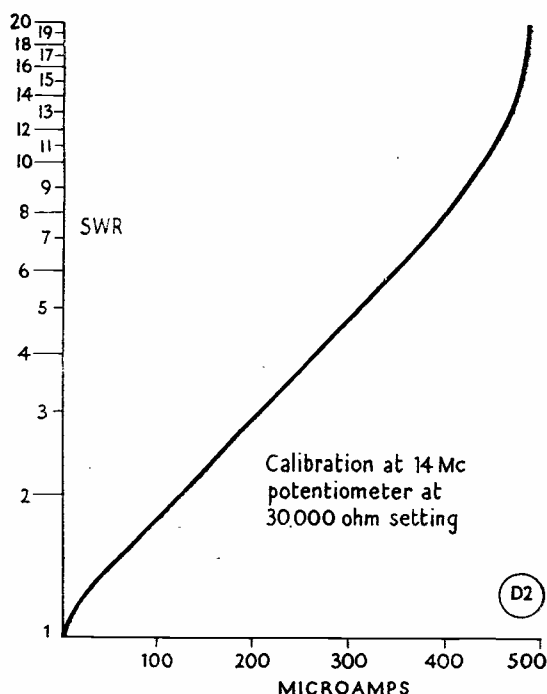


Fig. 2. A calibration curve for 14 mc drawn for the instrument as illustrated and described, with the potentiometer R4 set at a value of 30,000 ohms. A logarithmic scale is shown for convenience, but the plotting could just as well be on ordinary squared paper.

(4) Reverse the connections, so that the Tx is feeding into the output side. Adjust the potentiometer and/or the PA tank coupling until the meter is reading exactly full scale. Make a careful note of the potentiometer setting, which must be written on the calibration chart for this band.

(5) Again reverse the connections, so that the Tx is feeding into the input side, *but make no alterations to the adjustments of Tx or instrument.* The meter should now read zero or very nearly so. If the reading is more than 2% of full scale, then something is wrong with the arrangement of the components or with the quality of them.

If the null point is in order, proceed as follows:

(6) Fix one 150-ohm resistor across the calibration plug and insert the latter into the input socket. Feed the Tx into the output socket. Adjust the PA coupling slightly, to recover full scale deflection as in para. 4 above, but this time leave the potentiometer alone.

(7) Reverse the connections again; the meter will now show a substantial reading, and this

will be the SWR of 2 to 1. Make a note of the reading.

(8) Connect other resistors, singly or in series, and proceed as in (6) and (7) above, each time adjusting for full scale deflection as in (6) by adjusting the PA coupling and touching nothing else. It does not matter if any resistor, or combination of resistors will not give *exactly* 3, 4, or 5, etc., to 1; any ratio will be sufficient for plotting the graph; for instance, a 500-ohm resistor will give a SWR of 6.6 to 1.

(9) From the readings obtained in this manner, plot a graph as in Fig. 2. For convenience, the SWR is shown on a logarithmic scale, but if a larger sheet of paper is not objected to, ordinary squared paper may be used.

(10) A separate graph must be prepared for each band on which it is required to make

measurements. This is necessary because the combined impedance of $C1 + R1$ is not proportional to the frequency in use.

Subsequent Measurements

(11) Feed the Tx into the output socket, and connect the line to be measured to the input socket. Set the potentiometer to the point noted on the calibration graph. Low power should be used again, because although the instrument will take care of a lot more than 1 watt of RF, obtaining full scale deflection will otherwise involve altering the potentiometer which will render the calibration graph useless.

(12) Adjust the PA link for full scale deflection.

(13) Reverse connections, when the reading on the meter, in conjunction with the calibration graph, will give the SWR of the line.

A Magnetic Tape Recorder

DESIGN OF THE AMPLIFIER

PART II

E. P. HARRIS (G3GFN)

This second article in the series brings out a number of practical points on the design and operation of the audio side of the Recorder. Our contributor discusses the best approach to the problem of hum, and how to erase used tape to obtain the lowest possible residual noise-level.—Editor.

HAVING dealt at some length with the mechanical arrangements for a tape mechanism, it may be as well to consider, prior to dealing with recording and play-back amplifiers, the magnetic head itself.

The author's experience with low impedance heads has not been happy. Due to the extremely low output from the head, hum is the one major problem, and it would appear from experience that, when a matching transformer is employed, the elimination of hum (as eliminated it *must* be), in the head circuit is a job of some considerable magnitude. Even

well shielded transformers require moving about to determine the position in which they can be placed to avoid hum pick-up.

Inasmuch as the writer is not particularly enamoured of transformers in audio amplifiers, if they can be eliminated, in his humble opinion so much the better. For this reason, experiments were conducted with high impedance heads, and no hum troubles were experienced. High impedance heads, it would appear, can be placed in the best position mechanically and, provided that they are reasonably shielded, will give no trouble.

In discussing heads, one point should be mentioned concerning connecting them to the amplifiers. The heads are supplied with two leads, and it is not satisfactory to earth one of these leads to the tape table, and run the other in a screened wire to the amplifier. This method introduces high hum level (and sundry and mysterious noises) when the motors are working. The only method is to use either a screened twin, or a single screened, the outer of which is well insulated. The outer should be earthed at the amplifier end *only*, and not at the tape table end. A separate earth, including the motor frames, as well as the tape table itself, should be run to the amplifier chassis.

Equalisers

It may be as well to mention that the author does not employ any form of equalisers in the

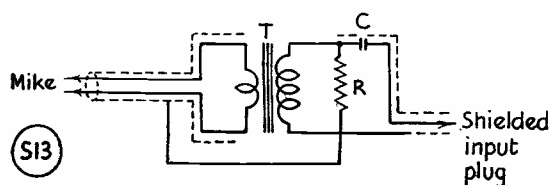


Fig. 9. Input circuit for a ribbon microphone. T is a Woden mu-metal potted microphone transformer; C is .001 μ F mica; and R is 330,000 ohms.

recording amplifier. Experience has shown that it is far more satisfactory to correct for tonal range on play-back, and record straight. With high impedance heads, the response curve generally rises with frequency, and this in itself gives the top boost required in recording magnetically.

Combined Record-Play-Back Amplifiers

While it is obviously possible to design an amplifier which is capable of acting both as a recording amplifier and a play-back amplifier—dependent on the position of a selector switch making the necessary circuit alterations—such arrangements usually leave much to be desired.

While combined amplifiers find favour commercially, it is only because cost is of prime importance. There is no doubt that for finest performance, independent amplifiers, each specifically designed for its application, are to be preferred. From an experimental point of view, individual amplifiers are easier, since adjustment to values does not involve switch circuits which might tend to make matters confusing.

To make this series as complete as possible, it is proposed to deal with Recording and Play-back amplifiers individually, giving circuits which have been developed, and are used by the author, and finally to suggest a circuit for a combined amplifier, which can be used where the utmost fidelity of reproduction is not required, or where economy is of prime importance. While it has been stated that the combined amplifier does not give that extra quality necessary to place it in what may be described as the "fidelity class," its reproduction does

equal that of a standard radio receiver, and exceeds the quality given by most.

Recording Amplifier

The power output of the recording amplifier required fully to modulate any given tape depends upon the coercivity of the tape, but even with the high-coercivity tapes generally available, the power requirements are small. A single 6J5 will, for instance, give more than adequate output when resistance capacity coupled to a high impedance head.

As a result of the low power requirements, a recording amplifier can be of extremely simple design.

When considering the design of such an amplifier, it is as well to take into consideration the facilities required when recording. Normally microphone, gramophone and radio inputs will be needed, and the inclusion of a simple mixer circuit is an advantage. In addition to some visual means of determining the recording level—in order to prevent over-modulation of the tape, subsequent distortion on play-back, and difficulty in erasing—the inclusion of an audio monitoring channel is recommended. Inasmuch as it is desirable to make this channel operative on all inputs, and in order to prevent feed-back when monitoring microphone input, the use of headphones is advisable.

Headphone monitoring is far more satisfactory than speaker monitoring, not only on account of the absence of acoustic feed-back, but because, from the recordist's point of view, external noises are to a large degree eliminated, and more intimate contact with the recorded matter is obtained.

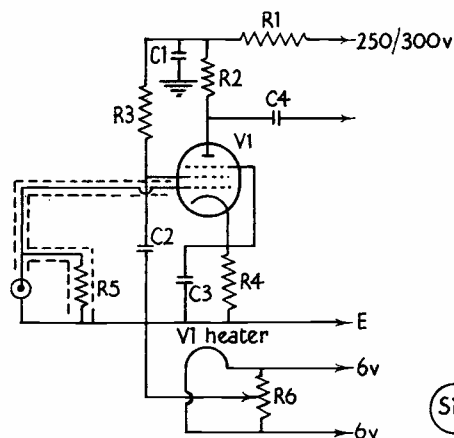


Fig. 10. Circuit for a suitable microphone pre-amplifier; all values are given in the table.

Table of Values

Fig. 10. Suitable Microphone Pre-Amplifier Circuit.

C1 = 16 μ F	R4 = 2,200 ohms
C2 = 0.1 μ F	R5 = 3.3 megohms
C3 = 50 μ F	R6 = 100-150 ohms (only required if heater line not CT).
C4 = .01-.01 μ F coupling	V1 = 6J5
R1 = 100,000 ohms	
R2 = 220,000 ohms	
R3 = 680,000 ohms	

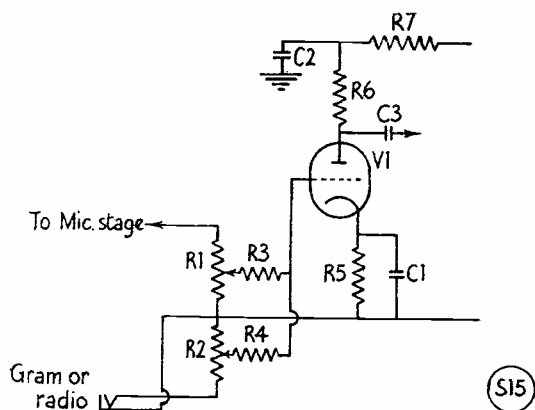


Fig. 11. A Gramophone/Radio Input and Mixer circuit for the recording layout.

Mention has been made of determining visually the recording level at any given distance, in order to obviate, or reduce, over-recording. There are three main methods of obtaining an indication of the power fed to the recording head. One is to employ a filament lamp in a circuit such that it just glows, when the amplifier output is sufficient to modulate the tape fully (a variation of this is to use a neon which flashes on peak output); another system employs a cathode ray tube tuning indicator, while the third utilises a meter as indicator.

Of the three types, the writer prefers the use of a meter, since it is more easily read, and moreover, allows the determination of intermediate recording levels, and will indicate when the signal value falls into the noise level of the system. Suitably wired, the meter can be made to give a standing reading equivalent to the bias supplied to the recording head, and in these days of wide variation in mains voltage, such a check is more than necessary.

Having generally reviewed the recording amplifier, the individual sections can be examined in detail.

It is doubtful whether, when microphones are considered, agreement on the use of any one particular type can be reached. In the author's opinion, microphones of the sound-cell or filter-cell crystal types are to be preferred for tape recording, unless fairly complex equaliser circuits are to be incorporated in the microphone channel. Experience with ribbon and moving coil microphones has shown that, in addition to hum troubles normally associated with these microphones, considerable top lift is required. With crystal microphones of the

Table of Values

Fig. 11. Gramophone/Radio Input and Mixer Circuit.

C1 = 50 μ F	R3, R4 = 470,000 ohms
C2 = 16 μ F	R5 = 2,200 ohms
C3 = .01-0.1 μ F	R6 = 47,000 ohms
R1, R2 = 500,000 ohms.	R7 = 47,000 ohms

types mentioned, equalisers are unnecessary, thus giving simplification of the microphone channel circuitry. Despite the difficulties mentioned in connection with ribbon microphones, it has been found possible to operate this type of microphone satisfactorily when used in conjunction with the input coupling circuit shown in Fig. 9. The ribbon microphone's directional characteristics make it particularly useful in certain applications, and as is well-known, its frequency response is excellent.

The selection of a suitable pre-amplifier valve for the microphone is limited to three types—namely, 6J7, EF37 and EF37A. The EF37A has the superior performance, having negligible hum and thermal/shot noise. The B7G-based equivalent is the EF40.

Fig. 10 shows the circuit of a microphone pre-amplifier employing an EF37A. Points to be noted are the completely screened grid leak, the use of a co-axial type input socket, and although not shown on the circuit diagram, in addition to a screened top cap, a valve screening can.

It is doubtful whether gramophone and radio inputs will ever be required together, and for this reason these two inputs may be made to a common socket. By use of this arrangement a "valveless" mixer circuit may be employed, which gives a further simplification of the recording amplifier.

Fig. 11 shows the circuit of the gramophone input stage, and also a mixer circuit which has been employed by the writer on numerous occasions. The circuit is quite free from interaction between controls, and allows complete freedom of mixing. There is, however, an insertion loss and additional amplification is necessary to make up for this.

Fig. 12 gives the circuit of a complete recording amplifier, employing the points mentioned as desirable, and the two previous circuits of Fig. 10 and 11.

The circuit is quite straightforward and without complications. V1—Microphone amplifier. V2—Radio or gramophone input and mixer. V3—Tape modulator. V4A is the monitor, fed from the grid of V3, while V4B is the Recording level indicator amplifier, also fed from the grid of V3.

The recording level indicator V4B has on

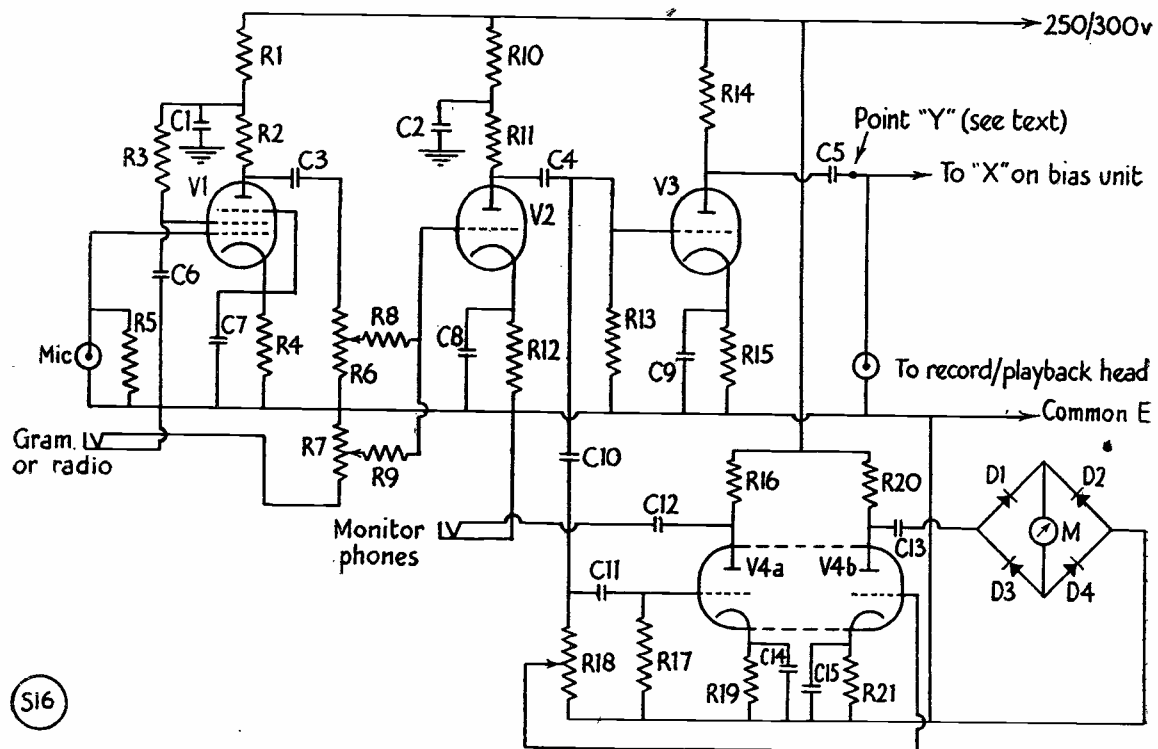


Fig. 12. Circuit of the Recording Amplifier complete, as described by G3GFN—see table for values.

its grid a pre-set potentiometer, and this is set such that on the meter (which is a 500 microamp. movement) an indication of 450 microamps. is given when the tape is being fully modulated. Due to the anode-to-grid capacity of V3, some of the bias which is fed to the recording head will appear on the grid of V3. As a result of this, it will be present also on the grid of V4B, and consequently give a small standing indication on the meter. This is an advantage for the reasons already mentioned. It can, if so desired, be eliminated by using an HF by-pass condenser between the grid of V4B and ground. The use of such a condenser will result in the meter circuit indicating incorrectly in the upper treble register. As it stands, the meter circuit, when using germanium diodes such as GEX33's or GEX44's, is reasonably non-frequency selective.

Magnetic recording heads require a constant current feed, and it is usual to find that a resistor of approximately 47,000 ohms is included at point Y in the coupling between tape modulator and recording head. In practice, the writer has found that this resistor can with advantage be omitted, and the power normally

Table of Values

Fig. 12. Circuit for a Complete Recording Amplifier.

C1, C2	- 16 μ F	R1	- 100,000ohms
C3, C4	- .01-0.1 μ F	R2	- 220,000ohms
C5	- 0.25 μ F	R3	- 680,000ohms
C6, C10, C11	- .01 μ F	R4, R12, R15,	
C7, C8, C9	- 50 μ F	R19, R21	- 2,200 ohms
C12, C13	- 0.1 μ F	R5	- 3,300 ohms
C14, C15	- 50 μ F	R6, R7	- 500,000ohms
V1	- EF37A	R8, R9, R13	- 470,000ohms
V2, V3	- 6J5	R10, R11, R14,	
V4	- 6SN7	R16, R20	- 47,000ohms
D1, D2, D3, D4	- Diodes	R17, R18	- 1 megohm
	- GEX33/ GEX44	Meter	- 0-500 micro-amp.

dissipated over such a resistor conserved. The advantage is that a single 6J5 will then fully modulate high coercivity tapes, whereas with the resistor in circuit, the power given by a 6J5 is not quite sufficient, necessitating the use of a power valve of some description. The use of such a valve brings added complications in the method of limiting the power to the head, and at the same time avoiding frequency selectivity.

The layout of the amplifier is unimportant, provided that due care and attention are paid to the EF37A stage, with regard to AC pick-up in the grid circuit. If the bias oscillator is

The value of R5 is dependent on the HT supply voltage. It should be chosen so that the screen dissipation of the KT61/6V6 is kept within maximum limits. At the same time the minimum value should be used in order to ensure highest output from the oscillator unit.

One particular difficulty was experienced by the writer, and this occurred when using a radio feeder. Harmonics of the bias oscillator beat with the received signal, to produce annoying heterodyne whistles, making it impossible to record from this medium. In the original Bias-and-Erase unit, and oscillator was of open construction. Complete screening, including the use of a well-ventilated valve screen, helped

matters considerably. It was also found that running the radio feeder from a different mains outlet to the recorder gave further reduction in the heterodyne whistle, and the whistles were only then apparent on weak Continental stations.

Complete Recording Amplifier

The combination of the circuits of Figs. 12 and 13 will make a recording amplifier of considerable flexibility, and capable of excellent performance. Adequate reserve of power is available to modulate fully high coercivity tapes without overloading any stages in the amplifier.

Selective IF Amplifier

NARROWED BANDWIDTHS
ON CW AND PHONE

I. E. HILL (G6HL)

All operators on the communication bands have one problem in common—picking out the wanted signal and holding it clear of interference. Some achieve this by sheer operating ingenuity and skill, others seek constantly for methods of obtaining still higher selectivity in the receiver itself. This article describes how an IF amplifier can be produced giving the narrowest practicable bandwidths for CW and phone working. The design depends mainly upon lightly coupled circuits of high Q, with an IF of 85 kc.—Editor.

THE crowded condition of the amateur communication bands necessitates a high degree of selectivity in the modern receiver. However, there is a limit to usable selectivity, determined largely by transmitter stability and operating convenience. Transmitter stability is not controllable at the receiver and therefore the signal must be accepted as heard. Some operators prefer receivers having a very high degree of selectivity capable of rejecting almost all signals other than the one desired. Something approaching this condition can be achieved; but, with possibly a changing incoming signal and certainly continually changing interference levels, tuning is extremely difficult to hold. For general amateur CW

working a receiver responding to a narrow bandwidth—say 1 kc—and rejecting all else is more satisfactory. The operator develops a selective ear for reception of the wanted signal through the remaining unwanted QRM.

Quite satisfactory IF selectivity can be achieved through using a crystal filter, but the response curve shows high selectivity “on the nose” with a low response at relatively wide “skirts” off the resonant frequency. The use of a band-pass crystal filter will improve matters, but the writer has had little success in completely obviating the skirt response by this means.

The BC453 receiver has found favour with many as a convenient addition to the receiver IF, and it is capable of removing much of the skirt response of a crystal filter. Certainly it can make considerable improvement to the selectivity of an average receiver, but it is far from the ultimate.

Desirable Standards

For present day conditions on the amateur bands in the HF range 1.5 to 30 mc, ideal receiver selectivity would be as shown in Fig. 1, the over-all response width being 1 kc for CW reception and 4 kc for phone (speech only) with no response *at all* outside this pass band.

A number of IF strips have been constructed during the past two years with this selectivity target in view. Using two IF stages coupled by a total of six BC453 IF transformers operating at 85 kc, the highest selectivity obtainable was a little better than 2.5 kc at skirt, with a response curve shape similar to Fig. 2. The BC453 transformers are of convenient size and give reasonable results, but they are air-cored and of rather low Q.

Scratching around in a junk box revealed a

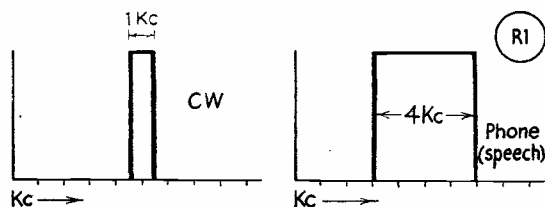


Fig. 1. Ideal IF selectivity curves for CW and Phone reception, showing desirable bandwidths and cut-off shapes.

number of DF coils from ex-R.A.F. receivers Type R.1155. The DF coil for Range 5 covers 75 to 200 kc when used with a .0005 μ F parallel variable condenser.

The Q of the Range 5 coil is very good, particularly when the iron dust core is screwed in—the minimum resonating parallel capacity being used. Examination of the higher frequency coils for Ranges 3 and 4 showed them to be suitable for rewind without special coil winding facilities. After a few preliminary trial rewinds and check of frequency coverage it was decided to try an IF rebuild utilising a dozen R.1155 coils for the selective circuits and BC453 85 kc transformers for “gap filling.”

Higher selectivity necessitates high Q in the tuned circuits, but too high Q can produce ringing and/or instability. The answer is to use only moderately high Q and more tuned circuits. The problem then becomes one of how to couple the tuned circuits effectively. The Range 5 R.1155 coils have a low impedance primary winding with a centre tap connected to earth and to a Faraday screen. This primary winding invited use for coupling via a selectivity switch, one position of the latter to give high selectivity for CW, one for intermediate selectivity and one giving lower selectivity for Phone. After some consideration it was decided to use Range 5 R.1155 DF coils

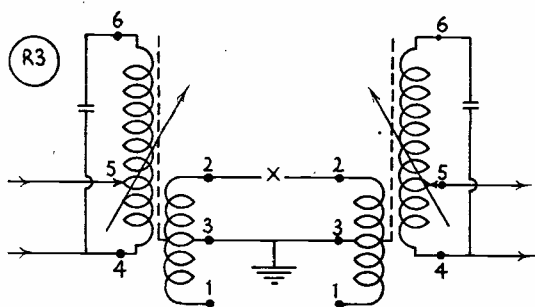


Fig. 3. Coupling a pair of Range 5 D/F coils taken from the R.1155 receiver. The desired 85 kc falls within the coverage of these coils.

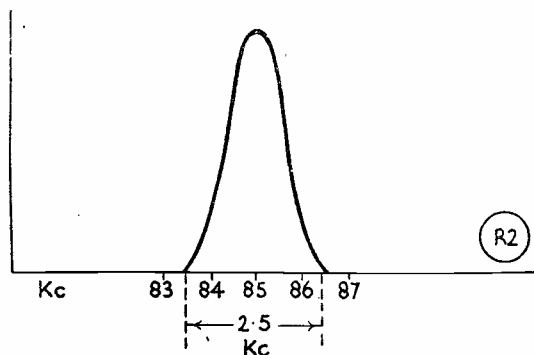


Fig. 2. The sort of selectivity curve that can be attained in an IF amplifier under the conditions stated in the article.

for switched circuits and to rewind Range 3 and 4 coils to resonate at 85 kc. The coil former has four winding sections and 145 turns of 7/44 Litz wire are wound on each. A tap is provided at the centre, but might be preferred at the end of the first section from the low potential end of the coil. A .00025 μ F silver mica condenser will resonate the coil to 85 kc and give a better Q than the Range 5 coils !

IF Coupling Methods

At this stage it might be profitable to consider a few alternative methods of coupling. Fig. 3 shows two Range 5 coils coupled by means of the low impedance primary windings. The coupling is entirely inductive, is fixed and determined by the number of turns on the low impedance coil. The low impedance coil is a convenient one to switch at X.

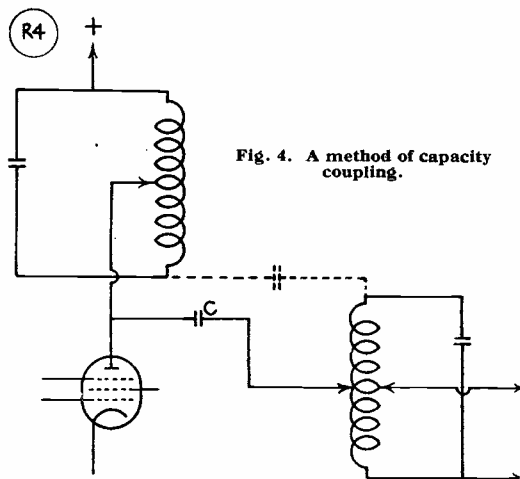


Fig. 4. A method of capacity coupling.

Capacity coupling is illustrated at Fig. 4. In this case the larger the value of condenser C the greater the coupling, but also the loading on the tuned circuits. Tapping the tuned circuits will reduce the loading but also reduces coupling. Fortunately, high gain is not a requirement in the projected amplifier and coupling condenser size can be kept to the very minimum.

Another convenient coupling system has been utilised by W1DX in a high selectivity IF amplifier (*QST*, May '50). In Fig. 5 the higher the value of condenser C the looser the coupling.

Having decided the various methods of coupling to be used it remains only to put them together and add a few valves. Refer Fig. 6.

Construction

General layout follows conventional principles, care being taken to avoid unnecessary coupling between input and output circuits. In general, components are located as they appear in Fig. 6 working left to right or *vice versa*. Underchassis metal screens are used to isolate stages and to support the selectivity switch wafers, all of which are operated by a common shaft.

Alignment

This is best done by the use of a wobulator and oscilloscope, but a signal generator and output meter can be equally effective if somewhat more laborious. With the selectivity switch to broad and L13 at loose coupling (centre rod out) coils L1, L2, L12 and L13 are peaked for maximum output. L13 is then adjusted to maximum coupling (centre rod in) and L1, L2 and L12 retrimmed to give maximum effective bandwidth—about 4 kc.

The selectivity switch is next set to the intermediate selectivity position and L8, L9, L10 and L11 peaked to maximum output. If a wobulator is used these coils can be set to give a narrow band pass—about 2 kc—but peaking will be almost equally effective.

In the sharp selectivity switch position the remaining coils L3, L4, L5, L6, L7 are peaked to maximum output and in this position the response should be little more than 1 kc at the base of the selectivity curve! Using the wobulator a little "frigging" with circuit tuning will give a response curve just over 1 kc wide at the base and approximately 500 cycles wide at about 6dB down.

This IF amplifier is intended only to give *selectivity*. Owing to the low IF chosen it

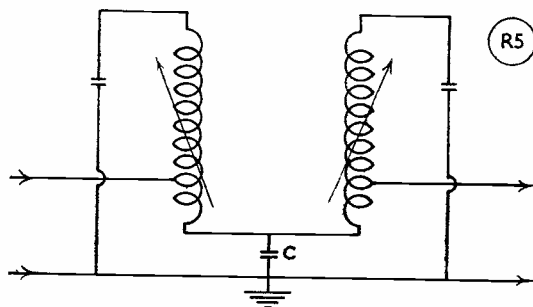


Fig. 5. Another method of coupling. The significance of capacity C is discussed in the text.

must be used in association with other frequency conversion stages in order to reduce second channel interference troubles. Gain is therefore set at a common figure for all selectivity positions. With selectivity to "Broad" output is noted and then with selectivity changed to "Medium" R4 is adjusted to give the same output as on "Broad." The process is repeated at "Sharp" selectivity position, R2 being adjusted in this case.

Application

The heading of this article is "A Selective IF Amplifier." How it is utilised is another matter, and no two true amateurs will adopt exactly the same method. In the writer's case the 85 kc IF amplifier is being built into a complete IF unit where it will follow a two stage tunable IF amplifier operating from 975 to 995 kc. It is intended that the complete IF Unit should follow tuned converter units.

Additions

A "hole-punching" noise silencer has been built into the IF amplifier. This comprises a conventional IF stage at 85 kc followed by a double diode full wave rectifier, the RF filtered DC output of which is used to bias grid 3 of the 6L7 (Fig. 6) to cut off during short bursts of static, etc. If this feature is not desired the 6L7 of Fig. 6 can be replaced by a 6SK7. AVC is obtained from a 6B8 AVC amplifier/rectifier fed by a 6SK7 IF stage coupled from point Y on Fig. 6 by a 85 kc BC453 IF transformer. AVC is not fed to the main 85 kc IF stages, all of which operate at constant gain. An S-meter is incorporated in the plate circuit of the AVC IF stage, which is controlled by AVC. This S-meter operates on both CW and Phone; careful screening of the BFO has almost entirely eliminated changes of BFO reading when the BFO is switched on.

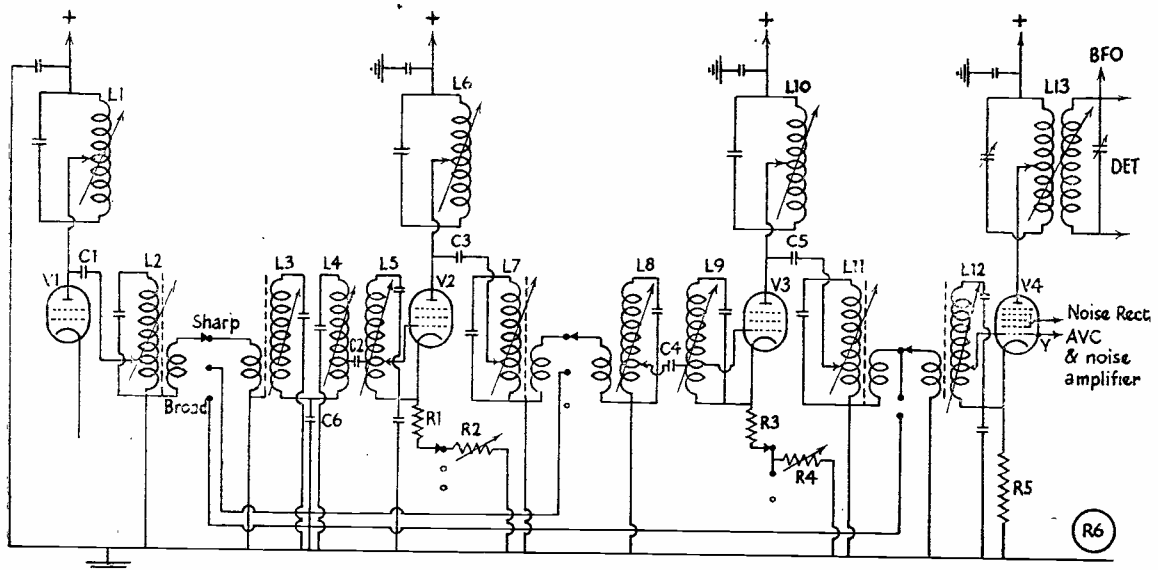


Fig. 6. Circuit of the 85 kc IF amplifier unit, using the Range 5 D/F coils from the R.1155 receiver. Details of coupling methods are given in the article. Values are: C1, 50 μF ; C2-C5, 20 μF ; C6, .05 μF ; all by-pass condensers, 0.1 μF ; coil tuner capacities as in text; R1, R3, 270 ohms; R2, R4, 20,000 ohms; R5, 470 ohms; V1 is the converter stage; V2, V3 can be 6SK7 or similar; V4 6L7, or 6SK7 if noise suppression omitted. Coils: L1, L4, L5, L6, L9, L10, D/F coils from R.1155 rewound with 145 turns 44-Litz wire per section, 4 sections centre-tapped. L2, L3, L7, L8, L11, L12, Range 5 D/F coils from R.1155.

One important requirement in the tuned RF section of the receiver is a minimum of 25.1 reduction and no, repeat, no backlash or sogginess in the bandspread tuning control.

Results

On sharp selectivity, signals just pop in and out and the receiver is completely immune to interference from the strongest legitimate signals more than 1.5 kc off frequency. Unfortunately, it is not completely proof against the objectionable noises and key clicks produced by some badly designed and/or adjusted transmitters, although it does reduce many of

the effects.

Final

Those neglected R.1155 DF coils are worth a second look; the design is convenient, Q is high and they are easy to rewind for IF applications but Litz wire should be used. If cleaning Litz wire ends for trimming presents difficulty, try dipping in methylated spirits; apply a mtach and blow out the flame before the wire disappears. Practice on a few odd lengths of Litz wire is advisable!

Those R.1155 coils also have possibilities for AF filter applications!

CORRIGENDA

Readers should note the following slight corrections to articles which appeared in our March issue. In "Two-Metre Portable," p.22, Table of Values, Fig. 2, R7 should read 100,000 ohms and R8 11,000 ohms; the second "C5" in the same table is C6 in the circuit. The author also points out that the HT supply to V1, V2 could with advantage be by-passed to earth with .001 μF , inserted as near as possible to those valves.

In G2PL's interesting article on the Ground Plane, on p.20, he asks to be quoted as having said "the increase in gain of 1 to 2 S-points represents 6-12 dB," and not as stated.

On p.27, the Table of Values under the "R9'er for Twenty" circuit diagram should reach 10 μF for C1, C6, and 500 μF for C3, C4, C5, C8. In the circuit itself, the anode/cathode pin numbers should be 7 cathode, and 5 anode.

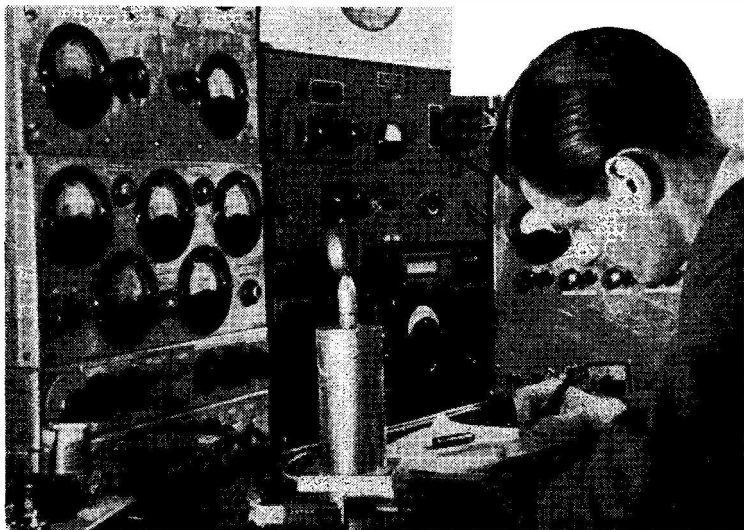
DX COMMENTARY

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

LAST month's diatribe concerning the Complete and Utter Clot who pollutes our bands from time to time has evoked a wide response. Almost everyone, it seems, has suffered at some time or another. No one, however, can suggest any remedy until such time as we amateurs are allowed to play with Guided Missiles.

We put forth two alternative suggestions last month: (a) Don't work them; or (b) Work them and be as rude as you know how. It has been pointed out, however, by many suffering readers that these are both ineffective with the real, genuine, dyed-in-the-wool Clot. If he is left alone (says G3EDW, for instance) he still seems quite happy, playing for hours and CQ-ing, irrespective of whether anyone replies; if you really tell him off, he comes back with "RR dr ob mni tnx fer fb rpt, pse QSL 73 dr ob" What can you *do*? We have not yet started a "Bashing-Heads-against-Brick-Walls Dept.," but we foresee it—just around the corner.

Now please note, sensitive readers, that the above is not aimed at the novice, the self-confessed not-so-hot operator or even the Slight Clot in a Small Way. It is for the Absolute Limit in Clottery . . . the T1 with jelly-fist; the T2 with "modulation"; the whistler-with-Hola with a blancmange in his VFO; and the European who calls you for seven minutes when you are trying to work DX. No one of lesser stature will qualify. Thanks to several readers who have added their ammunition to our own.



CALLS HEARD, WORKED AND QSL'd

Now let's change the subject, shall we?

The Month's DX

On the whole, we can't deny that it has been one of the worst months—probably the very worst—since we started writing this "Commentary" more than five years ago. (Yes—time flies, does it not?) The almost uniform badness of *Twenty* has sent the DX types scurrying up to *Forty*, which they have generally found to be even worse. Those who have trekked right up to *Eighty* have found a few new countries of the semi-local type, but precious little real DX.

And yet the "pipe-line effect" has accounted for some quite nice DX contacts at times. There have been days when the States have been absent, Europeans weak, the band apparently dead, and yet VS6's or VS7's have been reaching S8 or even S9. There have been other days on which we have heard no ZL's or VK's in the early

mornings, but just a solitary KG6—also at S8-9. The general level, though, has been 'way down and just about as bad as can be.

Ten metres, of course, has closed down so effectively that hardly anyone even bothers to mention the band!

Twenty

A newcomer to this feature and to the Marathon table is G2BAM (Blandford), who held the call on an AA licence in 1926. He enriches our store of invective with a new slogan, applicable to almost anyone: "You want the best DX: we have it: you've *had* it." It does rather describe a certain attitude. 'BAM is rock-bound on two frequencies and has suffered from the Clots already mentioned. DX referred to includes ZC4KN, AG2AG, ZS2FV, PY7LJ, 4U-AJ, CR7CD, KH6BL, EL2A and "RU1XL"—the last five being Gotaways. Who on earth is that last one?

G2DPY (Shoreham) is a new-

comer, not to us, but to Twenty, having been a very persistent user of Forty for DX purposes. He finds the great open spaces on Twenty quite embarrassing, and the QRM much less severe than on Forty, and he thinks the "bad manners" story much exaggerated. Using only 25 watts, 'DPY has worked VS7, VU, HZ, ZD2 and 4, CX, PY, EAØ, EQ, VS2, MP4, AR8, AP, VS6, ZS and others. (Thought we said conditions were bad! All this is since January 10.) Regarding location, he is in a river valley with hills to the NW but a clear field of vision in all other directions.

G3BDQ (Hastings) has also done well on the band, with FQ8, VQ4, EL, VS7, ZE, TI, FF, FB8BB, VP7NZ, ZS3HX, ZS8MK and the *tour de force*, YA3UU (1400). 'BDQ puts in a plea for more rubber-stamped QSO's with DX on Twenty and says "Keep the nattering for Eighty or the Top Band." Some DX types, he rightly says, take so long to wade through a simple routine QSO that several waiting 'chasers miss a chance. And he also makes the interesting suggestion that the "T" code is outmoded these days, nearly every report being T9. We could report anyone simply as "55" or "56" instead of "RST 559" or "RST 569"; if the note was bad, one could always say so. Other views on this will be welcomed.

G3GUM (Formby) reports once more, his best being CR5AA, VP4LZ, TI2AG, TI2RG, EL2R, DU1MD and CO7AH, with ZD6DU as a Gotaway (three times!) 'GUM has received a nice card from PX1AA, but unfortunately can't claim ever to have worked him; so if anyone whose call remotely resembles G3GUM (on phone) wants that card, he had better write, stating date, time and band. 'GUM also draws our attention to a possible Sign of the Times: the Small Ad. in the last issue offering to exchange a transmitter for a shotgun

G3FXB (Hove) says his best were EK1RR, OQ5VN, MP4BBD, TI2TG, VP6FM and VS1CZ. There weren't even any Gotaways of note! TI2TG was worked the long way round, at 1600 GMT.

G6QX (Hornchurch) says "poorest month yet" and offers VS1, 2 and 6, plus HS1WR for a new one and FI8YG for a suspect. G5FA (London, N.11) collected CR9AE for a new one, plus VS2CR "and a few odds and ends."

G3TR (Southampton) worked phone only, and managed to get Y1, OQ5, LU, ZS, ZL, OX, VE8 and "a shower of PY's," with his 75 watts to a "ZL Special." Next month he hopes to have more time and "maybe some extra aerals."

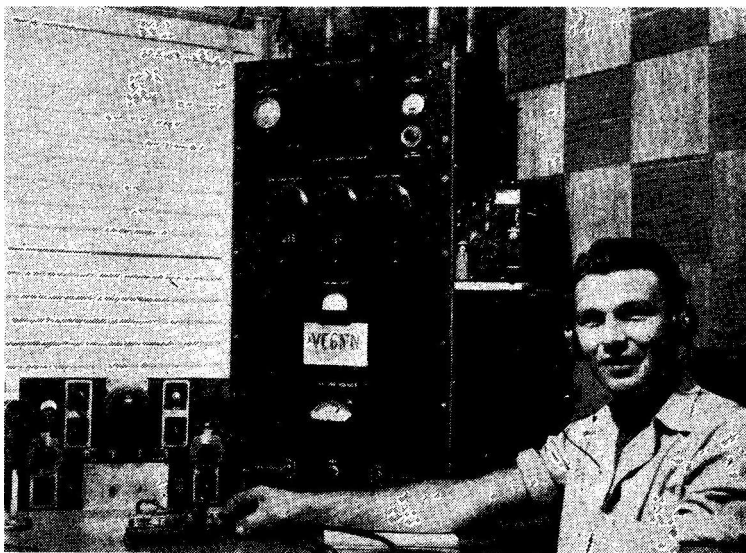
G5BZ (Croydon) continues to be annoyed by phones in the CW band, and says that several very well-known G's are addicted to the practice of starting a QSO on CW and then changing over to phone on the same frequency, which is definitely anti-social and ill-mannered. He remarks, though, that the ARRL CW Contest pushed the phone gang back into their rightful territory! 'BZ now has a very handsome lead in the Marathon—his best contacts were FM7WF, CR9AE, HS1WR, HE, TA, KH6, VE8 and quite a host of others, including the Star Turn — YA3UU. And he was very amused when he managed to work a UA9, who

came back to him as "UB5BZ," but referred to a previous QSO, also to G5BZ's card, and called him by name throughout! A sporting type, obviously—and that's definitely one Zone up for 'BZ.

G3FXA (Bexhill) enters the Four-Band table for the first time, starting, as one should, on the bottom rung! (He won't be there long). This month's DX included ZE, M1, VP6, KZ5, FF, MP4, VP4, ZD4, CR9AE and a few other nice pieces. He wonders why all the CN8's seem to be using BC-610's and coming in at S9 plus, when there is a 50-watt power limit out there.

G3EDW (Rayleigh) has found little of interest on the band, but is annoyed at the difficulty in raising ON, PA, HB, GW and the like for his WAE. Whenever the skip is short enough to get them, he says, they are all calling CQ DX! It is a problem, that—we have suffered too. G2NS (Southbourne) has been QRT for a bit, but a few days' listening brought up FF, KL7, VQ4, ZS, MP4 and the like.

And so ends the shortest Twenty-Metre news bulletin we have published for many a month. Fortunately, at the time of writing



VE6MN, Lethbridge, Alberta, has a neat layout for CW operation on Twenty, with a 3-element close-spaced beam. His receiver is a home-built 10-valve superhet, and the station score is 128C worked with 102 confirmed in 37Z.

there are distinct signs of improvement, and the Contest season is upon us. Maybe next month will see some epoch-making achievements.

Forty

Just when conditions have been such that one would expect all sorts of good things on Forty, what have we had? Nothing, mostly. On many nights the MUF seems to have been even lower than 7 mc, on which we have heard nothing but broadcasting and a very few weak Europeans. Even the well-known addicts seem to have forsaken the band, and it is not surprising.

G2DPY, before deserting it for Twenty, worked AP2K, PY, FF8, ZL and CR4. G8VG (Dartford) managed SU1FD and 1GY, "in between the bad spots." G3BDQ reports ZB1BQ, a PY, some W's and 4X4BX. G6QB managed to find the odd VK and ZL (mostly around 0830) but little else.

G3FXB, hitherto very successful on the band, reports only OX3EL, 5A2TT, SU1XZ and a VE. He says the band gets worse and worse. G6QX mentions VP6LM but no one else.

G5FA, one of the Old Lags of Forty, mentions only OX3EL, SU1XZ, ZC4BL and HV1AD—the latter worked with tongue-in-cheek. G5BZ says that the outstanding signal on the band was VQ4HJP, S8-9, calling CQ and apparently getting no replies. Inci-

dentally, we should like to know why these VQ4's reach such terrific strengths on Forty; we heard VQ4AQ and VQ4CM side by side one night, both S9 and slightly "watery." VQ4HJP has often been heard, and VQ3BM used to put in a good one, too. But the ZS's never reach comparable strengths, nor do the nearer countries like SU, FQ8 and FF8—why?

G3EDW, alone among our correspondents, says that conditions on the band have been very good, and his list of Gotaways is terrific. Those he worked included FQ8AE, SU's, 5A's, Trieste and Corsica.

One small item of news is that EL2R promised to be on the band at 2230 most nights, but no one seems to have heard or worked him.

Eighty

Here's another disappointing band. Apart from isolated (and pretty short) periods, the DX on Eighty has been nowhere near last year's standard. Practically all the "DX" reported is really semi-local stuff, but most people seem to think themselves lucky to work even that!

G8VG offers OY2Z (worked at 0615); G3BDQ puts in EK1FM; G6QB heard EK1FM, EA4BH and EA9AP working a non-stop, three-way one night, so if anyone wants EA9

G2YS (Chester) called CQ DX at 2055 one evening, and back came VO1P on a band otherwise full of Europeans. G3FXB found two new ones—F9QV/FC and 5A2TT. He was the latter's first G on Eighty. 'FXB adds that ZD4AB is believed to have been on, too.

G6QX worked OY3IGO and 9S4AX, plus a highly suspect "YA1AH." G5BZ didn't spend much time on the band, but he did collect CT2BO, OY3IGO, 9S4AX, HE9LAA and GD3UB to help his score along.

G3EDW offers a nice little bunch, including EK, 4X, 3A, 3V, KP4, ZC4, W, VE and OX.

G8VB (Greenford) sends what he calls "Excerpts from a Snooper's Diary," being the results of listening on the Eighty phone section any late evening. They are not remotely connected with DX, and therefore don't belong here, but we can truthfully say that they reveal a state of affairs on the band that might well be tackled by some official monitoring stations. Many of the remarks and witticisms would make Fourth-Form humour positively sophisticated. We should like to print them in full as a Solemn Warning, but (perhaps fortunately) space does not permit.

Top Band

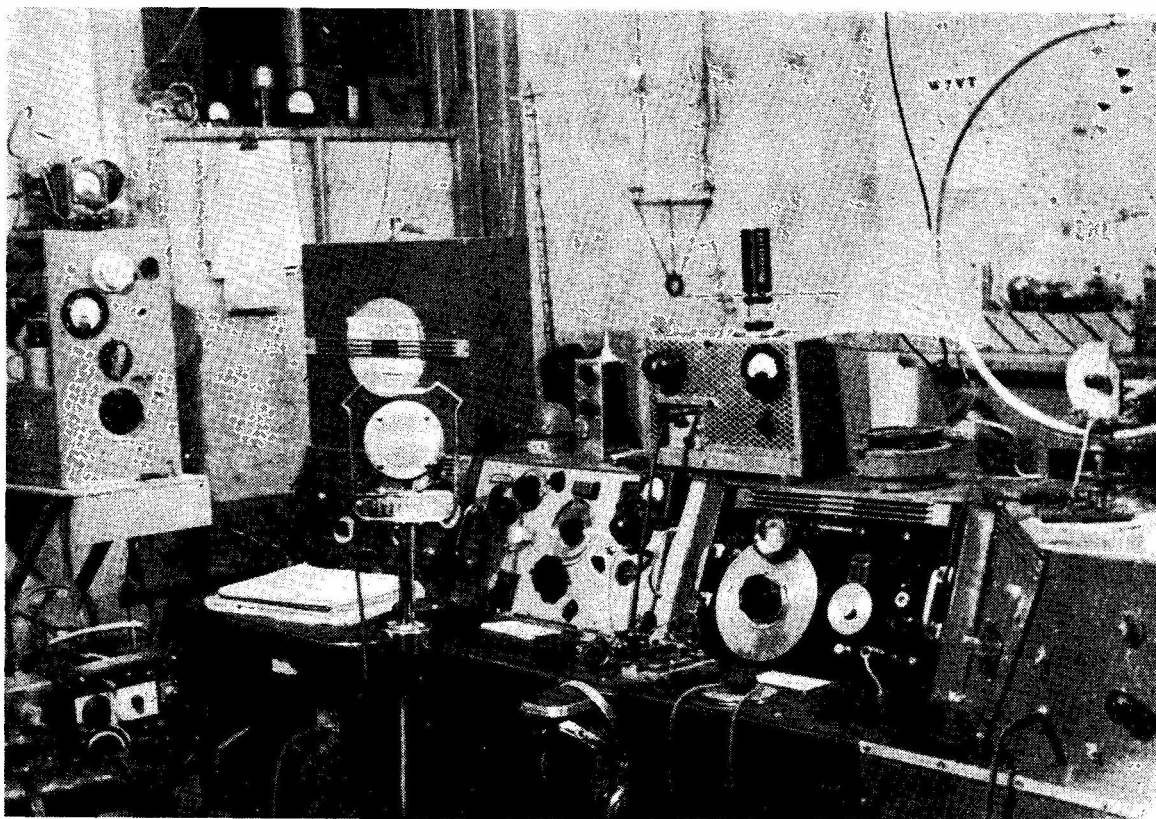
The full report on the Trans-Atlantics appears elsewhere in this issue, and you will gather from that that even this band has been well down on last year's performance. WIBB (Winthrop, Mass.) voices our own views precisely, as follows: "Contrary to the general belief that DX gets better on the LF bands as the HF bands get poorer, the truth is that when the HF bands are bad, DX on the LF bands is also bad. What fools people is that when there isn't any good DX on the HF bands, the only stuff there is, is on the LF bands; this leads to the belief that the LF bands get better as the DX bands get worse, which we know to be wrong." Slightly involved, but true!

Certainly there is not the slightest doubt that Forty, Eighty and One-Sixty have *all* been much worse this winter than last.

FOUR BAND DX TABLE
POST WAR

Station	Points	3.5 mc	7 mc	14 mc	28 mc	Countries
W2QHH	495	90	90	209	106	209
G6QB	480	49	92	204	135	220
G2AJ	433	42	81	192	118	211
G5BZ	401	50	89	201	61	205
G2VD	398	42	80	170	106	178
G5FA	364	33	110	148	73	163
G3FXB	321	42	93	147	39	156
G6QX	314	46	82	131	55	156
G6BB	310	38	80	138	54	147
HC2JR	293	3	15	143	132	183

Station	Points	3.5 mc	7 mc	14 mc	28 mc	Countries
G8VG	258	34	76	122	26	140
G6YR	255	16	33	105	101	152
G2YS	248	40	45	123	40	136
G2BW	238	21	53	133	31	139
GM2DBX	217	5	31	101	80	121
G6TC	213	17	58	110	28	118
G3GUM	211	31	38	141	1	153
GM3EDU	197	37	41	96	23	116
G2HKU	181	3	46	118	14	128
G3FXA	181	22	44	107	8	116



G2BCX (London, E.18) has a consol layout, designed for operating comfort and convenience. From left to right : 20-metre converter, main receiver, 2-metre converter, main control panel switching both transmitters and modulator. It will be noted that the receivers slope back for ease of operation. The whole consol is in one piece, completely moveable, and took about three months to build and wire. Of particular interest is that the microphone visible in the photograph has been used by Mr. Churchill on more than one occasion ; the loop-aerial on the right has also earned fame as the means of tracking down and unmasking a local pirate operator.

G5FA still combs Top Band for some further points for his WAE/II. He has worked G, GC, GD, GI, GM, GW and OK—and all the cards have arrived, which pleases him no end. G3EDW worked OH3NY but had the horrible experience of hearing ZC4XP at 569 while his transmitter was strewn around the shack in small pieces!

Sundry new countries have been appearing on the band. GW3ZV (Rhigos) worked ZC4XP and F7AR, and tells us that a TF5 heard the following stations: G2AF, 2AOP, 2HW/A, 3AKW, 3ARL, 6AR, GW2CUT, 3FSP and 3ZV.

SU1XZ listened on 1.7 mc one night recently and was surprised to hear G4AU, 6HD and GW3ZV. VQ4CM hopes to be on the band soon.

Otherwise the Top Band seems to have reverted to its traditional use for local ragchews, QRP tests, Slow Morse and all the other uses to which it is normally put.

The Eclipse

We duly kept watch during the period of the total eclipse of the sun (March 25) and found that many stations in or near the path of totality were coming in very much more strongly than they should have been under normal conditions. Among them were FF8AG, FQ8AE, YI3BZL, YO3RF and MI3ZX. Others that popped up in a surprising manner, and went out again as quickly, were a KL7 and a VE8, and, finally, DU1AP, who suddenly emerged from the noise, peaked about S6 and disappeared again.

All this was on Twenty, of course, about 0830-0945.

News from Overseas

VS7RSC is the official station of the Radio Society of Ceylon, operating from the Colombo Plan Exhibition. VS7DB sends some interesting information about this, and tells us that the electrical noise within the Exhibition grounds is so high that (as already reported) a VHF link has been installed. A remote receiver is used, signals being relayed in through a two-metre link from about a mile away—an ingenious way of tackling the problem. The Exhibition is open for a month, and VS7RSC operates on phone with 250 watts and a 3-element beam. Very special QSL cards will be sent to all contacts when the Exhibition closes.

ZS2FV (Port Elizabeth) wants

to get something off his chest about a VS9 station who was asking for QSL's and sending his full QTH, some time back. 'FV promised, and sent, to this station one of the latest *Call Books* by registered post, but from that day to this has heard no more, and hasn't even a VS9 card. If this should catch the eye of the culprit ZS2FV would be interested to QSO Brighton, as he was there during the war and it is also the XYL's home town.

G3IDR writes from Ahlhorn (BAOR) to say that he is awaiting his DL2 call, when he will be active on all bands from 80 to 2 metres. He confirms that DL2's are not now allowed to use the Top Band. He will be spending some leave during July and August in Trieste and San Marino, and he says that a letter from the

WAZ MARATHON, 1952

Station	Zones	Countries
G5BZ	32	97
G2VD	28	93
G6QB	27	69
G6QX	26	66
G3FXA	25	64
G3BDQ	23	66
G3FXB	23	60
G2DPY	20	48
G3GUM	19	34
G5FA	18	56
G3TR (Phone)	18	41
G5GK	17	24
G2AJ	16	45
GM2DBX (Phone)	16	44
G2BW	16	36
G2BAM	13	35
G6YR	12	24
G6TC	9	26
G2BJN	9	26
G2VJ (Phone)	8	12
G3GVY	2	5

NOTE: New entries in this table must not include QSO's dating back more than two months from the time of entry. Regular reporters should send in their score month by month — three months' failure to do so will be taken to indicate loss of interest and the score will be deleted.

REAL DX AGAIN ON THE TOP BAND!

For the second half of the CW section of the ARRL DX Contest, March 14-16, KV4AA, of St. Thomas, Virgin Islands, went on 160 metres. He worked ALL W Districts, three VE Districts, was heard by KH6JJ and received ZL1BY, who also logged KV4AA, though there was no actual QSO KV4/ZL. Repeat — all this was on Top Band, just about three weeks ago! The DX on the LF bands is there if you go for it.

latter place (concerning just-what-you-might-imagine) is very hopeful. So look out!

VS6CK is newly licensed in Hong Kong, and is on 14086 kc, CW only, "between 0100 and 1600 GMT," which seems fairly generous! Maybe he means 1300? He runs 25 watts to an 807 and very much wants QSO's with G.

There has apparently been some pirating of the call VS9AC. The former owner, now in London, says he is receiving shoals of QSL's and reports; he left Aden last September and never, at any time, used Twenty.

Miscellany

G3GUM has worked, and received a card from GM3HXC (Orkney). He now asks "If the Channel Islands and the I.O.M. count as countries . . . ?" There are considerable differences between the status of Orkney and the other two examples, though, and probably a very good reason why it should remain in the same bracket as the Isle of Wight. We would all like some more countries, but where on earth would it end?

G6AH takes up the cudgels about over-optimistic reporting and "sparing the other man's feelings." He quotes the case of a G station working an Italian phone who obviously had a wobbly SEO and a spring-mounted tank coil; yet this G gave him a nice report and said "Fine signal, OM." 'AH suggests that the phone experts should switch in the BFO occasionally, before handing out flattering reports. Another thing that annoys him is this business of "Readability 5 when no QRM"—to say nothing of the people who give R5 reports and then ask for a repeat.

G3GVY (Buxton) suggests that we should use this feature to emphasise the charms and general excellence of the VHF bands. He thinks that the devoting of more "space" to VHF herein might result in more "space" remaining on the DX bands! We doubt whether you would notice the difference.

GM2DBX (Methilhill) is our only Scottish correspondent this month (wonder if he knows what TVI is by now?) He suggests that a separate Marathon table for phone would be a good thing if a few more entries could be conjured up. We agree—but let's have the entries.

G3GZO (Padgate) sends the smallest card we have ever received (without a stamp!) to ask who we meant by "G3TAU" last month. We typed G3ATU, but between us and the reader someone made an anagram of it.

G3DYN (Gravesend), who is ex-Y13DYN, kindly sends in the full gen. on the LABRE certificate. Thanks, 'DYN, for the trouble, but, as you doubtless know by now, we published it last month.

GW8BW (Rhigos) claims the first post-war Phone DXCC for Wales. He is exiled in G-land at the moment and can't get on the air, but hopes to manage something soon. Meanwhile, GW3ZV tells us that he has acquired an R.201 receiver. This little gadget weighs just over half a ton and employs 86 valves, most of which perform special jobs. There is a motor-driven shift correction device which holds a CW signal to within 120 cycles. John suggests that he might be spending quite a lot of time servicing this monster from now on.

In the first leg of the ARRL (CW) Contest, when most of us

found conditions so poor that we could barely raise a W or VE, GW3ZV worked 509 of them, on Twenty only! This may have been a pipeline effect, for certainly most of Europe was blacked out for the W's. G3FXB had 53 contacts and tells us that EI9J had 250 and YU1AD 54. (We had about 12—quite hard work!) The second leg saw *much* better conditions, but, of course, we have not had time to amass any reports yet.

Other Contests

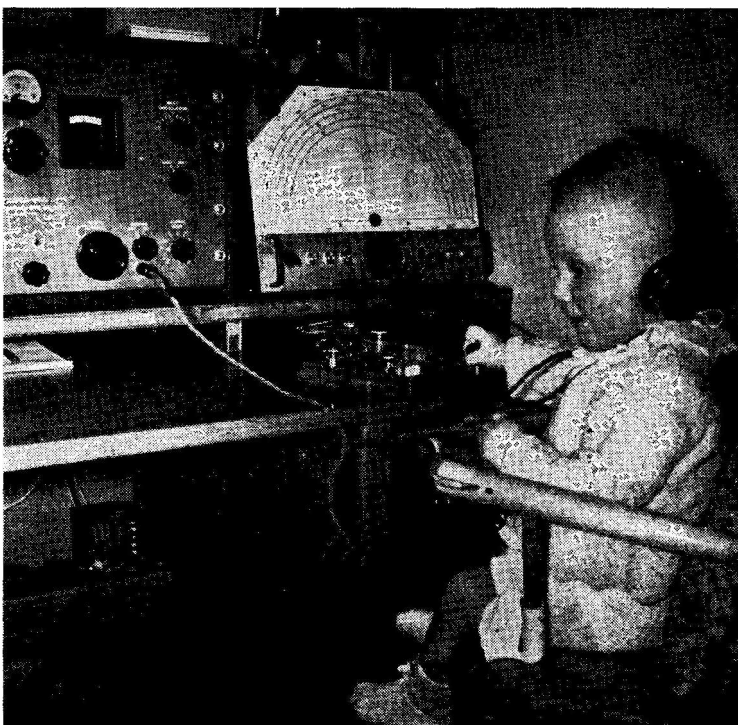
The OZ Society, EDR, is the organising body for this year's All-European DX Contest, the dates for which are December 6-7 (CW section) and December 13-14 (Phone section). This Contest will be arranged as part of the EDR Jubilee Programme. Further details will be available in due course.

In addition, there is to be an EDR Jubilee Contest, running from 2100 GMT on May 3 to the same time on May 4, during which stations outside OZ will try to work as many Amts (Districts) of Denmark as possible. All bands from 80 to 2 may be used, and the usual RST-plus-serial number (starting at 001) will be exchanged. The multiplier will be the sum of the Danish Amts worked on each band; OZ stations will signify their district by an index letter added to their call-sign.

Yet another one is the OZ Cross-Country Award, for working as many of the districts as possible, counting all contacts since August 1, 1947. It is impossible to reproduce all the rules here in full, but details may be obtained from OZ2NU, the Contest Manager.

Incidentals

Last month we mentioned that Norman Joly is now settled as ZC4RX, and would be on the air before long. Since then we have heard signals from SV1RX/MM, about whom we have no information; perhaps someone can give us the story on this, if any?



They say "Catch 'em young." The second operator at SM5KP, Bromma, is only 9 months old but is already knocking out a CW signal!

YA3UU suddenly cropped up on phone on March 15 (frequency about 14120), all in among the ARRL CW Contest. No doubt by now it is well-known and many of the phone DX-ers have raised him.

From ZS8MK: LU4ZI is another of the Argentine stations down in the Antarctic. This one is on Deception Island, which we imagine to be South Shetlands.

From G3GRL (Nottingham) and W7BD: VP8AJ will shortly be on 14130 kc at mid-day and 2000 GMT from Graham Land. This is a new VP8AJ, the old one now being VP8AO.

And that concludes the report for a very meagre DX month. Next month is bound to be better—it just couldn't be worse! Let us have all your reports, scores, claims and odd gen. by **first post on April 16**. For the next month

the deadline will be first post on May 14.

Keep up the good work and please remember that nothing is too trivial to report; it may not strike you as interesting, but there's no knowing what all the others might think.

With that we sign off until next time. 73, BCNU and Good Dx-ing.

P.S.—For all those who have made rude remarks about our El-Bug, while in the novice stage: we are now working on an Electronic Mike, with a two-way paddle, so arranged that it says "Hi-hi-hi-hi" on the dot side and "Er—Er—Er—Er" on the dash side. This makes it possible to work phone with the minimum of effort and the slightest knowledge of Basic English.

Always mention Short Wave Magazine when writing to Advertisers—It Helps You, Helps Them and Helps Us

THE recent spell of bad conditions has shown just how much we still depend on natural phenomena, in spite of our alleged triumphs over Nature. We can spend untold energy on improving receivers, aerials, transmitters, and our technique in general, and then . . . down comes Nature's damper, and we can't even work outside Europe on 14 mc. It is (or should be) a sobering thought. Here are men engaged on atom research, supersonic flight and even interplanetary travel, and yet we can't send a signal 3,000 miles without assistance from erratic phenomena which we have not yet learned to control. Of course, the high-powered commercials can do it, but I think I am right in saying that Rugby's 16-kc frequency (18,750 metres!) is still the only one on which World's Press News can be copied with certainty in any part of the world and at any time.

THE SOCIAL SIDE

It would be interesting to know the exact proportion of licensed amateurs who belong to, and attend regularly, their local Club. The Club movement has always flourished with certain types—those who like to meet their fellows in the flesh once a fortnight, those who like listening to others talking (and don't mind doing a bit themselves). But there are two other types on whom the Club movement definitely does *not* thrive: the over-modest individual, who is scared of being asked to talk, and the (dare I say it?) rather socially conscious individual who thinks some of his fellow-amateurs are not quite the type he would ask home to tea, and therefore is not too keen to meet at any time. The latter, fortunately, are not numerous—but they exist all the same.

VINTAGE STUFF

No apologies are needed for returning to this subject, so great has been the interest shown in a recent paragraph. Old Timers in radio are just as proud of their old gear as Veteran Motorists of their old cars, and the unearthing



of a crystal-oscillator (DE5B!) or of an old PA (Western Electric '210!) produces sensations comparable only with those engendered by finding a bull-nosed Morris-Cowley in the garage one fine morning. Inefficient it may have been (though we should hate to admit it), but that is all excused—and more than excused—when we remember The Good Times We Had. No one has yet gone so far as to build up a complete working station from "veteran" parts, but several Old Timers have ancient units still doing duty in the most gallant fashion. Examples I know of are a PA with push-pull 210's, a Top-Band rig with a DET-1 (yes, 10 watts!) and a modulator with this line-up—MH4, ML4, two PX4's, two Cleartron 625's. And up to a year ago I could find a heterodyne wavemeter of my own with a Myers valve therein—red ebonite one end and black the other, if you remember them?

DEMOCRACY

What a band our Top Band is! Its charm is that all meet on an equal footing and that there are no blasting-through tactics as on the DX bands. With the exceptions of those who are fortunate enough to possess colossal aerial systems, most of the habitués of the band have signals of similar strength, and of pretty good quality, too. There, too, one meets the Two-Metre man taking a rest; the DX-hound in exile; the Old Timer fed-up with all the

fuss and bother on the other bands; and, of course, the Fish-Fone and the Shipping. But it certainly has a charm of its own, and those who have never used the band have missed a lot.

STANDARDS

It has struck me forcibly during recent months that operating ability and technical ability often go hand in hand. One rarely hears a badly-operated station that does not also suffer from a technical fault such as a T7 note, or poor modulation, or clicks, or spread. On the other hand, it is very seldom that we find a well-operated station with a poor note, bad modulation, or any of these faults. To elaborate: the T9x station doesn't seem to go with a bad fist, nor the "BBC-quality" phone with inane operating procedure. It just means that some people must be cleverer than others; but what a pity that all those "others" never seem to learn. What is the Club movement for? And, going farther back, how *did* some of them get their licences in the first place?

ACCESSORIES

Someone was recently heard, on the air, proclaiming that many amateurs worried so much about "gadgets" that their main equipment became overlooked or neglected. My view about this is that "gadgets," if they are useful, are part of the main equipment, and an indispensable part. Relay switching for quick change-over, monitors, 'scopes, keyers, Q5-ers, and all such useful auxiliaries are, to me, more fascinating to experiment with than a mere transmitter or receiver. Long live gadgetry, for it is precisely this that gives the fullest opportunity to the amateur to make-do-and-mend, to modify, to turn to his own purpose things that were originally intended for something different. It would hardly be an exaggeration to say that a man's enthusiasm for his station can be measured in terms of the usefulness of his ancillary equipment—and don't you think that expression sounds much better than "gadgets"?

Top Band Transatlantics, 1952

SURVEY OF RESULTS ACHIEVED IN THE SECOND
POST-WAR SERIES ORGANISED BY SHORT WAVE MAGAZINE

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

Last year we were able to report a highly successful series of tests, running from December 1950 until March 1951. With the steady decline in conditions on the HF bands, it was imagined that this year's Top Band tests would have been even more successful. This did not prove to be the case, conditions on the band being noticeably worse than in 1950-51. The results, on the other hand, are no less interesting, even if the two-way contacts were not so numerous. Co-operation on both sides of the Atlantic was excellent, and the tests have once more made a worthwhile contribution to knowledge and experience of the 160-metre band.—Editor.

TRANSATLANTIC work on the Top Band achieved at least one record this season—the band opened up earlier than ever before. The two stations performing the ceremony were VE1EA and G3PU (Weymouth), at 0520 on November 25. Shortly after this a CQ from G3PU was answered by W1LYV. Surely, we thought, this was the curtain-raiser to a record-breaking season of Top Band DX.

Unfortunately our hopes were not justified, and when the Tests proper began on December 16 it was pretty obvious that nothing sensational was afoot. In point of fact, some of our regular participants heard *nothing* that morning.

Coming on the heels of the record-breaking work between ZL1AH and the two GW stations, 3ZV and 3FSP, this seemed a little hard. But so it remained, almost throughout the period of the tests, and not one single Sunday morning proved to be even up to last season's *average* for signal-strength and activity.

The First Test, December 16

This test was "thrown in as an extra," in the hope of an early start to the season. Punctually on the stroke of 0500 most listeners heard W1BB on his usual frequency start up with Greetings—but with a very weak little signal compared with last year's 569 affair. So far as reports indicate, the only DX signals heard that morning were W1BB, K2USA, OH3NY and EK1CW. And only three actual contacts were reported—K2USA and W1BB worked GW3ZV, and W1LYV worked KV4AA.

GW3ZV was logged by VE1EA, W2EQS and KV4AA, and KV4AA was heard by VE1EA. W1BB and K2USA were received at

EK1CW, but no contacts were made. Activity on the other side included at least sixteen stations, among whom were W1AWO and W1DBM calling CQ DX on phone! But results were very mediocre and this first Test was written off.

Reporters on this side—to whom we gratefully give credit herewith—were G2AJ, 2HKU, 3AFZ, 3COJ/A, 3DIY, 3HQB, 3HQQ, 3IDG, 6GM, GM3OM and SWL N. C. Smith.

From the other side, W1BB reported a much higher noise level than last year, and generally bad conditions.

The Second Test, December 23

From the start it was obvious that this morning was going to be a little better. Transatlantic stations began coming in at once, the most frequently logged being W1BB, 1EFN, 1LYV and 2EQS. Others were W2MX, 3FDY, 9CVQ and 9NH.

On this occasion several contacts were made. W1BB worked GW3FSP, G5JU and 6GM; W1LYV scooped the pool with GW3FSP, G3COJ, 3ERN, 5JU and 6GM; W1EFN and 9CVQ both worked GW3FSP and G5JU, while W2EQS and 2MX both worked GW3FSP and 6GM. Obviously, honours were going to GW3FSP this time; without in the least belittling his performance it is only fair to add that GW3ZV was in bed!

In addition to the above, W1LYV heard and called G2FGD. But now a newcomer steals upon the scene, as they say in the thrillers . . . ZL1AH was listening, and heard W1BB, 9CVQ and 9NH, reporting this on a 7 mc sked later on. So no one could deny that the band was open.

EK1CW logged W1BB, 1EFN and 3FDY

out of the fourteen or so active W stations that morning. Once again W1BB complained of a very high noise and static level. So worried was he, in fact, that he had a long talk with Dr. Greenleaf Pickard, the well-known pioneer in reception technique, and he picked up a few wrinkles which might possibly help to pull weak signals through the racket.

Reporters on this side were G2AJ, 2FGD, 2HKU, 2YS, 3COJ, 3IDG, 5JU, 6GM, GM3OM and SWL N. C. Smith.

The Third Test, January 6

Those of us who got out of bed this chilly morning were full of hope that something better might turn up. If anything, though, conditions were down on those of December 23. The W's heard this side were 1AHX, 1BB, 1LYV and 3PYR, plus KV4AA, EK1CW and ZB1BJ. W1LYV was the star turn on the other side, working G2AJ, 2PL, 3DIY, GW3ZV, EK1CW and KV4AA. W1BB and 1SS worked GW3ZV, and W3PYR worked G2AJ.

A week before this W9CVQ had made history by *working* ZL1AH—December 31 at 0645 CST—for the first W-ZL QSO on the band. Unfortunately on the morning of January 6 he did not show up at all, although he was believed to be active. Among the W's who were on the air were W8LJH, 8ZCO, 9NH and ØNWX. The latter is, of course, the new call-sign of our old friend W4NNN, who did so much good work on the band more than a year ago.

Other occurrences of note on this morning were the reception by EK1CW of W1BB, 1LYV and 3PYR, and the message passed by OH3NY to the effect that he was hearing W1BB regularly. Credits for this morning's reports go to G2AJ, 2PL, 3DIY, 5MR, 5RI and N. C. Smith.

W1BB took his noise problem so seriously that he erected a 1,000ft. directional receiving aerial, which he put up the previous afternoon. He also borrowed a DB22A pre-selector; but, alas! the noise won again. Stew was by now seriously thinking of remote receivers out in the country linked to his station by telephone, especially as he found that W1LYV and 1SS were logging signals that he couldn't hear at all—and hearing the others about half-an-hour earlier than he did.

W1LYV's success on this occasion—and thereafter—was probably due to the fact that he had put up an aerial 1,029ft. long, into which he pumped his 180 watts. He is situated in the open country, with little or no noise to

TABLE I

U.K. STATIONS MAKING CONTACT WITH W/VE

G2AJ (W1, W3)	G5JU (W1, W9, VE1, VE2)
G2FGD (VE1)	G6BQ (W1)
G2PL (W1)	G6GM (W1, W2, VE2)
G3DIY (W1, VE1, VE2)	GW3FSP (W1, W2, W9)
G3COJ (W1)	GW3ZV (W1, W2, W9, VE2)
G3ERN (W1)	

contend with. The bulletin from W1BB indicated that 'LYV was by then thinking of going up to 2,058ft. of wire for the following tests.

Publicity on the other side was by now extended to the VOA Programme, W2ESO having been extremely co-operative in putting a series of news flashes into the Amateur Radio programme each Sunday night.

On January 12 an interesting little party took place. W9CVQ, 9NH and ØNWX were having a snappy three-way at 0820 GMT, all sending at about 25 w.p.m. A message reached them, a few days later, to the effect that ZL1AH had copied all three of them solidly for *more than half-an-hour*, at strengths of 559 and 569. This is DX in any language!

The Fourth Test, January 20

Rather more DX was heard over here on this morning, although it seems that only two of the W's succeeded in making contacts. Those heard were W1BB, 1LYV, 2BFA, 2EQS, 2TRK, 4ATC, 9LB, 9NH, and 9PYC. KV4AA was also logged.

W1BB succeeded in working G2AJ, 2PL, 5JU, 6GM, GW3ZV and KV4AA; in addition he heard G3DIY. W1LYV worked G2PL, 3DIY, 6BQ and GW3ZV, as well as logging GW3FSP. EK1CW heard W1BB. Among the active ones was WØNWX again—apparently just too far West to break through to us.

W1BB put up his 1,000ft. wire again, all over the neighbours' property, and had to take it down immediately after the tests (0430 in a blinding snowstorm!). He did succeed, this time, in bolstering up signals a little, by using two aerials on the receiver and leaving off the earth connection. GW3ZV also had trouble with aerials, and used a 750ft. wire throughout, instead of the much longer and better aerial of last season.

Fifth Test, February 3

This was a very disappointing period, with only slight activity on both sides. One suspects that the temperature at this end may have had something to do with it, especially as a few signals were heard between 0500 and 0520 but never again! VE1EA showed up this time, having apparently been plugging away

during the other tests with an aerial that proved to be no good. He, together with W1BB and 1LYV, represented all the Transatlantic DX heard this morning. EK1CW and OH3NY were on the band, but the sum-total of contacts were made by W1BB-G5JU, and VE1EA-G3DIY and G5JU. A new station active, but not heard here, was VE1HJ; W9CVQ and 9NH were also on, as was KV4AA, who worked several W's, but these were only considered as local contacts!

This time W1BB left his thousand-footer up until daylight to try to get a photograph of it, but an irate neighbour found it first and tore it down! (Stew hadn't asked permission, because he knew it wouldn't be granted in any case.)

Sixth Test, February 17

On this occasion the early risers probably went back to bed without hearing anything, because the band opened very late. It was of very little use until after 0630. The chief item of news was that a lovely signal arrived from VE2WW, who was using a vertical half-wave supported by a balloon. At times he was putting over the best signal heard throughout the entire series of tests, although at 0600 he was barely readable. He worked G3DIY; 5JU, 6GM and GW3ZV. W9NH worked G5JU and GW3ZV; and VE1EA worked G2FGD and 5JU. VE1HJ and W1LYV worked GW3ZV.

On this occasion W1BB was away on business, but W1HFJ was operating the station for him. Stations heard over here were W1BB, 1LYV, 2EQS, 9NH, VE1EA, 1HJ and 2WW, and KV3AA. EK1CW also logged most of them.

Apparently an approaching snowstorm gave a high static level in the W1 territory, and apart from W9NH, none of the more distant signals broke through, although several W3's and W8BKH and 8LJH were known to be on. W1BB was actually marooned in severe snowdrifts in New York State, when trying to get home the following day.

General Notes

So much for the detailed test-by-test report of the occurrences. Everyone feels that they were pretty disappointing this year, in spite of

the fact that we might reasonably have predicted a lift in conditions instead of the reverse.

This has led several Top-Band workers to suggest that our theories have been all wrong, and that the Top Band will probably be best for DX at the *peak* of the sunspot cycle—not at the trough. So when Ten is wide open once more we will certainly organise Top Band DX Tests—just to see what happens.

As always, there were black sheep on this side—those who would persist in calling CQ right on the edge of 1800 kc, and even those who made a brief but dramatic appearance right in the U.S. band, calling the W's on their own frequencies. So rapidly were they told where to alight that their efforts were very short!

Scheveningen Radio, as usual, was a trial, being on 1800 kc with high-power phone and high-power spread. Next time we shall certainly warn the W's not to operate below about 1810 kc.

G6LB (Chelmsford), who was successful last year, didn't manage any contacts this time, but was told by W1EFN that noise level and terrific QRN on the other side accounted for the poor results this season.

G5JU (Birmingham), who turned out to be one of the most successful stations on our side this year, especially with the W9's, attributes some of his success to the fact that he was using a *reflector*. He adds that he also went to a lot of trouble to obtain a first-class earth, which forms a part of the radiating system on the Top Band.

Sundry DX

We have a report, with no dates mentioned, to the effect that W0NWX did finally manage to hear GW3ZV and G5JU, but no QSO's took place. GW3ZV was also heard by MD2BC/SU (date not stated).

4X4CJ (Tel-Aviv), who hoped to be on the air to give G's a contact in Asia, was unable to arrange the necessary permit and did not transmit at all. It was left to the enterprise of ZC4XP to provide the Asiatic end, which he did to some effect. Operating on Wednesdays and Saturdays, he made quite a few contacts on 1850 kc—a stout effort.

Several of the SU's spent some time listening on the band, but no results are reported. At the time of writing, however, more of them are taking it seriously, and VQ4CM is also busy putting up a huge aerial on which he is convinced that he can get through to us. A TF5 station has also reported hearing quite a number of G's.

TABLE II

U.K. AND W/VE STATIONS HEARD BY EK1CW	
G2ACV, 2ATM, 3CCZ, 3DIY, 3ERN, 3FPO, 3GGN, 3HQO, 5JL, 5RI, 6BO, 6OX, GIZARS, GM3OM, GW3CDH, 3FSP, K2USA, W1BB, 1EFN, 3FDY, 3PYR, 9NH, VE1EA, 2WW.	
U.K. AND W/VE STATIONS WORKED BY EK1CW	
G2AJ, 2FGD, 2PL, 3BKF, 3COJ/A, 3PU, 5JU, 6GM, 6QB, 8JR, GW3EFZ, 3ZV, W1LYV.	