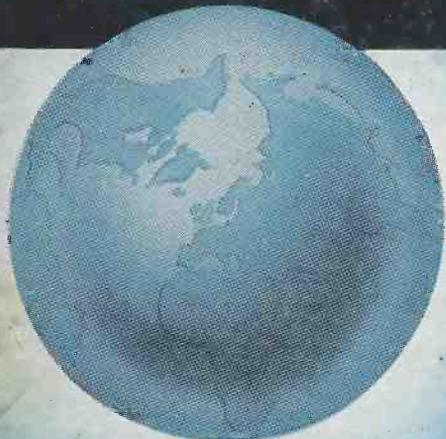


*The*  
**SHORTWAVE**  
*Magazine*

2/-



**EXCLUSIVELY FOR THE  
RADIO EXPERIMENTER &  
TRANSMITTING AMATEUR**

**VOL. VII No. 7 SEPTEMBER 1949**

## A MIXED BAG

from

# WEBB'S RADIO

The following are just a few lines at random from our vast and varied stock. "Special offer" items are offered subject to being unsold. Other apparatus is standard stock.

### Special Offer VALVES

Acorn Type 954 (H.F. Pen.) 6.3 volts	..	3/3
Acorn Type 955 (Triode) 6.3 volts	..	3/6
Type 1625 (12 volt equivalent of 6L6G)	..	3/9
Type 8012	.. .. .	18/6
Type 801	.. .. .	8/3

### EDDYSTONE Semi-Automatic MORSE KEY No. 689

Designed in modern style in streamlined die-cast housing. Perfect action for the speed king .. £3:17:6

### WEBB'S "465" I.F. Transformers

A new line offering a highly efficient 465 kc/s transformer ("Q" = 140) at a reasonable price. 3½ in. high by 1½ in. square. Price, each 6/., per pair 11/9.

### "Electronic Engineering"

#### HOME-BUILT TELEVISOR

Webb's carry all components for both London and Birmingham versions. Ask for "Television List," post free. Also our technical assistance is always at your service.

### WEBB'S

#### SERVICE DEPARTMENT

can accept Communication Receivers for complete overhaul and re-alignment. When a set leaves us performance is guaranteed as new and up to makers' specification.

### "WILLIAMSON"

#### High-Fidelity AMPLIFIER

#### MAINS TRANSFORMERS

Partridge VDN (brass studs on bakelite panels) ..	£4:18:0
Partridge VDL (wire leads) ..	£4:8:0
Webb's KW1036 (Tagboards Pri-Wire Sec.) ..	£3:8:6

#### CHOKES 30H 20 m/A

Partridge C25/60 (Unshrouded clamp mounting)	16/-
Webb's KW1066 (Shrouded)	16/6

#### CHOKES 10H 150 m/A

Partridge C13/200 (Unshrouded strap mounting)	£1:11:0
Webb's KW1065 (Shrouded)	£1:16:6

#### OUTPUT TRANSFORMERS

Partridge Type VDN (connections to brass studs on high-grade bakelite panel) ..	£5:13:0
Partridge type VDL (wire leads) ..	£5:0:0
Woden potted type with tag connections ..	£4:2:6

#### VALVES

2—Osram KT66 (matched) ..	£1:16:6
2—Osram B65 or 6SN7 ..	£1:16:6
Or 4—L63 or 6J5 ..	£1:16:8
1—Brimar 5V4G ..	11/-
Or 1—Cossor 53KU ..	18/3

Webb's Radio \* 14, 50HO ST., OXFORD ST., LONDON, W.1.

Telephone : GERrard 2089.

Shop hours : Weekdays, 9 a.m.-5.30 p.m. Sats.: 9 a.m.-1 p.m.

*Important*  
**ANNOUNCEMENT**



*to users of the*

**VALVE  
TESTER**

**RADIOLYMPIA**

See our Exhibit at  
**Stand No. 85**

Sept. 28 — Oct. 8

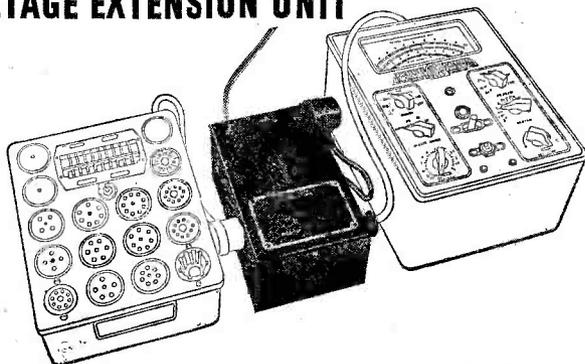
In response to popular request, we are pleased to announce the availability of the following accessories, which provide an inexpensive means of bringing the "Avo" Valve Tester completely up-to-date. Possession of these accessories will, furthermore, render it a simple matter to maintain the "Avo" Valve Tester in a condition capable of testing any new types of valves that may be produced in the future.

**ACCESSORIES for the 'AVO' VALVE TESTER**

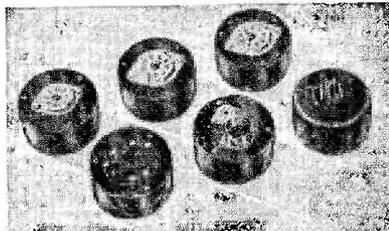
**FILAMENT VOLTAGE EXTENSION UNIT**

For providing filament voltages of 1.4 to 117 volts for testing valves recently introduced into general use and which are not covered by the original "Avo" Valve Tester.

This unit is plugged in between the Meter panel and the S.S. panel, where it may be left permanently in position regardless of whether the original or the additional heater voltages are being used.



**VALVE BASE ADAPTORS**



These Adaptors have been specially designed for plugging into the international octal socket of any "Avo" Valve Tester Panel which is fitted with a rotary selector switch. The following types, covering recently introduced valve bases not provided for on the existing Valve Panel, are now available:—

- Type No. 1 .... B7G and B8A.
- Type No. 2 .... B9G (EF50, etc.).
- Type No. 3 .... B8B (American Loctal).
- Type No. 4 .... Hivac Midget 4- and 5-pin and Midget Diode.
- Type No. 5 .... Blank.

*Other types will be made available as required, and Adaptors can also be supplied for any special valve base.*

Sole Proprietors and Manufacturers :

**AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.**  
WINDER HOUSE, DOUGLAS STREET, LONDON, S.W.1.

Telephone : VICTORIA 3404-9

VTE

# LAWRENCES

**NEW FREQUENCY METERS TYPE BC221.** Range : 125 kcs-20 mcs. Crystal calibration. These high quality laboratory type instruments may be employed as V.F.O., Freq. Standard, etc. Complete with Handbook and Spares, guaranteed perfect, £12/10/-.

**NEW RADAR T.R. GAS GAPS TYPE IB24, 10/-.** Also T.B. Type 724B, complete with cavity holder, 15/-.

**ELECTRONIC BOMB SWITCHES.** Type B2A. Contain Timing Circuit, using two 2050 gas-filled tetrodes, 4 valuable relays, etc., 16/6.

**NEW P.M. SPEAKERS** by famous makers. 5", 11/6; 6 1/2", 12/-; 8", 12/6; 10", 19/6; 12", 38/6

**NEW AMERICAN BOX KITES M357A.** Originally employed for elevating long antenna. Lift substantial weight. Cost \$9, 15/6.

**NEW M.O.P.A. TUNING UNITS, CAY47155.** 1.5-3 mcs or 800-1500 kcs. Precision dials, instrument case. Ceramic Switches. Suitable for V.F.O. conversion. State range required, 17/6.

**NEW METAL STORAGE BINS.** Ideal for storage of small parts. Nine sliding drawers. Overall size, 19" x 6" x 5", 15/-.

**NEW CARLTON 10 hy CHOKES. 100 mA.** 230 ohms, 7/9; Also special transformers for BC348, BC453 Receivers, etc. Input 230v Secs : 220-0-220v at 80 mA. 26v at 1A. 5v at 2A. Fully impregnated, 30/-.

**BC453 DYNAMOTORS.** Genuine plug-on type, 28v in, 250v out at 60 mA. Can be modified to run on 12v. Guaranteed perfect, 12/6.

**NEW BLANK RECORDING DISCS, 15.** Finest quality. Zinc base. Acetate coated. 12 discs packed in metal box, 35/-.

**E.H.T. CONDENSERS.** 7+11 mfd. 2 kV, 6/6. 1 mfd 3,500v tubular can, 4" x 1 1/2" Micamold, 3/6.

**NEW AMERICAN STAR IDENTIFICATION INSTRUMENTS.** A precision instrument complete with charts for all latitudes. Accurate in all parts of the world. Popular with Marine Officers, Astronomers, Navigators. In Leather Case, with instructions, 3/-.

**NEW RECEIVERS TYPE 76.** 3 valves, inc. frequency changer ECH35. Dust cored I.F. illuminated slow-motion dial. Two wavebands, switched. Complete with circuits, in transit case, 28/-.

**NEW BENDIX COMPASS RECEIVERS BC433G.** This renowned unit converts to a super sensitive high quality broadcast receiver. 200-1750 kcs. Fifteen 6v valves. Two R.F. stages. Dust cored coils. Complete with Control Panel BC434A, Mounting Panel FT224A, flexible tuning shaft, and handbook. In makers' cartons, £6/17/6.

**NEW AMERICAN HEADSETS TYPE HS33.** A most popular lightweight set, extremely sensitive, fitted with comfortable rubber ear cushions and leather covered headband. Recommended for Amateurs, Hospitals, Laboratories, etc., 7/6.

**AERIAL TUNING UNITS, TYPE 126.** Rotatable inductance. R.F. ammeter. Tune 2.5-13 mcs, 7/-; Also American Type BC306A, used with Tx BC375. Variometer type. Slow motion dial, 11/-.

**BENDIX RADIO COMPASS RECEIVERS.** Type MN26. Valves : 1 6L7, 2 6N7, 1 6B8, 2 6J5, 5 6K7, 1 6F6. Freq. : 150-695 kcs. 3-4.7 mcs. Converts to high performance communication receiver. Complete with circuits, and plan, 90/-.

## Examine this list of Bargains. Better Surplus at Lower Prices

**NEW MINIATURE MOTORS, Type G45.** Size, 1 1/2" x 1 3/8" x 3". Laminated field. Fitted small centrifugal speed governor, 24v, 6/6.

**NEW CLOCKWORK CONTACTOR UNITS.** Clockwork movement, of great accuracy. Incorporate electric switch closing twice a second. Useful for flashing signs, timing devices, etc., 5/6.

**NEW VALVES.** At 37/6, VCR97, 715B, 813, 100TH. At 25/-, 3EP1. At 20/-, 703A. At 17/6, 5FP7. At 10/-, 1B24, RL37. At 7/6, 6AG5, 6B4G, 6F7, 6G6G, 6K7, 6L7, 6SQ7, 6V6, 7F7, 7Y4, 9D6, 12K8, VRI50, 713A, 717A, 865, EF36, EF39, EF54, Pen46, KT33C, 9002. At 6/6, 3Q5, 5Z4 metal, 6B8, 6J5, 6K7G, 6Q7GT, 6SJ7, 1625, 5U4G, 5U4Q, RL7/ECS2, MU12/14. At 5/-, 6AC7, 65L7, 6SN7, 7V7, 12A6, 12AH7, 12SG7, 12SH7, 12SJ7, 12SL7, 12SK7, 12SR7, SP61, V960, VU133, 956, 2050, 9001, 9003. At 4/6, 2X2, 6SH7, 8D2, 12J5, 1N21, 1N22, 1N23. At 2/9, 6H6, 7193, D1, SP41. All guaranteed.

Two or more valves post free, otherwise add 6d.

**AMERICAN AMPLIFIERS TYPE AM19/APA14.** 3 6SN7, 2 6H6. Numerous parts. Black Crackle cabinet, 7" x 5" x 5". Special offer, 18/6.

**GENEMOTORS, TYPE 33.** Ideal for Car Radio. Input 6-12v. Output 200v DC, 11/-.

**NEW AMERICAN GROUND STATION MASTS.** 36 ft., telescopic, dia 5". Adjustable self-supporting tripod base. Fabricated wood construction of enormous strength. Ideal for Television or Amateur Beam Arrays. With all fittings complete, £6.

**AVIATION INSTRUMENTS & GAUGES.** Large variety, send stamp for illustrated lists.

**CATHODE RAY OSCILLOSCOPE UNITS BC929.** 3 BPI Tube. Panel controls for shift, focus, brilliance, amplitude, etc. Seven valves inc. H.V. Rectifier. Instrument case. An ideal unit for conversion to Test Scope, 70/-.

**NEW AMERICAN CLOCKWORK UNITS, BC608A.** Ten jewels, 40 hr. movement. Luminous 60 sec. dial. Incorporates electrical contact mechanism and thermostat, 25/-.

**MARCONI E.M.I. OSCILLATOR-WAVE-METERS, W1310.** 155-230 mcs. For 230v AC operation. Lab. type instrument, with individual calibration charts. Magic eye indicator. Complete, £4/5/-.

**NEW AMERICAN HYDROGRAPHIC BALLOONS.** Inflate to 6 ft. Useful for hoisting aeriels, or stratosphere and radar experiments. Complete with special Hydrogen Generators, ready for immediate employment. Only 7/6.

**NEW ACCUMULATOR HYDROMETERS.** Finest quality. Essential for efficient charging, 4/9.

**MAINS INTERFERENCE FILTERS, 5C/870.** Six screened sections, each containing dust cored choke, condenser, 4" x 4" x 2", 7/6.

**DYNAMOTORS PE94.** The most suitable type for conversion to AC Motors. Fitted 1/2" shaft. Full instructions supplied for simple modification to 1/2 h.p. 230v AC/DC motor, 18/6.

**NEW MOVING COIL HEADPHONES,** with moving coil hand mike, large comfortable earpieces. The finest obtainable, 10/6.

**NEW R.A.F. 6" LUMINOUS COMPASSES.** In teak case, suitable for yachts, etc., 14/-.

Terms: CWO. Prices include carriage. Send stamp for lists.

61 BYROM STREET, LIVERPOOL, 3.

'Phone : CENTral 4430

# LAWRENCES

## 2 useful **EDDYSTONE** Publications

### *"Making the most of your Receiver"*

This interesting booklet will prove valuable to the enthusiast who can improve his reception by following the suggestions outlined in its pages. It is newly published and contains up-to-date information on Short Wave Aerials, General Purpose Aerials, Shipboard Aerials, use of an earth, electrical interference, etc.

PPICE 1/-.

### *The **EDDYSTONE** 145 Mc/s Guide*

This booklet is in popular demand. It describes a compact and efficient converter using readily obtainable valves and a crystal-controlled transmitter capable of an excellent performance. Both units are tried and tested, and you can rely on getting really good results.

Perhaps you are a little doubtful about 2 metres? It is an easy band on which to get going, and the units described in the Eddystone 145 Mc/s Guide will not take you long to put together.

Or do you just want a receiver? The converter in the Guide is very fully described, and construction has been simplified, without sacrificing performance. Difficult metal work is avoided if you obtain the ready drilled chassis, etc. The converter can be used with any receiver which tunes to 10 Mc/s.

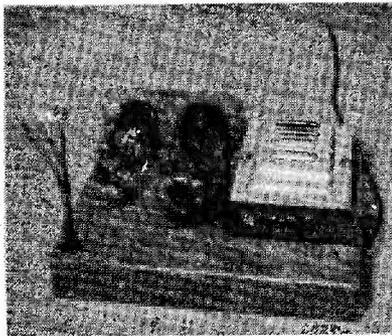
PRICE 1/6

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76 PRESTON STREET • FAVERSHAM • KENT



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template included

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We are able to undertake the alignment to maker's specification of most makes of American Communication Receivers. Enquiries to our works at Rochester.

### Now Ready—New Production STABILISED POWER PACK

for BC221 frequency meter or similar application. Input 0-110-200/250v 50 c/s. Output 150v 5-40 ma. Regulation 5/30 ma 2v—5/40 ma 4v. Type P22/A fits the battery compartment of the BC221 and is manufactured by us using new high grade components on stove enamelled aluminium chassis.

Size 8" × 6 $\frac{3}{8}$ " × 4".

# RADIO CLEARANCE LTD.

**27 TOTTENHAM COURT ROAD, W.I      MUS 9188**

### U.H.F. RECEIVERS R.1481

To clear space in our warehouse prior to rebuilding, we are offering the remainder of our stock of these well-known receivers at clearance price. Freq. range 65-86 Mc/s, 6" S.M. Dial, 10 6-3v Valves, 3 VR65s, 4 VR53, 1 VR66, 1 VR54, 1 VR57. I.F. Freq. 12 Mc/s. B.F.O. These receivers are 19" rack mounting, brand new in transit cases, with circuit diagram. £4/4/-, carriage paid.

### RECEIVERS R.U. 19

6-valve straight receiver with 3 R.F. stages, using plug-in coil packs, H.R.O. type. Valves : 3 78's, 2 77's, 1 1642. Black crackle case, 15" x 8" x 8". Provision for remote or local control. Dial cal. 0-100. Supplied new, complete with valves and 3 coil packs covering Q, 524-844 ; E, 1285-2155 ; G, 2960-4620 ; H, 3865-6265 ; £2/15/-, carriage paid.

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V.F.O. by Wilcox Gay. Type M.I. 19467A. Uses 807 electron-coupled osc., very stable, well screened. Employs 2 circuits : (a) Using cath. grid, screen, tuning 1-5 Mc/s in 6 bands. (b) Plate circuit as multiplier ; tuning 2-10 Mc/s in 3 bands. Incorporates grid choke, grid leak, grid current meter (0-10mA) for intermediate amplifier. Supplied brand new in original cartons, with installation accessories and instruction book. £5, carriage 5/-.

### POWER UNITS, TYPE 46

Power units with 1154/55. Input 200/250v 50 c/s. Outputs 220v 110mA D.C., 6-3v 13 Amp. D.C. Metal rectifiers used in both cases. In perforated metal cases. 19" x 15" x 12". £2/10/-, carriage paid.

### MAINS TRANSFORMERS

Primary, 0-110-200/250v 50 c/s. Secondaries, 230-0-230v, 100mA, 5v 2A, 6-3v 2A, C.T. 15/6.  
 Primary, 200/250v 50 c/s. Secondaries, 270-0-275v, 120mA, 4v 2A, 4v 3A. 13/6.  
 Primary, 200/250v 50 c/s. Secondaries, 460v 200mA, 210v 15mA, 6-3v 5A. 15/6.  
 Primary, 200/250v 50 c/s. Secondary, 110v. Rating, 60w. Enclosed. 18/6.  
 Auto. Trans. 230/250v 50 c/s. 100W. Unshrouded, 10/6.  
 Primary, 200/250v 50 c/s. Secondary, 360-0-360v, 220mA, 4v 8A, C.T. 4v 3A, 6-3v 3-5A. 32/6.

### SMOOTHING CHOKES

15H, 200mA 150 $\Omega$ , size 6½" x 4½" x 3½" ... .. 7/6	6H, 200mA, 100 $\Omega$ ... .. 6/-
20H, 300mA, 150 $\Omega$ , Weight 13 lb., size 7" x 5" x 5" ... .. 20/-	5H, 200mA, 90 $\Omega$ ... .. 7/6
20H, 40mA, 220 $\Omega$ ... .. 3/11	5H, 120mA, 140 $\Omega$ ... .. 5/-

### ELECTROLYTICS

8mF 170v, 1/3 ; 8mF 350v, 2/- ; 8mF 450v, 2/3 ; 8+8 450v, 3/6 ; 8+8+8 450v, 4/- ; 16mF 350v, 2/6 ; 16mF 500v, 2/9 ; 16+8mF 500v, large can, 3/6 ; 16+8 350v, 3/- ; 8+32 450v, 4/- ; 16+24+8 450v, 5/- ; 32mF 450v, large can, 2/9 ; card, 3/- ; wire ended, 3/6 ; 100mF 3v, 3d. ; 100mF 6v, 6d. ; 100mF bolt fixing 25v, 1/6 ; 25/25v, 1/3 ; 25/50v, 1/3 ; 50/50v, 1/6. Special lines : 16mF 350v, card, 1/9 ; 24mF 350v, can, 2/- ; 8+24 350v, can, 2, 6 ; 60+100 350v, can, 3/-.

### LOUDSPEAKERS, P.M.

5", less trans., 9/6, 5", with trans., 11/6 ; 6½", less trans., 11/- ; 10", with trans., 21/- All brand new boxed, with ali. speech coils. Post extra.

### TELEVISION POWER PACKS

All Chassis, 15" x 6½" x 2½", with 2 trans (5Kv 5mA, 4v 1A, and 360-0-360v as above), wired with smoothing choke, electrolytics, and rectifier holder. £4/4/-, carr. paid. Input 200/250v 50 c/s.

### R.F. UNITS

Type 24, with valves, used, good condition ... ..	8/6 plus 1/6 post
Type 25, with valves, used, good condition ... ..	10, 6 plus 1/6 post

### MODULATOR AND MIXER UNITS W6332A

Ex-Admiralty Units with 7 valves, 1-5U4G, 1-VR54, 2-6J5, 2-P61, 1-VR65. On chassis 10½" x 11½". Also 5H 200mA choke, large mains trans. (500 c/s), pots, res., conds., etc., in metal case with louvres, 10½" x 11½" x 6½", 21/- carr. paid.

### 10-VALVE RECEIVERS R28/ARCS

Covers 100-150 Mc/s. Supplied New with valves (including 4-717A's), 42/6.

### ROTARY POWER UNITS

Input 24v D.C. Output 230v A.C. 50 c/s. Rating 75 watts. In metal case, 18" x 12" x 11", with 2½" 0-250v meter on output. Auto trans., slydlock fuses, output control switch to raise or lower volts. £3/10/- carriage paid.

Type 104. 12v D.C. input, outputs 250v 6-5mA, 6-5v 2-5A. D.C. P.M. Rotary on chassis with cover, size 8½" x 4½" x 6½", 6/11 post paid.

Type 87, input 24v. Output as Type 104, 5/11 post paid.

### CERAMIC SWITCHES

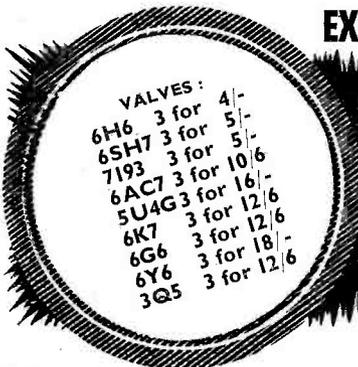
2P 3W 1 Bank ... .. 2/-	3P 3W 1 Bank ... .. 2/6
3P 3W 2 Bank ... .. 3/-	

### VIBRATOR PACKS

Input, 12v. Output, 250v 65mA, with 12v vibrator and OZ4 rectifier. Mounted on chassis 5½" x 3½" x 1½", with 8 ft. screened cable, on output. Brand New, boxed, 17/6.

Vibrator Power Units Type 173. Input 24v D.C. Output 120v. Stabilised by S.130. With 12v vib. and metal rect., in metal case, 6½" x 10½" x 3½", 11/6 post paid.

**S.M. DIALS**, as used on R.F.26, etc., less Cursor, 3/11.

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*The finest*  
**RADIO VALUES**  
*ever offered!*

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**CHOKES L.F.** 4H, 150 m/a, 3/6. 6H, 250 m/a, 5/6. 10H, 100 m/a, 6/-. U.S.A. 15H, 100 m/a, 7/6, U.S.A.

**VIBRATORS.** 12v input 250v 60 m/a with amplifier and two valves, OZ4 Rectifier and 6K6 output, 15/-.

**MICROPHONES.** Throat type carbon, 1/-. Button type carbon, 1/6. Hand carbon with press switch, 2/6.

**METERS.** 5A R.F. T.C. 2½" square, 3/6; 1A R.F. 2½" round, 3/6; 50 m/a 2½" round, 5/-; 100 m/a 2½" round, 5/-; 5-0-5 m/a 2½" round, 6/-; 14A D.C. with shunts 5" round, 15/- (basic 75 M.V.F.S.D.).

**TRANSFORMERS.** Auto mains 230/115v 100 watts, fully shrouded, 14/-. Mains 230v/250-0-250 60 m/a 5v 2A 6-3v 3A, half shrouded, 15/-.. 230v/350-0-350 100 m/a 5v 2A 6-3v 4A, half shrouded, 20/-.. 230v/300-0-300 150 m/a 5v 3A, 6-3v 7A, half shrouded, 27/6. Output type for P.P. 6L6's 15 watts 3 and 15 ohms matching, 12/6.

Small Multi-Ratio Inter-Valve Driver, open type R.C.A. with C.T. Primary. Secondary Ratio 2, 3, and 5 to 1.

**AMPLIFIERS.** R.C.A. 7-valve P.P. 6L6's Hi Fi with gram, mic input, output socket 5, 7½, 15 ohms for speaker, genuine 20 watt with on-off switch, tone and volume controls and indicator light, £17. Worth £50. 12 only.

**LOUDSPEAKERS.** 5½" Plessey with Tx, 11/-. 8" Truvox, 13/6. 10" Truvox, 19/6. 12" Truvox, 42/-.

**DIALS.** Fast and slow motion with Vernier 200-1, 4/-.

**COVERS.** First quality Egyptian cotton, approx. 7 to 10 sq. yd. area, 12/6 each. Worth 60/-.

**PUSH-BUTTON UNIT.** Five way, new, 1/6.

**PHANTOM ANTENNAE.** Type A98, 1/6.

**FANS.** ½" bore with securing bolt, 4 blade alloy. Size 4½", 2/-.

**MORSE PRACTICE SET.** Inc. buzzer and key. Wooden base, 3/-.

**CABLE.** Twin rubber cab. tyre 9/012 5A rating. 12yds., 3/6, or 25/- per 100 yd. Twin P.V.C. bell, 12yd., 1/-.

**CONDENSERS.** Bath tub types, enquiries please.

**U.S.A. OIL.** 1/6000 V.D.C. 6/-. 4/600, 4/-. 2/600, 2/6.

**BRITISH OIL.** 1/4000, 3/6. 2/4000, 5/-.

**HEADPHONES.** S.G.B. 2000 ohms, 4/-. S.G.B. 4000 ohms, 5/-. U.S.A. H.S.23 2000 ohms with rubber caps, 6/-. m/c with hand mic. and press switch, 7/-.

**ELECTROLYTIC CANS.** 25/25, 1/-, 32/350, 1/6; 8"×8"×8"400, 3/-.; 8"×16", 3/6.

**VARIABLE CONDENSERS.** .0002 two gang 2/6; .0003 three gang, 3/-.

**HYDROMETERS.** Lead acid, 1,9.

**INSULATING TAPE.** Large rolls, 1/-.

**CONTROL UNIT.** Type 108 with .5 m/a meter and 20v meter and three-pin 5A plug, etc., 10/-.

**TELE-MIC CORDS.** 5½" extension cords, 6 for 2/-.

**WELDED STEEL CHESTS.** 24"×15"×15" with two carrying handles and hasp for lock, 40/- each.

**WOODEN TOOL BOXES.** 16"×14"×12" with snap-on lids, 12/6 each.

**WOODEN TOOL CASES.** 40"×24"×20" with carrying handles and hinge lid and interior sections. High grade job. Worth £10, only 50/-. (U.S.A. Green).

**CHASSIS ONLY.** R9B receivers with host of useful T.V. spares, 12/6.

**ANTI-VIBRATION MOUNTS.** Box of four, 2/-.

**RUBBER SQUARES.** Sorbo type, 5"×5", six for 2/-.

**ENGINEERS STEEL SQUARES.** 4", 2/6.

**FLEXIBLE DRIVE.** For Command receivers BC453/4/5, 5/- each.

**D.C. ROTARY CONVERTORS.** 28v 250v 60 m/a, 6/-. 27v 60v 2-5A, 10/-.

**HEADSET ADAPTORS.** From high to low impedance or reverse, 1/- each, or 3 for 2/6.

**MODULATOR UNIT.** W6332A 7-valve, 20/-.

**RECEIVERS.** BC357 2-valve, 10/-. R.F. unit type 24, 12/6; BC.AR.429 5-valve, 30/-; R1147A 6v U.H.F., 50/-. All new.

**RELAYS.** U.S.A. gold contacts 24v 200 ohms 4 way or 2 way, 3/- each.

**ROTARY SWITCH.** On-off Yaxley type, 1/6. 10 m/ccrystal, brand new with ceramic socket, 15/-.

**BAKELITE ANGLE BANDS.** 2"×2"×19", 1/6 each.

**CORK SHEETS.** 24"×36"×⅜", 2/6 each. Astounding value.

**ZIP FASTENERS.** 8" lightweight, many uses, 1/- each, or 5/- doz.

**DOT THE EYE FASTENERS.** Wonderful value, 2/- per doz.

**PILOT'S COCKPIT LAMP HOLDER AND SHADE.** 3 for 2/6.

**CORK MATS.** 5½" dia. ½" thick, six for 2/-.

**FAMOUS MONSTER ELECTRONIC PARCELS.** "A" 40/-; "B", 20/-. See June and July adverts.

**WESTON PRODUCTS (Liverpool) LTD.**

71 Great George Street · Liverpool • Telephone ROYAL 5754/5

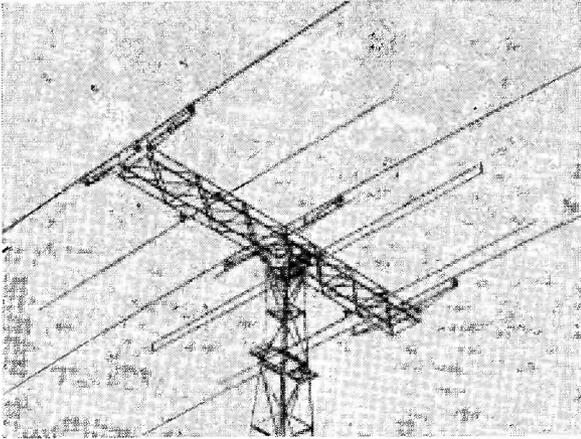
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# STAGGERING PROOF OF EFFICIENCY OF THE NEW "**DX-PANDA**" ROTARY BEAM..

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"Ask the man who  
owns one."

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We supply all  
requirements.

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CHELTENHAM RADIO SOCIETY DURING N.F.D. WORKED  
KZ5, W6's, VK's, W's, VE's, etc., USING

ONLY **5 WATTS** and the

**20-metre "DX-PANDA" ROTARY BEAM**

We install complete installations in any part of the country for commercial (V.H.F., U.H.F. and TV requirements) as well as catering for amateurs. Highly skilled technicians ensure complete satisfaction. Export orders command priority.

**PLEASE NOTE:** Owing to rapid expansion of business we have been compelled to launch a new company—as sole distributors and agents for the Panda range of productions—and this will be known as Panda Radio Co., Rochdale.

### **Special!**

---

Owing to enormous success we are offering our bargains as per July issue for a further period — get yours now — don't be disappointed. Also a few more BC-221's at £10.10s. and complete satisfaction guaranteed. Order at once. Selenium Rectifiers, 12v 1½ amp. Ideal for relays. 2 for 9/6.

PANDA RADIO CO.,

58 SCHOOL LANE, ROCHDALE, LANCs.

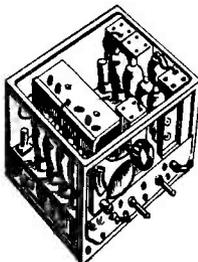
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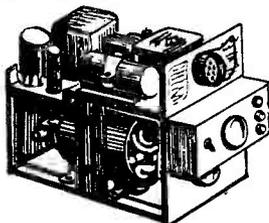
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# RADIO EXCHANGE Co. for Bargain!

9, CAULDWELL STREET, BEDFORD.



**RECEIVER TYPE 21.** A 9-valve superhet, battery operated Rx, that tunes to "10." Here, at last, is the stand-by receiver you have awaited for so long. With 2 bands—4.2/7.5 and 18/31 mc/s, it incorporates B.F.O. and crash limiter. It is the receiver unit of the famous Army W/S21. Complete with valves, for 35/6, carr. paid.



**POWER UNIT No. 19.** Designed for the W/S 19, 12v or 24v input, deliver 540v at 40 mA, 275v at 110 mA from a rotary transformer, and 275v from a vibrator pack, with OZ4 rectifier. ONLY 15/6, carr. 3/6. A few less outer cases for 12/6, carr. paid.

**AMPLIFIER 165.** A twin audio amplifier, complete with 5 valves. As constructed they consist of an EF36 driving an EBC33 and an EF36 driving push-pull EL32's, but can be easily converted. Complete with circuit. 19/6, carr. 1/6.

**RF 25's.** Perhaps the best known surplus unit, tuning from 40/50 mc/s, and with a large variety of uses. In sealed maker's cartons. ONLY 15/6, carr. 2/6.

**SLC RECEIVERS.** Something new to the surplus market! A complete radar receiver, tuning to 204 mc/s, with tunable oscillator, four IF stages, at 11.5 mc/s (staggered), and all output circuits. They have 2 RL7's (RF) L.O., diode mixer, 7 SP61's, 2 rectifiers, 1 pen 45, 2 triodes and 6 EA50's—a total of 20 valves! Converts for TV or 144.

OUR PRICE only 30/6, carr. paid.

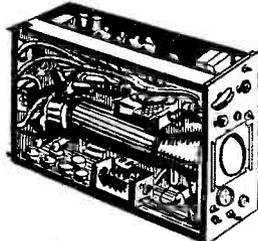
**RECEIVER No. 25.** Covering 4.3-6.7 mc/s, and has a host of useful parts—such as a pair of 460 kc/s IF's, mike and output transformers, dozens of resistors and condensers, plus 6 mains-operated valves. A limited number available for 22/6, carriage paid.

**TELEPHONES D MK V.** Now that the dark nights are approaching, and ham activity is reawakening after the summer holidays, it is time to think about the shack: save the XYL's voice and fit a telephone to the house. Complete with bell, buzzer, key, and standard PO type handset! ONLY 25/6, carr. 2/6.

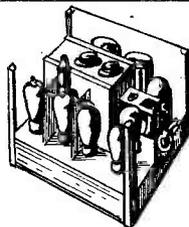
**WIRE RECORDERS.** Western Electric Wire Recorders, as illustrated last month. These superb instruments are equally useful for speech or music and will find a variety of applications in or out of the shack.

The main unit, with a four-stage amplifier which is used for recording, playing-back or as an ordinary PA unit, and has negative feed-back to ensure quality, also contains the erase oscillator, which applies an AC bias during recording, and the very robust motor. The detachable head, using machine cut gears throughout, contains automatic switching and sufficient wire for approx. 40 mins. top quality recording.

They are designed for 115v operation, but we supply a step-down transformer, and microphone. Complete, £45.



**INDICATOR 198.** The ideal unit for building an oscilloscope or modulation monitor. It has a 3" short persistence CRT, 4 VR65's, 1 VR54, 3 EA50's and a veritable goldmine of resistors, condensers, pots, switches, etc. Brand new, in sealed maker's cartons, 35/6, carr. 5/6. A few, new, but store-soiled, for 30/6, carr. paid.



**TR9 RECEIVER.** A battery-operated, 6-valve receiver, covering 6/9 mc/s. Ideal for standby, converts for other frequencies, and no alignment difficulties as it is T.R.F. Complete with 6 valves. OUR PRICE 15/6, carr. paid.

**PU TYPE 4.** A 12v input power unit, giving 300v at 75/100 mA with metal rectifiers, electrolytics, vibrator, vibrator transformer, chokes, etc.; attractive panel, and useful size. Store soiled, to clear, 7/6, carr. 2/6.

**VARIOMETERS.** The easiest way of tuning your antenna, designed for the W/S No. 19, they contain coils, Westectors, pots, etc. ONLY 2/6, carr. 1/6.

**STILL AVAILABLE.** Bargain parcels at 30/6; keys at 2/6; meters at 3/6; phones at 2/6 and 5/6.

All goods sold as used unless otherwise stated.

**RADIO EXCHANGE CO.**

9 CAULDWELL STREET,  
BEDFORD. Phone: 5568

# SAMSONS SURPLUS STORES

**M.C.R.I. Receivers.** A limited number only available. Frequency range 20-3,000 metres. Complete with two batteries, power supply for 95-250v AC/DC, earphones, aerial, earth, etc.. Brand new in sealed maker's containers. £10/10/- Carriage 3/-.

**Nife Batteries.** 1.4v. Dim. 6" x 3" x 1". 7/6. Post 6d.

**12v 16 A.H. Batteries,** by Pritchett & Gold. Brand new in fine oak containers, 6½" x 8½" x 8½". 25/- Post 2/6.

**2v 16 A.H. Batteries,** made by Pritchett & Gold. Brand new. 8/6. Post 1/-.

**E.H.T. Mains Transformers.** Primary 115v. Tapped secondary 0-1,500, 2,000v, 6.3v 4a, 2.5v 2a. Brand new. 15/- Post 9d.

**Filament Transformers.** 6.3v 15a, 17/6. Post 9d.

**Miniature Mains Transformers.** Pri. 200-250v. Sec. 250v 20ma., 6.3v. Dim. 3¼" x 2" x 2½". 17/6. Post 9d.

**Varley Miniature Transformers.** 250v Prim. Sec. 8v 12v 3.3a, 6v 5a. 15/- Post 9d

**Power Packs** for the M.C.R.I. receivers. Input 55-250v AC/DC. Output 90v and 7.5v. Brand new. 39/6. Post 1/6.

**Master Voltmeters.** 0-20v. Made by Metro-Vic. 6" mirrored scale. Brand new. 17/6. Post 1/-.

**"Evershed" Bond Testers.** 0-0.1 ohms. Brand new. 17/6. Post 1/-.

**V.C.R. 97 Tubes.** Brand new in maker's case. 35/- Carriage 3/6.

**Heavy Duty Mains Transformers.** Pri. 200-250v. Sec. 12v 75a. Ideal for electro plating. £4/10/- Carriage 5/-.

**C.R. Unit Type 162C.** Includes V.C.R. 517, V.C.R. 139, 3 VR65s, 1 VR52, 4 diodes, condensers, resistors and many other useful components. Brand new, packed in maker's crates. £3/17/6. Carriage 5/-.

**Ken-Rad IR5s.** Brand new and boxed, 7/6. 174s. Brand new, 6/- Post 6d.

**Mine Detector Amplifiers.** Includes 3 IT4 valves and holders, spring clips, condensers, resistors, etc. Brand new. 19/6. Post 1/-.

169/171 EDGWARE ROAD, LONDON, W.2. Tel.: PAD. 7851

125 TOTTENHAM CT. RD., LONDON, W.1 Tel.: EUS. 4982

All orders and enquiries to our Edgware Road branch, please.

## Benson's Better Bargains

**TRANSFORMERS:** 610-0-610v 185 ma, 20/-; 6v, 1a (2), 7v 5a, 4v 6a, 15/-; Reversible 230v to 15-10-5-0-195-215-235v 2½a, 20/-; 0/260-300-340v 120 ma, 10/-; 48v ¼a, 8/-; 20v 20 ma with rect., 5/6; 20v, 3a, 7/6. Above have std. input 50c.

**RCA.** Fully shrouded. Input 190/250v, 50c. Output 400-350-0-350-400 200 ma, 6.3v 6a, 5v 3a, 37/6.

**DRIVER/MOD.** CT Primary, Twin Sec., each 1:1.74. Impedance P500/Ss3K. 2 KV. insulation, 10/- THE PAIR, 40/-, boxed. **POWER PACKS** Input 190/250v. Output 350v 120 ma, 12.6v 3a (less rect.), 35/-.

**VIBRATOR PACKS,** DC 6v to 190v 80 ma and 6v, 22/6. 12v to 250v 120 ma, ex No. 19 Set, 20/- BC453/4/5 3-gang variables, 3/6; Dynamotors, 7/6. Set 3 coils, 3/6; set 3 IFTs, 5/- (454/5 ONLY). Potted Condensers, 1/- (state types). BC456: Mod. Trans., 3/6; Chokey, 2/- Dynamotors, 12/6.

**DINGHY TX HAND GENERATORS.** Output DC 300v and 6v or Input 6v, output 300v, 15/-.

**OIL-FILLED CONDENSERS,** .1 2.5Kv, 3/6, .1 600v, 9d., .5 800v, 1/6 (all tub. bakelite). Metal 1 mfd 1.5 kv, 1/6, 4 mfd 1 kv, 4/6, 12 mfd 750 vw, 5/6. **DIODES IN22, 3/-.**

**MURHEAD SM DRIVE,** 4/6. **XTALS,** 5.1 to 6.78, 7.55 to 8.9 mcs, 5/6, 8.09, 7/6. 100 kcs, ½ in., 15/- Miniatures 2.04, 2.115, 3/6 pr.

**144 mcs CONVERTERS** is Valves CV66, EF54 (2), EC52, with circ., 20/-.

**RF UNITS,** 24, 25, 15/-; 26, 35/-.

**METAL RECTIFIERS** 600v 30ma, 230v 80ma, HW, each 5/-; 280v 100ma CT, 6/6; F.W. 230v ¼a, 7/6; 48v 2½a, 15/6; 15v 5a, 17/6. 12v 6a, 22/6.

12v 1¼a, 8/- 48v 1a, 5/6, 70v ¼a, 4/- **CHOKES** 1 kv. w. 350ma 7H, 15/-; 500 vw 250ma 7H, 10/-; 300 ohms 100ma, 4/-; 100 ohms 200 ma, 7/-.

**POTENTIOMETERS.** Ceramic 1k ¼a, 5/6, w/w 20k 4w, 3/-, ¼k, 1/9; Carbon ½m 100k 50k, 1/3. **VITREOUS RESISTORS** 35k 35w, 30k 25w 25k 15w, 400 ohms 20w, each 1/-.

**BULGIN.** Twin fuseholders, 1/-; Ruby Indicators 1/3; Toggles SP, 1/9; Mains (chassis), plug and socket, 2-pin 5a, 1/3. Toggles DP, 1/3.

**VAR. CONDENSERS.** Spindled, ceramic miniatures, 100 pf, 2/-; 75 pf D.E., 1/6; 75 pf twin, 2/6; 160 pf 3-gang, 5/- Knobs, various, 6/- doz.

**EDDYSTONE** 60 pf, linear, 2/- **SPINDLE COUPLERS** std. ½ in., 9d., Epicyclic drives SM, 1/3.

**CABLE.** Screened 6-core with two inside pairs screened 9d. yd. Screened Twin, heavy 9d. yd **PYE PLUGS** (2) on 1 yd. coax., 1/6.

**CREED** Keying relays, high-speed, .5 ma, 12/6 **METERS** MC 0/50ma, 6/-; 0/2½a, 7/6; 0/1a, 5/-; 0/30a, 7/6; 0/100 ma, 6/-; 0/500 µA 5/-.

**BC348.** Trimmer Kits, 3/6; A1 Knobs, 9d. Bendix Ant. Relays DPDT, 5/-; Slydlock Fuses 5a, 1/- Resistors, new, 25 values, 50 asstd., 5/6.

**VALVES—5R4GY, 6SN7, 6SL7, EF50, 12SK7, ARP12, AR8, EF39, 12SK7, 12SG7, 12AH7, 9003, 9002, EF36, 6K7M, EBC33, 3B24, at 5/-; 2051, 6SH7, SP61, SP41, 12C8 at 3/6; 6H6, EA50, EB34, 7193, CV6 at 3/-; 5U4G, 5Z4M, 6X5, VR150/30, 12K8, 6B8M, 6SC7M, 6SA7, 6AC7, 6J7, 6S7J, VU133 at 6/6; 6V6G, 6L7M, ECH35, 6K8M, 6F7, 807, EC52, CV66, EF54 at 7/6.**

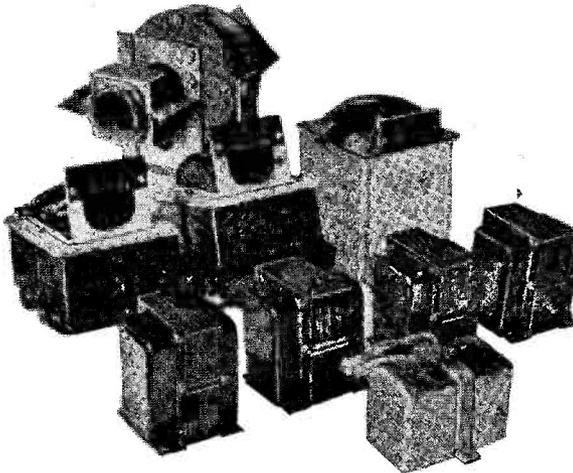
**CALLERS—**Bendix 3 types, TR1196 Rx, No. 21 Set Rx, TR1131 Power Packs, etc.

Terms: C.W.O. NO C.O.D. Carr. Paid. S.A.E. enquiries please.

W.A.BENSON, 308 RATHBONERD., LIVERPOOL 13

STONEYCROFT  
1604

# MAGNETIC T.V. PARTS



We have available, at very much below the standard prices, all the essential parts for making a magnetic type Television or for converting your bin. green picture into a white picture. Actually these parts were made by a famous company for a smaller Television manufacturer, who unfortunately was under-capitalized, and could not make a success of his business. This is the reason why the parts are so cheap, for they are definitely superior to most that are on offer to-day.

The three main parts are: (a) The tube assembly which consists of a frame on which are mounted the focus coil and the line and frame deflection coils. This is suitable for a 9, 10 or 12in. magnetic Cathode Ray Tube. (b) The E.H.T. Transformer to give 4 kV and (c) the very efficient line output transformer. The price for this set of three parts is £3 10s. 0d, and we will forward without extra charge the circuit diagram of the Television which was originally designed around these parts. The interesting feature about this Television is that it uses mostly easily obtained H.F. pentodes. We will supply the circuit data separately at 2/6 per copy. Of course you don't have to stick to the circuit as supplied; any conventional circuit will do equally well.

If you are starting from scratch, the other parts for the original circuit are available as per the above illustration, and at similar keen prices:

- Fully shrouded chokes 9 henry 120 mA—2 required. Price 7/6 each.
- Fully shrouded chokes 17 henry 80 mA—2 required. Price 8/6 each.
- Mains Transformer—350-0-350 at 120 mA, 4v at 10 amp, 4v at 2 amp—1 required Price 17/6.
- Mains Transformer—400-0-400 at 80 mA, 4v at 6 amp, 4v at 2 amp, 2v at 2 amp—1 required. Price 15/-.

We will supply any of the above parts separately at prices as shown or you can have the complete outfit of the nine parts as illustrated for £6 10s. 0d., carriage paid

## THIS MONTH'S SNIP



American receiver data published during the war by the Champion Electric Company. These manuals were originally sold at 12/6 each, and even at that they were considered good value for money, for they really comprise volumes of service sheets. They give circuit diagrams, component values, alignment data, and practical layouts of all the popular American receivers which have been imported to this country. Contents are as follows:—

- Vol. 1—Spartan-Emerson.
- 2—Crosley-Belmont Pt. 1.
- 3—Crosley-Belmont Pt. 2.
- 4—R.C.A. Victor-Go-Admiral.
- 5—Emerson (Part 2).
- 6—Stewart-Warner-Fada.

We have only a limited number of these sets of volumes, all are ready for immediate despatch, or for callers, and the price is £17/6 for the library of 6 volumes. Don't miss this tremendous bargain. The manuals will undoubtedly earn their cost many times over.

# SALE OF RADIO SPARES

**MAINS TRANSFORMER. "WODEN"** made for the "AR88"—potted—fully shrouded and impregnated, fitted primary screen. 280-0-280 at 150 mA, 6.3v at 10 amp and 5v at 3 amp. Primary suitable for 50 cycle mains, 110-250v, 27/8. List No. 01.

**MAINS TRANSFORMER. "PARMEKO"** half shrouded drop through type, 350-0-350 at 80 mA, 6.3v at 4 amp, 5v at 3 amp, primary tapped for 200-240, fitted primary screen and impregnated, 16/8. List No. PF2.

**MAINS TRANSFORMER. 260-0-260** at 60/70 mA, 6.3v a' 3 amp, 5v at 2 amp otherwise as PF2 above, 13/9. Order List No. PF3.

**MAINS TRANSFORMER. 260-0-260** at 60-70 mA, 4v at 4 amp, 4v at 2 amp otherwise as PF2, 13/9. Order List No. PF4.

**TUNING CONDENSER.** Standard size 2-gang-0005 long (2" spindle) "PLESSEY," 3/6. Order List No. 06.

**AMPHENOL INTERNATIONAL** octa valve holder, 6d. each. Order List No. PE10.

**MIDGET TUNING CONDENSER.** 2-gang -00035 fitted with trimmers, and complete with Perspex dust cover. These condensers made by "PLESSEY" are of the type used for tuning personnel receivers, 6/6, plus 8d. postage. Order List No. PF6.

**4-GANG TUNING CONDENSERS.** -0005 each section—fitted trimmers—ceramic insulation. These are complete in a very useful chassis, and are fitted with a drive. Government surplus equipment but new and perfect, 2/9, plus 1/3 postage, case of 6 units, 17/6, carriage paid. Order List No. PF7.

**3 1/2" P.M. SPEAKER "ROLA,"** less output transformer, 3/9. Order List No. PF11.

**5" P.M. SPEAKER "ROLA,"** fitted standard O.P. transformer, 11/3. Order List No. PE13.

**12" P.M. SPEAKER "TRUVOX,"** 42/6. Order List No. B88.

### ELECTROLYTIC CONDENSERS

8 mfd. 350v	1/6
16 mfd. 350v	1/11
32 mfd. 350v	1/11
20 x 25 mfd. 200v	3/11
8 mfd. 150v	1/3
25 mfd. 25v	1/-
25 mfd. 50v	1/6
50 mfd. 12v	10d.
10 mfd. 25v	10d.
2 mfd. 450v	1/-
4 mfd. 450v	1/3
8 mfd. 450v	1/11
16 mfd. 450v	2/8
8 x 8 mfd. 450v	3/4
8 x 16 mfd. 450v	3/4
16 x 16 mfd. 450v	3/9
16 x 8 x 2 1/2 mfd.	4/9
8 mfd. 600v BR.850	2/6
8 mfd. 600v BR.1650	3/6

Send cash with order or request C.O.D. Orders over £2 are post free—we are open until 5 p.m. Sats. List available on request—it helps us if you can quote our Bin No.

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Windmill Hill,  
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The type JCF200 unit illustrated above is representative of the wide range of vacuum tube units available for low and medium frequencies.

### FOR FREQUENCY SUB-STANDARDS

Type JCF200, 100 KC/S

Available from stock adjusted to  $\pm 0.01\%$ . Higher accuracies supplied to special order.

#### FEATURES

- Low temperature co-efficient—less than 2 in  $10^\circ$  per  $^\circ\text{C}$ .
- Patented nodal suspension.
- Mounted in vacuum; performance independent of climatic conditions.
- Exceptionally high Q value.
- High stability.
- Small size,  $3 \times \frac{1}{2}$ " overall excluding pins.
- Fits standard miniature deaf aid valve socket.

Price £2-15-0

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LONDON, W.1. Phone : MUSEum 2453, 4539

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#### A.D.S. QUALITY AMPLIFIER

Full constructional details of our 4 $\frac{1}{2}$ -watt inexpensive quality amplifier are now available, including circuit diagram and layout pictures. Post free 9d.  
Complete set of components for above amplifier, including cabinet, chassis, knobs, etc. Carriage free, only £6 10 0  
Complete amplifier constructed and tested. Carriage free, only £9 9 0

#### WILLIAMSON AMPLIFIER

Main transformer, 425-0-425V 200mA, 6.3v 4z : 6.3v 2a, 5v 3a. Pri. 210, 230, 250v 50 cps. Size  $4 \times 4 \frac{1}{2} \times 4 \frac{1}{2}$ " high. (Postage 1/6). £2 17 6  
Choke, 10 Hy 150mA. Size  $2 \frac{1}{2} \times 3 \frac{1}{4} \times 3 \frac{1}{4}$ " high. Fully shrouded (Postage 1/-) £1 5 0  
Choke, 30 Hy 40 mA. Size  $2 \frac{1}{2} \times 1 \frac{1}{4} \times 2 \frac{1}{4}$ " high. (Postage 1/-) 13 6

#### ACCESSORY EQUIPMENT: CONNOISSEUR PICK-UP

A high impedance pick-up giving approximately 0-5v at the secondary of the special coupling transformer.  
Level frequency response from 50 to 1000 cps. Below 50 cps. a rising frequency response gives a bass resonance near 25 cps. Above 1000 cps. the output falls steadily, giving a loss of approximately 5db at 8500 cps and 9db at 12000 cps.  
Price complete with transformer (inc. P.T.) .. £4 10 5  
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#### GOLDRING 121 PICK-UP

An attractive lightweight pick-up requiring no transformer. Price, complete with sapphire point (inc. P.T.) .. £3 5 0  
Price, complete without sapphire point (inc. P.T.) .. £2 10 6  
(Postage 1/-)

#### WHARFEDALE 10" GOLDEN

3 or 15 ohms speech coil. Frequency response 40-12000 cps. Cone resonance average 80 cps. Maximum input power 8 watts.  
Price £3 15 0  
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#### NEEDLES (all prices include P.T.)

Connoisseur miniature needles, 20 per packet	2 10
Columbia Chrome (normal size), 10 per packet	1 9½
Columbia 99 Miniature needles, 10 per packet	3 7

(Post free)

#### TELEVISION

Our comprehensive television catalogue is now available, post free 6d. Contains itemised lists of "Wireless World" and "Electronic Engineerin'" Televisors. Please state if Birmingham area supplement is required.

Set of four black knobs with gold lettering for Electronic Televisor .. .. .	(Postage 6d.)	5 0
Bel Sound television coils to original specifications, all boxed and individually marked.		
Electronic Engineering (Birmingham or London) ..		15 0
Wireless World TRF (London only) .. .. .		£2 8 6
Wireless World Superbet (Birmingham or London) ..		£2 12 6
	(Postage 9d.)	
Seanco Television components for all types of Televisors.		
5 kv EHT with 2-0-2v rectifier heater. Fully shrouded.		£3 0 0
	(Postage 1/6)	
As above, 4 kv .. .. .	(Postage 1/6)	£2 8 0
Line output transformer (Elect. Eng. spec.) .. .. .	(Postage 1/3)	£1 5 6
Line and frame scanning coil (Elect. Eng. spec.) .. .. .	(Postage 9d.)	£1 5 6
Focus Coil (Elect. Eng. spec.) .. .. .	(Postage 1/6)	£1 10 0
Focus coil ST28. Special low current type for 12" CRT. D.C. resistance 10,000 ohms, max. D.C. 30mA, 25,000 turns	(Postage 1/6)	£1 17 6
Focus Coil ST18, series type. Resistance 300 ohms, maximum D.C. 150mA .. .. .	(Postage 1/6)	£1 7 6

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10 YORKSHIRE STREET, BURNLEY

Phone 4924

We make below a special offer from our extensive stock of over 20,000 Xtals. All these Xtals are by leading American manufacturers, R.C.A., Valpey, Billey, etc., and are unconditionally guaranteed by us except against mis-use. An output of upwards of 4 watts is readily available, and they can be used straight Pen. or in trieter. All holders are half-inch pin spacing, standard U.S. FT4 type, except the 80-metre band, which are BC 610 type fitting, with three-quarter-inch pin spacing.

**144 Mc.** To popularise the H.F. end we make the following special offer for Sept. only. 8075 to 8110, your choice of freq., 8/-. Normal 8000 to 8110 kc., your choice freq., incl. 8 mc band edge marker, 15/- 6000 to 6083, 9000 to 9125 kc., 15/-.

**21 Mc Band.** Are you ready for this all-the-year-round band? 5 Mc to Quad. 5250 to 5362 Kc, your choice freq., 12/6. Special offer for Sept. only, your choice of either 5327.5 or 5295 Kc, 7/6.

**7 Mc BAND.** 7000 to 7300 Kc, your choice of freq., 12/6. Special offer of fone band, your choice of 7200, 7225, 7250, 7275, 7300 Kc, 7/6.

**28 Mc BAND.** Triple. 9333 to 10 Mc, your choice freq., 15/-. Quad. 7 Mc to 7500 Kc, your choice freq., 12/6. Special offer for fone band 7200 Kc and up in steps of 25 Kc to 7500 Kc, 7/6.

**3.5 Mc BAND.** 3500 to 3800 Kc, your choice freq., 15/-.

I.F.'s, etc., 290/400 Kc, 800/1040 Kc, with the exception of 1000 Kc dead, any freq., 15/-.

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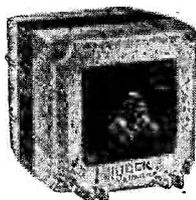
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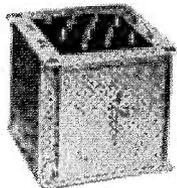
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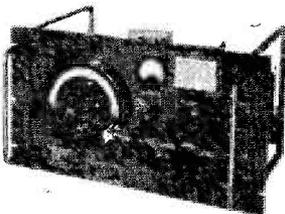
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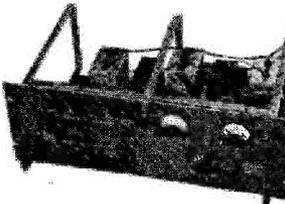
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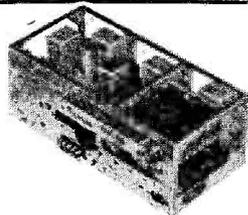
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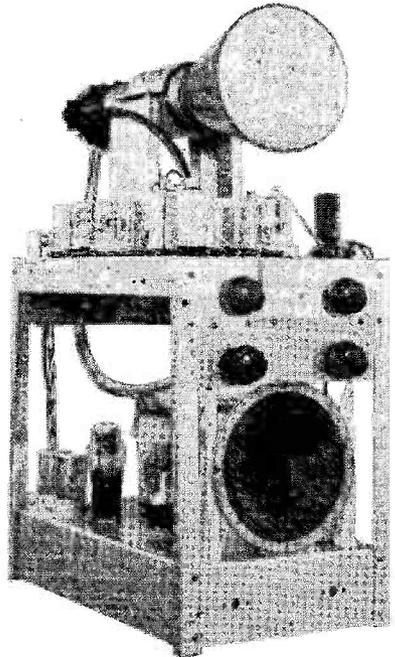
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# SHORT WAVE MAGAZINE

FOR THE RADIO AMATEUR & AMATEUR RADIO

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## EDITORIAL

## Competition

In this space two years ago, we discussed the competitive element in Amateur Radio, with particular reference to the working of DX as its expression.

It can be argued that competition would be unnecessary—and even undesirable—in that perfect state to which, but for the frailties of human nature, we might already have succeeded. For two thousand years of recorded history, clever men have been trying to alter human nature. For our present purpose, it is therefore reasonable to suppose that the competitive element will remain one of the dominant factors in the practice of Amateur Radio.

There are those who say that this competitive spirit should be discouraged; and they can advance many good reasons. But on analysis, the argument is found to mean that competition is a bad thing because it sets a successful individual above his fellows. Whereas, by what is said to be the new philosophy, we should all be cast in the same dull-grey mould of mediocrity—everybody must be “average” and draw the same rate for the job.

But as in all other spheres of human endeavour, in Amateur Radio it is competition which is the spur to progress. It cannot be gainsaid that the great technological advances of recent years were vastly accelerated by the pressure of war (another form of competition), producing results in three years which would not otherwise have been achieved in thirty or more.

Focusing this argument on our own particular and comparatively restricted field, it can be shown that the competitive element must be encouraged in the broad interests of the progress of Amateur Radio. Thus, the practice of the art will be improved and developed to the ultimate benefit of all concerned—including those who have no particular interest in competitive activity for its own sake.

*Austin Fosgh  
G6FD*

---

*This is the first of a series of fully detailed constructional articles, using only branded parts which are readily available, in designs representative of the best in modern British amateur practice. It is intended that these equipments should be built exactly as described, and each has been carefully prototyped for that purpose. Small variations in type or make of components are of course permissible, but the electrical values should be closely followed. All the designs are to MAGAZINE specification and the range of units to be covered in the series has been selected as being of immediate practical utility and application. Apart from the actual use to which the various pieces of apparatus can be put, it is hoped that the descriptive treatment will be helpful and instructive to all interested in building their own equipment.—Ed.*

---

## Top Band Cabinet Transmitter

Self-Contained, Phone/CW Operation, Universal Aerial  
Coupler, Mains or Battery Working, Fixed Station or Portable Use

By J. N. WALKER (G5JU)

---

THE requirement which led to the construction of this transmitter was the need for equipment which could be used independently of the normal power supplies. When carrying out tests on VHF, the low voltage power units are supplying the 145 mc transmitter (and possibly the 435 mc stages as well) and to change over to a "contact" frequency occupied too much time, particularly as a change back was usually necessary. Also, during such tests, the modulator is connected to other equipment and it is inconvenient to switch it to the "contact" frequency transmitter. In any case, in view of the low power permitted, it is more satisfactory to have an entirely separate transmitter for 1.7 mc.

Since portable work on 435 mc is envisaged at G5JU, calling equally for "contact" facilities, the 1.7 mc transmitter has been designed for quick conversion to battery operation, without internal modification. Obviously, the design is also good for purely 1.7 mc portable work, irrespective of the VHF angle.

From the point of view of others, this transmitter possesses a number of advantages. It is compact, self contained, totally enclosed and reasonably good looking. It should therefore appeal to the amateur compelled to operate in restricted surroundings, such as "digs" or possibly in living-room accommodation. The transmitter is readily transportable and convenient for use at either of the alternative addresses permitted to a /A licence holder.

Although not primarily intended as such, there is also the idea that the transmitter would make a very tidy VFO or crystal driver unit,

with the advantage of being entirely self contained. The only alteration necessary would be to omit the aerial tuning circuit and take the output *via* a co-axial socket from the link winding on the PA tank coil.

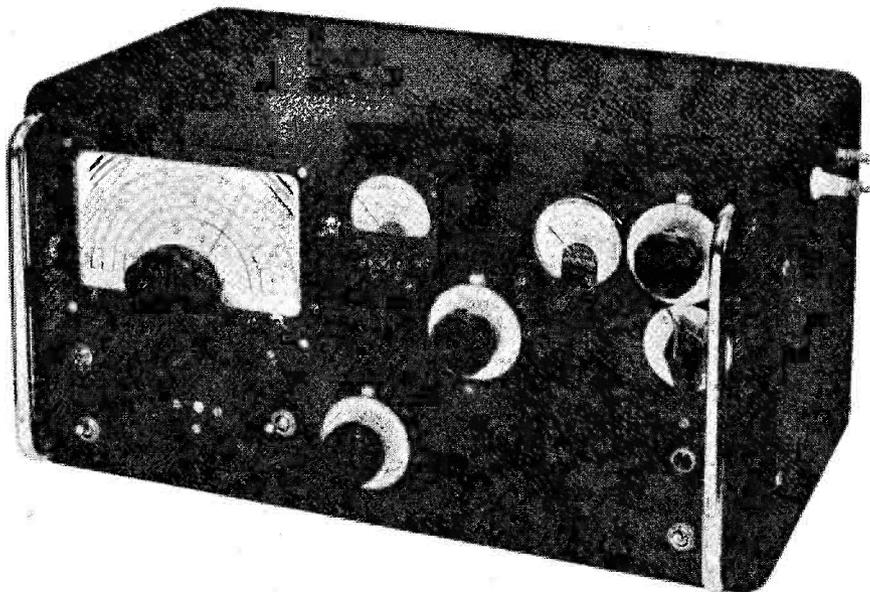
### Circuit Features

The complete circuit diagram of the transmitter is given in Fig. 1. The benefits of crystal control need no elaboration—suffice to say that, in a general way, crystal control should always be used when circumstances permit. Provision is therefore made for the use of a standard pattern crystal. However, it is also desirable to be in a position to choose an interference-free channel, to enable reliable contact to be maintained when the band is busy—with amateurs, trawlers or BBC harmonics!

The first valve—an Osram L63 triode—is used in a relatively simple yet efficient VFO circuit, which has been found excellent on all counts. The large dial is calibrated directly in frequency.

The fundamental frequency of the VFO is in the region of 900 kc, hence stability is good and a stabilised HT supply can be dispensed with, which is fortunate, since a stabiliser valve would take up extra space and consume additional current.

The choice of the second valve lay between the ubiquitous 6V6 and the Mullard EF54. Only a small RF output is required and the EF54 serves the purpose well. It is the more economical of the two, both as regards HT and LT consumption and functions with good efficiency in low power transmitting circuits, whilst the screening can, enclosing the glass



The Top Band Cabinet Transmitter complete

envelope is a useful feature. The EF54 is operated either as a doubler following the VFO or as a crystal oscillator on a fundamental frequency within the 1.7 mc band.

The power amplifier is an Osram KT8c, capable of good efficiency at a comparatively low anode voltage, and requiring but little drive. The tank coil is link-coupled to an aerial coil, the latter being provided with tapping points. The aerial circuit is arranged to work with different types of aerial, from very long to very short.

Fixed coils are employed in the earlier circuits but the tank and aerial coils are of the plug-in type, to permit occasional operation on the 3.5 mc band, with the KT8 functioning as a power doubler.

The ability to use telephony is an asset and a simple type of modulator is included. It consists of a single 6V6 valve, run at a reduced screen voltage (to reduce anode current and increase gain). The voltage developed across the audio frequency choke in the anode circuit of this valve is applied to the screen only of the KT8 and a fair degree of modulation is obtained, without disturbance of other adjustments. The high frequency response is restricted by the combination of R13 and C17 and this is an advantage. Energisation for the carbon microphone is derived from the voltage drop across the cathode resistor (R15) of the 6V6 valve, taken through a decoupling

network. The modulator stage is brought in and out of operation by the simple expedient of switching on and off the LT supply to the valve—a system also employed in the VFO circuit.

Two meters are fitted on the front panel, one for measuring the anode current of the KT8, the other for indicating maximum RF current in the earth side of the aerial circuit. As explained later, these two meters are sufficient for making all adjustments.

The power supply is of the condenser-input type, using reliable components running well within their ratings. The power connections are made *via* an octal socket at the rear. For AC operation, a plug wired as indicated is inserted, whilst for battery operation supplies are fed in through another plug. The standby/transmit switch is in series with the HT positive lead, so that it functions on either internal or external power supplies. If dual-purpose operation is not required, the special provisions for battery operation can be omitted, in which case the standby switch should be wired between the transformer HT secondary tap and chassis. The resistor R21 is there simply to ensure discharge of the smoothing condensers.

All controls, with the exception of the mains on/off switch, are situated on the front panel and are readily accessible. Aerial and earth connections are brought out to the side

of the cabinet—the lift-up lid in the latter makes it possible to adjust the aerial tapping clip without difficulty.

**Snags!**

It is perhaps unusual in an article such as this to find anything about snags encountered when building the equipment! It may be refreshing (and it should prove instructive) if the minor difficulties which arose are outlined. One would hardly expect snags to arise in a relatively straightforward 1.7 mc transmitter, but a few did crop up.

The VFO gave no trouble—none was expected as the design is one which experience has shown to be completely reliable. The writer prefers it to the so-called Clapp oscillator, the RF output of which is liable to vary greatly, with the result that the following valve is either over- or under-driven. The amplitude of oscillation in the present instance is constant over the whole range and the frequency stability is excellent.

The second valve did give trouble. It had been decided to employ screen grid keying—a system normally favoured at G5JU, as it usually entails breaking only a small current and voltage and gives a clean note, with the minimum of filter. However, the EF54, when being driven by the VFO, gave an appreciable

RF output with the key up (zero screen volts). This effect has been experienced with other valves and the way to prevent it is to increase the standing negative bias on the control grid. Since, with the screen grid at zero volts, the valve is passing only a small current, increasing the cathode resistor does not help much and it is necessary to connect a resistor between the HT positive line and cathode, so that several volts are developed across the cathode resistor, irrespective of the anode current. This was done and keying with the VFO in use was excellent—clean and with complete cut-off.

The EF54 possesses a high mutual conductance and should therefore make a good crystal oscillator. But it just could not be persuaded to oscillate! The reason, of course, was that the higher-than-normal bias had reduced the mutual conductance to a low figure (the EF54 has a short grid base). With the bias cut out, the valve oscillated well and keyed with only a small residual oscillation. But the VFO trouble had returned.

The only answer was to key the cathode of the EF54 and provide an effective key click filter. As Fig. 1 shows, this has been done and the stage performs well either as doubler or oscillator. Bias is derived almost entirely from the grid leak R4.

The components associated with V2 are below the chassis and well screened from the

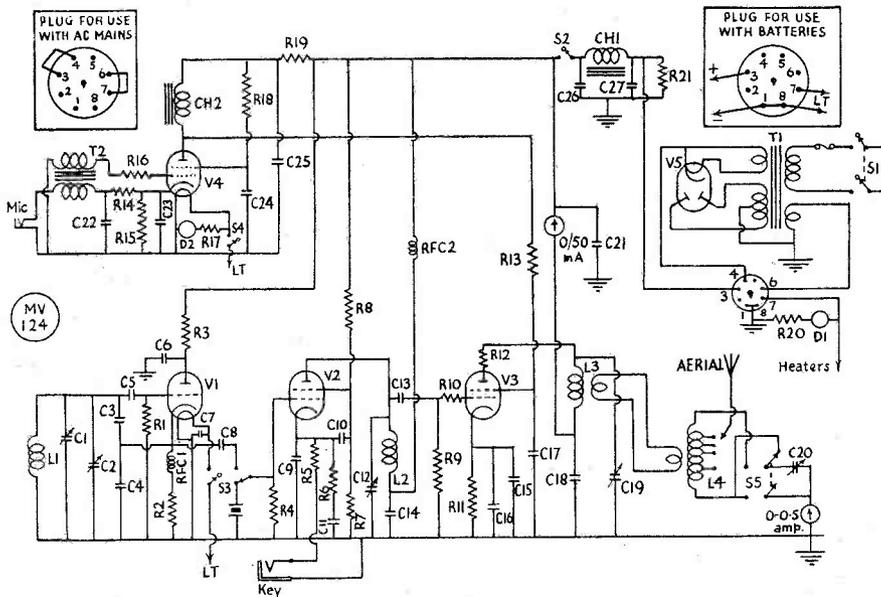


Fig. 1. Circuit complete of the self-contained 1.7 mc CW/Phone transmitter. It can be operated on 3.5 mc, and would make an excellent driver unit for a subsequent full-power installation.



end of the spindle to permit screwdriver adjustment.

The doubler/crystal oscillator operates on the same frequency as the PA and all associated components, with the exception of the crystal, are fitted below the chassis. The metal screen measures 4 in. long by 3 1/2 in. high and is bolted to the top deck in the position shown in the drawing.

Tuning condensers C12 and C19 are fixed directly to the panel without insulation but the aerial tuning condenser C20 must be insulated, otherwise the thermocouple meter will be short-circuited. The voltage present at this point is very low and the quality of the insulating material is of little importance. Conveniently, it happens that the indicating lamp holders are provided with paxolin washers, for use when high insulation of the holder is called for. In the present case it is not, and the washers are just right for insulating C20, the mounting hole being made 1/2 in. diameter.

The construction of the modulator section calls for little comment. The microphone transformer is mounted on the rear chassis wall

and the other components grouped around the V4 valveholder, using tag strips where found necessary. It should be noted that the whole of the transformer primary (the two blue wires) is utilised—the yellow wire is cut off short. Originally it was thought that an audio gain control might be necessary but tests show that it can be dispensed with.

The mains transformer and the chokes should be left to the last. As can be seen from the photograph, the connections are brought out below the chassis, which makes for tidy wiring, although rather more work on the steel chassis is involved in making the necessary holes. The smoothing condensers are contained in a single aluminium can, of the latest T.C.C. plug-in type, occupying a minimum of space and making replacement quick and easy in the event of a breakdown.

The tuning condensers are provided with engraved dials, to enable settings for different frequencies to be noted. The indicating plate for the aerial switch is an aluminium disc (actually an Eddystone Cat. No. 425 in reverse), suitably marked to show when the aerial circuit is series or parallel.

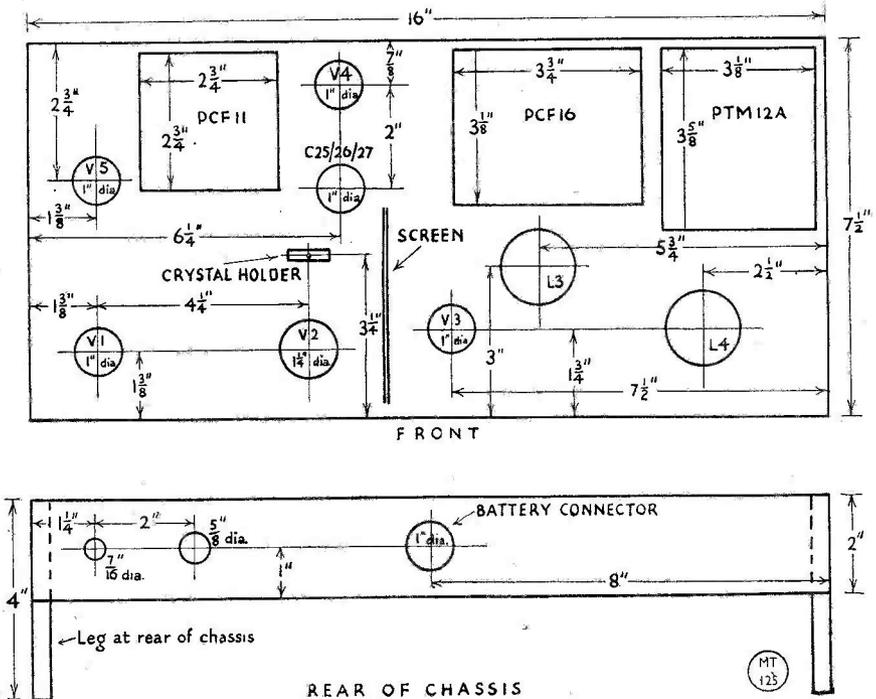


Fig. 2. Plan view of the chassis layout, with full drilling details.

Resistors R20 and R17 had to be inserted because 6-volt bulbs could not be obtained and 3.5 volt bulbs had to be used in their place.

**Wiring**

Single point earth wiring is adopted wherever practicable, the earth returns associated with each valve being soldered to a tag fixed beneath one of the valvholder securing bolts. The chassis is not relied upon for radio frequency return paths—for example, copper wire leads are taken from the large earthing tags on the variable condensers to the appropriate earth point. Circulating currents and instability are thereby prevented.

A five-point tag strip is bolted near the V1 valvholder, to hold firm the small components associated with the VFO. These should be mounted well away from the chassis, to minimise the effect of vibration. Similar tag strips are used in other parts, only a few of the components being held in the wiring.

Those leads associated with the RF parts of the circuit consist of 20 SWG wire enclosed in telcothene sleeving. PVC covered wire or flex is suitable for the power, LT, HT and modulator wiring. The switch used for changing over from VFO to crystal is a toggle type double-pole change-over, permissible in this case because the RF voltage is relatively small and the frequency comparatively low.

**Coils**

Details of the coils are as follows :

L1 = 85 turns 30 SWG enamelled wire on Eddystone 646 former

L2 = 65 turns 28 SWG enamelled wire on 646 former

L3 = 60 turns 22 SWG enamelled wire on 537 former. Link winding has 10 turns

L4 = 65 turns 22 SWG enamelled wire on 537 former. Link winding of 10 turns

Because of the rather high capacity across L1, the number of turns is critical. If wound to give the correct inductance, C1 should be at nearly maximum capacity (leaving something in hand for final adjustment) when the VFO circuit resonates at 860 kc, C2 of course being at maximum. Also, close tolerance (*plus or minus 5 per cent.*) silver-mica condensers are employed for C3 and C4. In actual fact, C3 consists of 220  $\mu\mu\text{F}$  in parallel with a 100  $\mu\mu\text{F}$ , and C4 of a 220  $\mu\mu\text{F}$  in parallel with a 330  $\mu\mu\text{F}$ .

Some latitude is permissible with the other coils, the sizes of which have been arranged so that maximum capacity is in circuit when the frequency is at its lowest. A gauge of wire one or two sizes smaller than that specified will have negligible effect.

The link windings on L3 and L4 should be wound over the lower end of the main winding, in order to secure adequate coupling. Insulation must be provided between the two windings and this can conveniently take the form of two or three layers of the thin adhesive plastic tape sold for bookbinding purposes. The number of turns to L4 are greater than with L3 because the stray capacities across it are smaller.

The taps on L4 are made every tenth turn from the top, the lowest section having 15

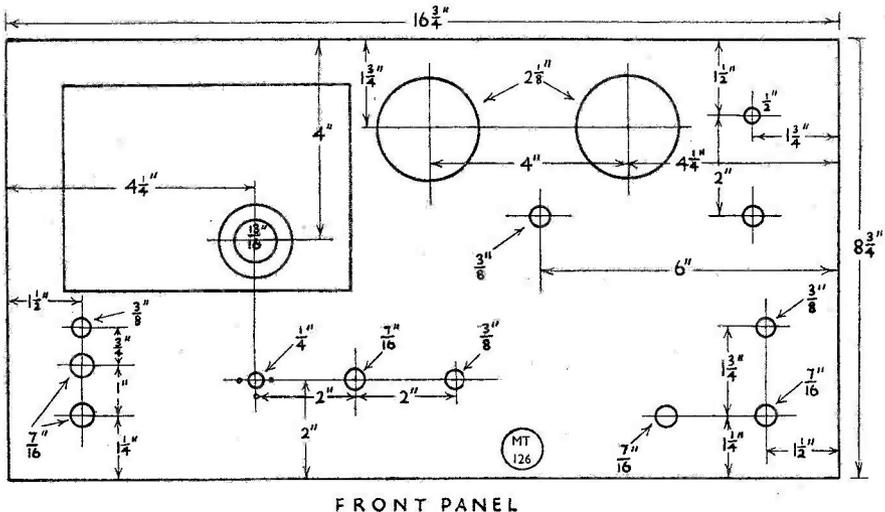
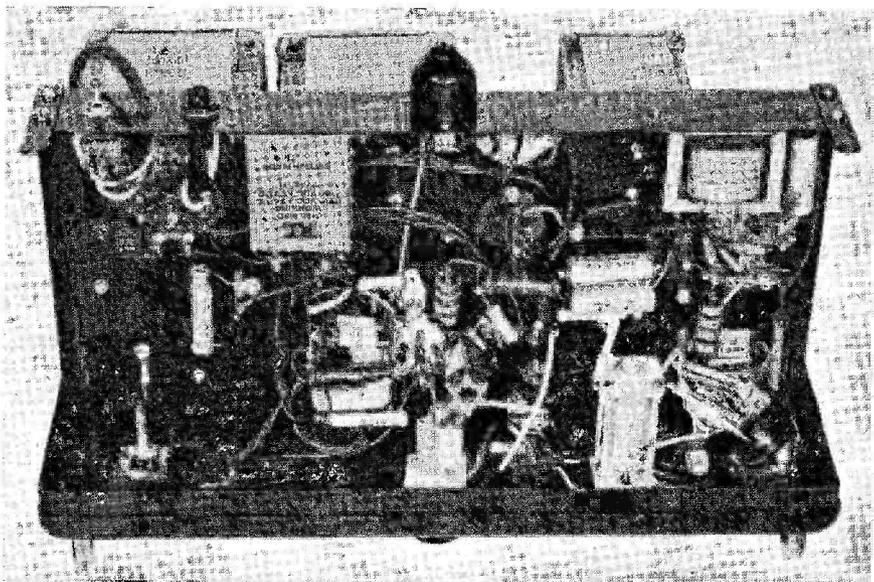


Fig. 3. Panel layout of the cabinet Top Band transmitter.



Underneath the chassis of the Top Band Transmitter. The general placing of parts and wiring out can be followed quite clearly.

turns. The six taps are brought up to holes made in the top ring of the coil former and each soldered to a "bunch" of tinned wire, connection to which is made by a crocodile-clip terminated lead coming from the aerial insulator.

#### Calibrating the VFO

There is little point in calibrating the VFO unless the operation is carried out with the highest possible degree of accuracy. Although the fundamental frequency is within the medium wave broadcast band, few broadcast receivers are calibrated with sufficient accuracy to permit transferring frequencies to the VFO, but useful spot checks can be made on some of the BBC stations.

The only satisfactory method is to employ a crystal oscillator incorporating 1000 kc and 100 kc crystals of close tolerance. For the benefit of those not familiar with the process, the calibration is carried out as follows :

The VFO coverage should be adjusted as accurately as possible by beating the harmonics on a calibrated receiver. Then tune in the harmonic of the 1000 kc crystal at 7000 kc on the receiver and switch over to the 100 kc crystal, the beat from which should be of reasonable strength so that it is not confused with signals. The fourth harmonic from the VFO is brought to zero beat with the crystal harmonic, noting the VFO dial reading.

Next locate on the receiver the 100 kc crystal harmonic at 7100 kc and again beat the VFO against it. This procedure is continued over the whole range covered by the VFO. The scale provided with the dial can then be marked off accurately. As a guide, the following figures are the ones obtained by the writer :

(6900 kc)	1725 kc	100 on VFO dial
(7000 kc)	1750 kc	91 on VFO dial
(7100 kc)	1775 kc	83 on VFO dial
(7200 kc)	1800 kc	74½ on VFO dial
(7300 kc)	1825 kc	66 on VFO dial
(7400 kc)	1850 kc	57½ on VFO dial
(7500 kc)	1875 kc	49 on VFO dial
(7600 kc)	1900 kc	40 on VFO dial
(7700 kc)	1925 kc	32 on VFO dial
(7800 kc)	1950 kc	23 on VFO dial
(7900 kc)	1975 kc	13 on VFO dial

Except at the extreme high frequency end, the scale is fairly linear and it is not difficult to interpolate frequencies between the 25 kc calibration marks.

#### Operating Adjustments

The KT8 power amplifier valve, when not driven, takes a standing anode current in the region of 40 mA, representing a dissipation of 12 watts—well within the rating for the valve. The measured HT voltage from the mains power unit is 300 volts. On bringing L2/C12 to resonance, either with the crystal or at twice the VFO frequency, the PA current will increase (the dial on C19 should be set to 100 deg.). Rotation of C19 to bring the tank circuit into resonance will result in the current

indicated by the meter dropping to 10 mA or less, provided the aerial circuit is out of resonance. It should be noted that the C19 dial reading should be well up the scale—another resonance point, with output on 3.5 mc will be found at a low dial reading.

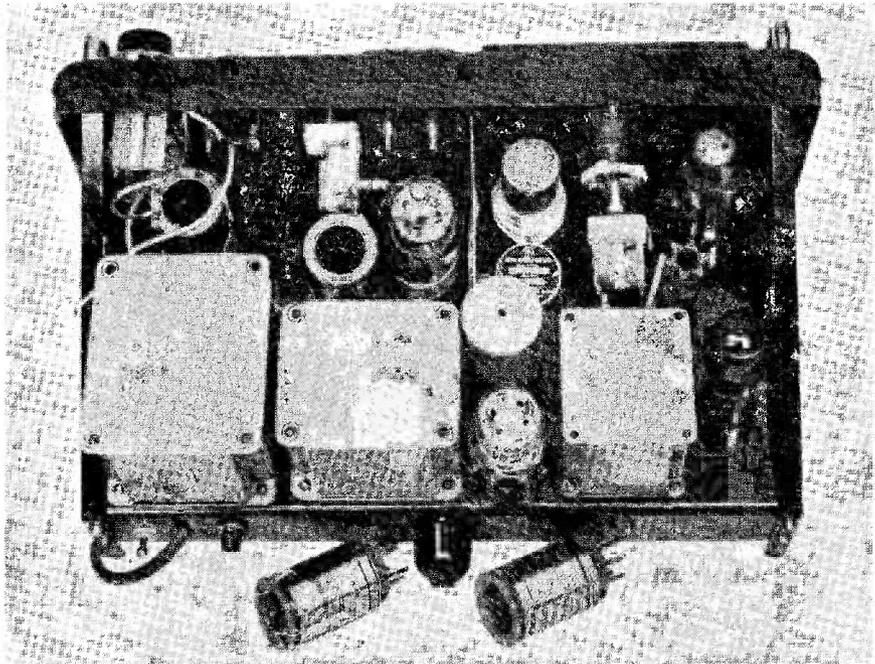
**Aerial Coupling**

A really good earth is very desirable and will increase the effectiveness of whatever type of aerial is employed with the transmitter. The aerial circuit adjustment naturally depends on the length of wire in the aerial. When the latter lies between 20 ft. and 100 ft. (i.e., something more or less than an eighth wavelength but not closely approaching a quarter wavelength) parallel feeding will be necessary. The aerial switch is put into the position which brings C20 in parallel with L4, and the aerial lead clipped on to one of the coil taps—near the top with a short aerial and further down with a longer one. As the aerial length approaches a quarter wavelength (approximately 135 ft.) and beyond (up to about 160 ft.), series tuning is called for and the aerial clip is

adjusted to place sufficient loading inductance in series with the aerial to bring it to resonance. Different combinations should be tried to determine the best one for the particular aerial in use, the aim being to secure maximum readings simultaneously in both meters. A neon lamp is also useful for indicating maximum RF on the aerial lead, but if the aerial is of a length near a quarter wavelength (or an odd multiple thereof) no voltage indication will be possible.

**Telephony**

Closing the modulator switch S4 brings the 6V6 valve into operation—the key must, of course, be short-circuited or the plug withdrawn. An ordinary carbon microphone of the immersed electrode type, as fitted in handsets, gives an adequate degree of modulation with a normal speaking voice. Raising or lowering the voice is possibly a somewhat crude method of varying the depth of modulation but in practice no difficulty has been experienced.



Top deck of the self-contained 1.7 mc transmitter. It can be VFO or CO driven at will, incorporates its own power supply, provides for screen modulation of the PA for phone working, and is complete with a multi-match output tuning network, permitting operation with any length of aerial. The Tx can readily be swung on to 3.5 mc, and the coils for that band are those loose in the foreground.

# Indoor Beam for Ten

## Effective Three-Element System, Easy to Build

By R. W. ROGERS (G6YR)

ALTHOUGH ordinary dipoles and long-wire aerials can give fairly good results on 28 mc, after several months' activity on the band it became increasingly obvious to the writer that, with the ever-increasing competition from G stations using beams, something better was needed. The beam described here is the outcome of experiments designed to ascertain whether an array fitted indoors, in the loft, would give any worth-while gain over the outdoor dipole in use. Results have been so successful that the writer is convinced that any possible improvement to be gained by the erection of a conventional outdoor beam is definitely not worth the trouble and expense involved. The total cost was only a few shillings and most amateurs will probably find much of the necessary material in the junk box.

The beam is fundamentally of the popular three-element type, using a folded dipole with director and reflector. But in order to accommodate it in the loft, the ends of all the elements are bent downwards. The maximum available space, allowing 360 deg. rotation of the beam, was a radius of a little over 5 ft. A spacing of 0.1 wavelength from the driven element was decided upon for both reflector and director, and a few rough calculations showed that the maximum span of the dipole would be 10 ft., and of the parasitic elements 8 ft., so that the total span is roughly half that of a normal beam. A spacing of 0.15 wavelength for the director gives rather more gain, but, in this case, would result in having to

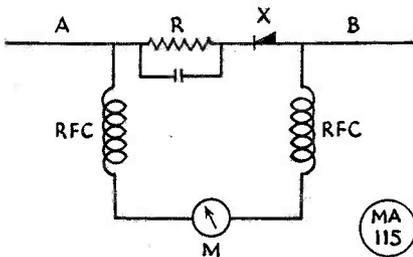


Fig. 3. Circuit for a suitable field strength meter for comparative measurements when setting up the beam. Values are given in the table.

This is an interesting and very practical article on the design and construction of a beam for Ten which, because it is indoor, is shorn of much of the mechanical complication deterring many from the erection of an outdoor system. Apart from that, a large number of amateurs are without the facilities for an outside structure and would yet like to work under beam conditions. Provided the aerial described here is properly fed and correctly adjusted, it should give the excellent results claimed for it by our contributor.—Ed

reduce the span of the elements still further, owing to the limited space available.

There is, of course, some loss of radiation from the bent-down portions, but as the radiation from a half-wave aerial is off the centre section where the current is very largely concentrated, the loss is not at all serious and amounts only to a very small fraction of the total.

### Construction

Figs. 1 and 2 show the general constructional details of the beam. The elements consist of lengths of 12 SWG copper wire, supported on a light framework of wood, on  $\frac{1}{2}$ -in. stand-off insulators. The framework need only be of sufficient strength to carry the weight of the wires and insulators, as, being indoors, no allowance need be made for standing up to gales or the weather generally. As the insulators always remain dry, the small size is quite adequate for inputs of up to 150 watts.

The folded dipole consists of two 12 SWG wires, spaced about 4 in. apart and shorted together at both ends. The spacing is not important, provided the two wires are of similar gauge. One wire is broken at the centre and the ends terminated on  $\frac{1}{2}$ -in. stand-offs. The feeder, which is of the 80-ohm balanced type, is connected into the aerial at this point. As an alternative, co-axial cable of similar impedance can be used, but results in an unbalanced distribution of current in the two sides of the aerial, the side connected to the outer braiding of the cable taking less current than the other side. This can, of course, be corrected by the use of a quarter-wave balancing section or "balun."

The writer has frequently seen it stated that the centre impedance of the driven element in a three-element close-spaced array is as low as

### Table of Values

Fig. 3. Circuit of Field-strength Indicator

- C = 100  $\mu$ F mica (across R)
- R = 1,000 ohms
- M = 0-500 micro-ammeter
- X = Crystal diode, 1N22
- RFC = RF choke
- A, B = See text

7 or 8 ohms. The impedance is certainly not so low in this case or the matching of an 80-ohm cable to the folded dipole would be very far from exact (a mis-match of nearly 3 : 1). Several matching systems have been tested, including a three-wire folded dipole, which would match 9 ohms to the feeder almost exactly, but the two-wire system shown has given the best results. Possibly, the use of wire elements and bent-down ends raises the impedance.

The beam is pivoted at its point of balance, and the type of bearing used at the centre and the method of rotation are best left to the individual choice of the constructor. The writer has a ball-bearing pivot (similar to a cycle hub) which was on hand, and a motor from a surplus IFF unit was pressed into service to rotate the array, through one of the geared-down spindles. The field and armature windings are connected in series for mains operation and a double-pole change-over relay serves to reverse the field connections and so turn the beam in either direction. The motor is coupled to the beam through a cord and pulley arrangement; a 12-in. wooden pulley, cut from 1/2-in. wood and grooved round its circumference with a file, is fixed to the underside of the beam.

**Tuning Up**

If the dimensions shown are copied, it is probable that the beam will work satisfactorily without any alteration, but it is recommended that the elements be adjusted in length for maximum performance at the frequency most likely to be used. If a field-strength meter is

available, it should be set up as far away from the beam as possible, consistent with an observable reading. A very satisfactory field-strength indicator can be constructed in a matter of a few minutes, using one of the new crystal diodes in the arrangement shown in Fig. 3. The pick-up wires, A and B, should be quarter-waves to commence with, but if the deflection obtained is too great, can be cut down in size. It is a great convenience to connect the micro-ammeter through a long length of flex, so that it can be brought into the loft and any variations in radiation can be seen immediately.

All the elements should be made several inches *too long* to commence with; they can then be pruned to the right size by snipping 1/2 in. at a time off each end. The folded dipole should first be adjusted for maximum deflection on the meter by turning to the best position and then gradually altering the positions of the shorting pieces at each end.

At this point, it should be decided whether to adjust for maximum forward gain or maximum front-to-back ratio (which has the benefit of reducing QRM from the rear). Assuming the latter case, the reflector is next pruned for minimum backward radiation, and this should give a very small indication indeed on the meter. Assuming 500  $\mu$ A as the maximum deflection, the minimum should be of the order of 10  $\mu$ A.

The director is then similarly adjusted, but in this case for maximum forward gain. It should be mentioned that, while these adjustments are taking place, the input to the PA

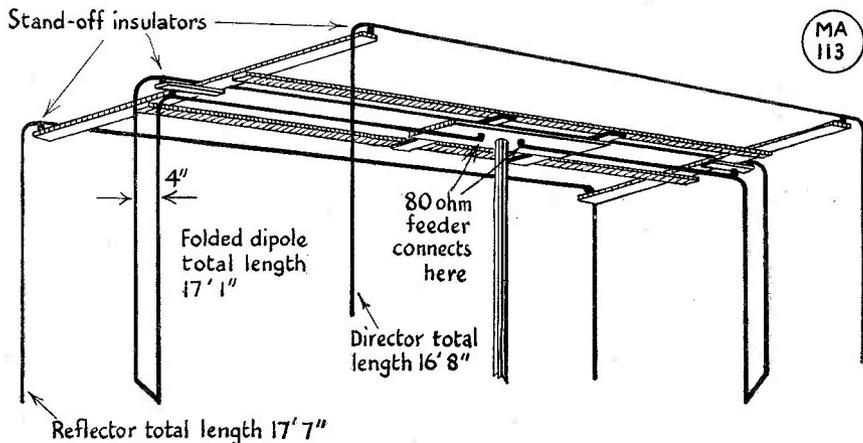


Fig. 1. General view of the indoor beam for Ten as used by G6YR.

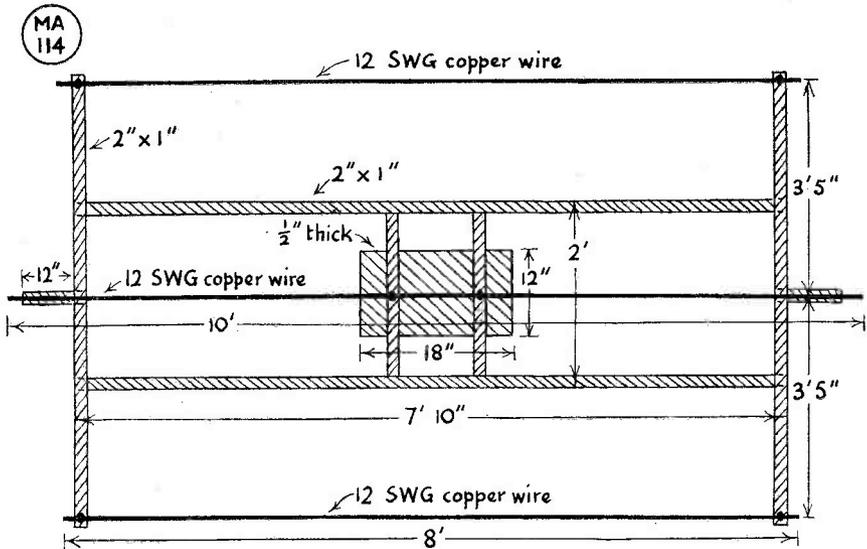


Fig. 2. Plan view of the G6YR indoor beam for Ten.

must be kept to a constant level by altering the loading from time to time. It is also advisable to run through the tests a second time paying special attention to the reflector length, which is very critical for minimum backward radiation.

#### Results

After nine months in operation, the beam has proved itself to be far superior to an outside dipole, especially so for contacts at extreme distances. As an example: No telephony contact with VK or ZL on 28 mc had ever been made on an outside aerial from the writer's station, despite the numerous calls which had been put out, but using the beam they became commonplace on Sunday mornings at the height of the QRM and reports of up to S9-plus were received. The roof of the house appears to have no effect on radiation, even in heavy rain, and equally good results have been obtained in all directions.

#### Suggestions

Probably a length of 300-ohm ribbon feeder would make a very satisfactory folded dipole, but this has not been tried by the writer. No doubt, also, the bandwidth of the beam could be widened by the use of similar ribbon for the director and reflector, as this would have the effect equivalent to using larger diameter

elements. The bandwidth of the original beam is not known exactly, but is certainly more than 500 kc, as has been proved on several tests. It does not, however, cover the full width of the entire band, but from the point of view of the writer this is not considered a serious defect.

It is thought probable that a beam on similar lines for 21 mc would give quite a useful gain over a dipole. In this case, the ends could have a double fold. The efficiency for the same span would be less, but it is believed that the improved low angle of radiation, as compared with a dipole, would still more than compensate for the loss in the end sections.

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# More on the GDO

## Some Useful Ideas

By R. F. STEVENS (G2BVN)

BEING impressed by the many practical applications of the grid dip meter described in the March, 1949, issue of the *Short Wave Magazine*, an instrument of similar type was constructed. The differences from the original design are accounted for by the gear that was available at G2BVN, the main alteration being the use of a 0-200 microammeter as an indicator in place of the magic-eye originally described.

The instrument is built into an aluminium box measuring 6 in. x 3 in. x 2 in., and the RF leads kept as short as possible using 16 SWG copper wire to ensure rigidity whilst the instrument is being handled. The meter is connected by a three-wire cable of suitable length to a power supply giving 220 volts at 8 mA, and 6.3 volts at .15 amp. The coils employed, which were also on hand, are of the "Denco" plug-in type using an octal base. These coils incorporate an adjustable tuning slug which was found to be invaluable for regulating the amount of grid current, which would otherwise have differed greatly on the various wave-ranges.

### Functions

The grid dip meter combines the functions of three separate instruments :

- (1) A grid dip oscillator (GDO), used to determine the frequency of RF circuits to which power is not being applied. When the meter coil is coupled to a tuned circuit the microammeter will show a pronounced dip at the resonant frequency due to the absorption of power by the circuit under examination. This dip should not be confused with the gradual alteration of grid current which occurs over each range.
- (2) An oscillating detector, used to determine the frequency of radiating RF circuits, the indication in this case being an audible beat in the headphones when the meter is tuned to the frequency of the radiating circuit.
- (3) An absorption frequency meter, readings being obtained on the microammeter when the instrument is resonated and coupled to a radiating circuit. In this case, it is necessary to apply filament power only to the 955 valve used in the GDO.

### Calibration

The accuracy of the meter will obviously

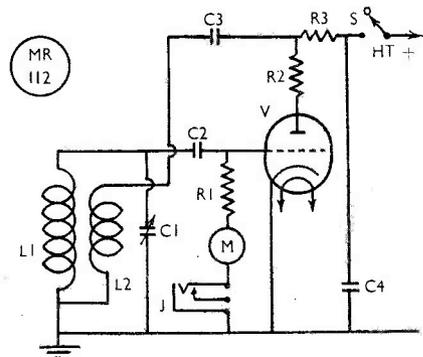
The grid dip oscillator has become one of those ancillaries of which the true worth can only be appreciated once it has been used. The practical applications of the GDO are too numerous to detail here, but our contributor suggests some of the several checks, measurements and observations possible with it.—Ed.

depend mainly upon the accuracy of the frequency standard used, and also upon the time and trouble taken in calibration (which will be amply repaid). It is recommended that the calibration be checked against a standard other than the one which was originally used. This check may be conveniently made on a communications receiver or with the aid of an absorption wavemeter, simply to make sure that the correct frequency ranges are being covered.

The calibration may be noted either by direct-reading concentric scales for the various ranges, or by constructing a graph for each coil. The latter method is favoured by the writer, mainly for the reason that, if the calibration should alter, it is easy to plot the fresh graph required.

### Transmitter Applications

The instrument may be used as a grid dip



Circuit of the grid dip oscillator as used by G2BVN ; values are given below.

### Table of Values

- Grid Dip Meter**
- C1 = 75  $\mu$ F
  - C2 = 100  $\mu$ F silvered mica
  - C3 = 100  $\mu$ F silvered mica
  - C4 = 200  $\mu$ F silvered mica
  - R1 = 15,000 ohms,  $\frac{1}{2}$  watt
  - R2 = 68 ohms,  $\frac{1}{2}$  watt
  - R3 = 20,000 ohms, 1 watt
  - L1/L2 = Plug-in coils as required
  - M = 0-200 microammeter
  - J = Closed circuit jack
  - V = 955 Acorn

oscillator to tune the grid and anode circuits without applying power to the transmitter, thus avoiding possible damage to valves by excessive off-resonance currents. Also, when winding doubler and buffer coils, the time and labour involved in the usual cut-and-try method are avoided, and there can be no doubt that the coil has been correctly wound to the desired frequency, and not to a harmonic. Further, the relative Q of circuits may be found by noting the meter dip. A greater dip indicates higher Q.

When the tuned circuits of a transmitter have been aligned with the aid of the GDO, then power may be applied, the tuning precisely adjusted, and the instrument may be employed as an absorption type meter to check the frequency of each anode circuit.

#### Parasitic Oscillation

When used as an oscillating detector the sensitivity of the meter is quite high and it may be coupled to a transmitter to give an audible beat in the headphones with the parasitic. The frequency of the parasitic having been determined the instrument may be used as a GDO to discover which circuit is resonating at this unwanted frequency. Care should be taken to ensure that the circuit being measured is in fact the circuit that it is desired to measure. This can be checked by altering one of the components, e.g. a variable condenser, or temporarily earthing part of the circuit, which should cause an alteration in the microammeter reading.

#### Receiver Adjustment

The instrument may be used as a GDO to align the RF stages of a receiver, and, in the case of superhet receivers, as an absorption type meter to check the working of the oscillator(s).

When aligning a superhet it should be checked that the correct frequency has been selected and not an image. Generally, the receiver oscillator is operated on the HF side of the signal frequency and, therefore, the correct calibration point is that signal obtained when the GDO tuning condenser is at its greater capacity.

#### Aerials

Using the instrument as a GDO, measurement of the resonant frequencies of the various types of aerials and feeders may be done, but it is proposed to mention only the more important applications.

The meter coil should be inductively or capacity coupled to the aerial (with feeders

removed), at a high current or high voltage point respectively, i.e. the coil held parallel or at a right angle to the aerial wire. A slight inaccuracy will result if a measurement is made at one of the ends of an aerial, and it will be observed that changes in height will greatly affect the observed resonant frequency.

Untuned feeders may be checked with the GDO by measuring the resonant frequency of the aerial with and without the feeders connected. With correct matching no change in resonance should be noticed. In the case of tuned feeders the reading should be taken at the aerial tuning circuit, and if the observed frequency is not correct, suitable alterations can be made.

The meter may also be employed as an absorption type wavemeter for obtaining relative field strength measurements, and for checking whether standing waves are present on a feeder.

#### Capacity

To measure capacity the instrument is used as a GDO, and it is necessary to construct a graph giving the resonant frequencies of a coil and a number of condensers of known capacity. It has been found that the Range 4 coil (covering approximately 6-16 mc) is the most suitable, and the condenser should be connected across the coil by the shortest possible leads. The calibration, if carefully carried out, will be of sufficient accuracy for all practical purposes over the range 50  $\mu\mu\text{F}$  to .005  $\mu\text{F}$ .

It is also possible to check a condenser in circuit, if it is not heavily loaded, by clipping a piece of 12 SWG wire across the unknown capacity (switches off!) and finding the resonant frequency with the GDO. The wire may then be clipped across various condensers of known capacity until a combination giving the same resonant frequency is found. This method is suitable for capacities up to 600  $\mu\mu\text{F}$ .

#### TVI

A great deal of time may be saved when installing traps and filters by using the meter as a GDO to ascertain the resonant frequency and relative Q. The filter should always be checked after it has been wired in the circuit to ensure that stray capacity has not affected the resonance.

Many other applications will come to mind but sufficient has been said to show that an instrument of this type is quite indispensable when it has been brought into use, and will amply repay the time and trouble taken in its construction.

## Surplus VFO Unit

### Amateur Application of the Type MI-19467-A Oscillator

By J. N. ROE, M.I.R.E. (G2VV)

ORIGINALLY designed for use with Type ET-4336 transmitters, the Wilcox-Gay (U.S.A.) Type MI-19467-A Master Oscillator Unit can be easily adapted to work as an amateur band VFO.

A power supply, meter shunt and a length of 80 ohm co-axial cable are the only additional items required, apart from one or two odd nuts and bolts.

#### General Description

The unit employs a single 807 as an electron-coupled oscillator and is capable of producing a T9x note at an extremely high order of stability. Output is ample to drive a 6L6 or 807. The case, panel and deck are constructed of 14 gauge steel with copper plating applied to the deck. Approximate overall size is 17 in. × 7 in. × 10 in. high. Reference to the photograph will provide a good idea of the general design and layout of component parts.

The oscillatory circuit and associated components are mounted in the top section. The 807 is inverted in order to bring the base connections in to this section. The cathode, control grid and screen grid form part of the fundamental generating circuit. The underside section contains all components for the frequency multiplying circuit, and the 807 anode is conveniently placed to permit short leads.

This method of isolating the two basic circuits—by virtue of the metal deck—is both simple and efficient. The unit slides into the case on two insulated strips which support the sides of the deck. The front panel overlaps the case and is secured in position by four large captive screws. These engage with an overlap lip on the front of the housing. An 8-contact Jones plug passes through the rear of the case and is fitted on the deck. With the unit in position in the case the two circuits are completely screened from interaction.

Front panel controls comprise: Oscillator and multiplier variable inductance tuning dials and appropriate condenser switches. The tuning dials are metal castings finished in black crackle and include fast and slow motion mechanism. Locking screws are also provided. Each dial is calibrated 0-100 deg. and, in addition, embodies a counter mechanism

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The commercial VFO driver described here, which has been freely available for some time as surplus, is the American version of the well-known Type 145 Oscillator. The author discusses its practical application on the communication bands.—Ed.

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graduated in 35 divisions. A 0-10 mA meter is also included on the front panel.

#### Tuning Range

As supplied, the unit has continuous coverage from 2 to 10 mc and is capable of controlling a transmitter on all amateur bands with the exception of 1.7 mc. By increasing the multiplier condenser range and using this stage as a buffer the Top Band could also be covered. For amateur use it is not generally necessary to go to 10 mc—7 mc being the maximum frequency required. The following details give the exact coverage of each circuit as selected by the front panel switches:—

Oscillator Switch	Coverage
1	1-2 mc
2	2-2.7 mc
3	2.7-3.2 mc
4	3.2-3.7 mc
5	3.7-4.4 mc
6	4.4-5.0 mc
Multiplier Switch	Coverage
1	2.0-3.1 mc
2	3.1-6.0 mc
3	6.0-10.0 mc

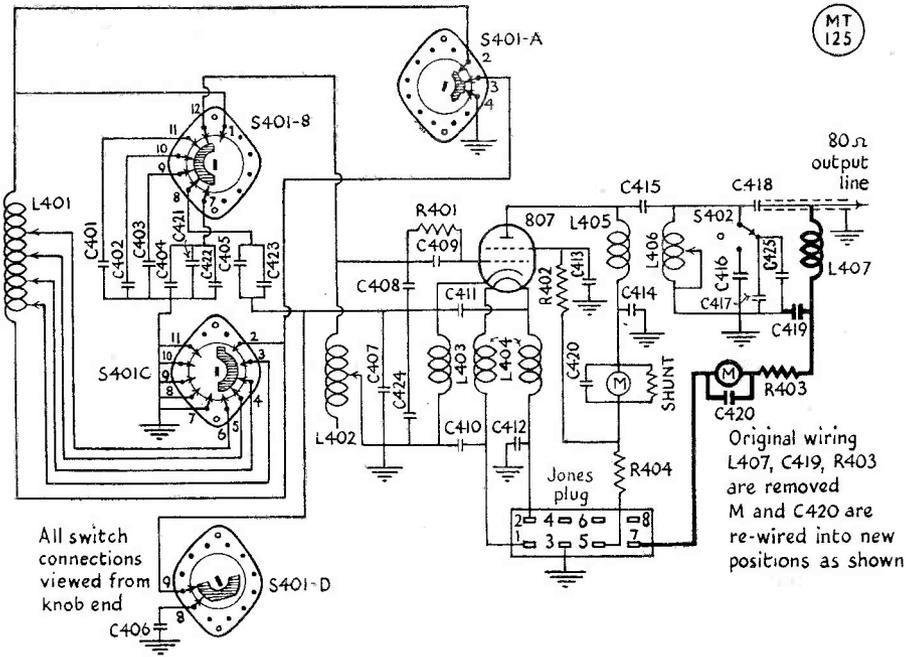
Both switches are of the ceramic wafer type and are fitted with flexible couplings to the panel controls.

#### Modifications

In its original form the output is wired to a grid meter and choke for connection direct into the grid of the driven stage. Most amateurs prefer to have the VFO unit on the operating table and not included as part of the main transmitter. This being the case it was decided to modify the output circuit arrangement. Components L407, C419, R403 (all located in the underside section) were removed together with associated wiring as shown in the circuit diagram. The grid current meter was fitted with a 2/3 ohm shunt (mounted on the meter terminals) for double scale reading, *i.e.* 20 mA. This was then wired into the 807 anode supply as shown. Care should be taken in this alteration to keep the length of the leads to a minimum.

The original spring clip output connector and wiring should be completely removed.

Output from the 807 anode circuit is taken via C418 by means of a length of 80-ohm cable. Normal TV coax was used and, during tests, lengths up to 6 ft. had no effect upon frequency or output. The centre lead should



Circuit of the piece of surplus equipment known as the M.O. Unit Type MI-19467-A, of which a photograph appears with this article. It can be used as an amateur band VFO, and a great many are in operation without the improvement suggested by G2VV.

**Table of Values**

MO Unit Type MI-19467-A

Component designations are as given in the Unit

- C401 = 30  $\mu\mu\text{F}$
- C402 = 60  $\mu\mu\text{F}$
- C403 = 70  $\mu\mu\text{F}$
- C404, 421, 422 = 240  $\mu\mu\text{F}$
- C405, 409, 418, 423 = 100  $\mu\mu\text{F}$
- C406 = 240  $\mu\mu\text{F}$
- C407, 424 = 170  $\mu\mu\text{F}$
- C408 = 120  $\mu\mu\text{F}$
- C410, 412, 413, 414, 420 = .01  $\mu\text{F}$
- C411 = 560  $\mu\mu\text{F}$
- C415 = 47  $\mu\mu\text{F}$
- C416 = 120  $\mu\mu\text{F}$
- C417, 425 = 160  $\mu\mu\text{F}$
- R401, 402 = 100,000 ohms, 2 watts
- R404 = 5,000 ohms, 10 watts
- S401—A, B, C, D = Ceramic 4-bank, 6 positions (oscillator)
- S402 = Ceramic single-bank, 3 positions (multiplier)
- L401 = Oscillator coil, tapped
- L402 = Oscillator variable tuning coil
- L403, 404, 405 = RF chokes
- L406 = Multiplier (doubler) variable tuning coil
- M = 0-10 mA meter with shunt (see text)

be wired direct to C418 and the screening earthed in the unit and at the transmitter.

A hole, just large enough to accommodate the cable, was drilled at the bottom left-hand corner of the panel (see photograph). Where more convenient for individual coupling to the transmitter this lead could be brought out at the right-hand side. In either case the lead MUST be kept in the lower section of the unit.

The case is supplied fitted with rubber shock absorbers and brackets which will not be required for normal table mounting. These should be removed and the holes fitted with short bolts. An output socket is mounted in the base of the housing. This should be removed and a small metal plate fitted over the hole in order to keep the screening complete.

**Power Supply**

As with all frequency controlling units, a separate power supply is strongly recommended. One furnishing 6 volts for the heater circuit and 260-300 volts at 50 mA HT should be satisfactory if fitted with ample

smoothing. A switch—for mounting at the operating position—should be included in the HT supply in order to render the VFO inoperative when listening. Connection between the power supply and the unit is by means of a four-way cable and the Jones socket provided.

### Transmitter Coupling

The output should be connected, in the usual manner, to the grid of the valve in the driven stage. In the case of a tritet oscillator the crystal is removed and the VFO output plugged into the socket wired to the grid. This method works quite well but the tritet tuning will be fairly flat. Such a condition is advantageous since varying the frequency of the VFO does not tend to throw the transmitter out of tuning adjustment to any considerable degree.

### Operation

For continuous use the unit should be calibrated against a reliable frequency standard but for preliminary tests may be tried by tuning for a zero beat against an accurately calibrated receiver.

For 3.5 mc operation the oscillator switch should be set to position 1 (this means that the

grid-screen-cathode circuits are working at 1.7 mc) and the multiplier switch to position 2. Tune the oscillator variable control for zero beat with the receiver setting and adjust the multiplier variable control for minimum current reading on the 807 anode meter. Using 300 volts HT, the standing current should be between 18 and 20 mA, dipping to between 12 and 15 mA when the anode circuit is tuned to resonance.

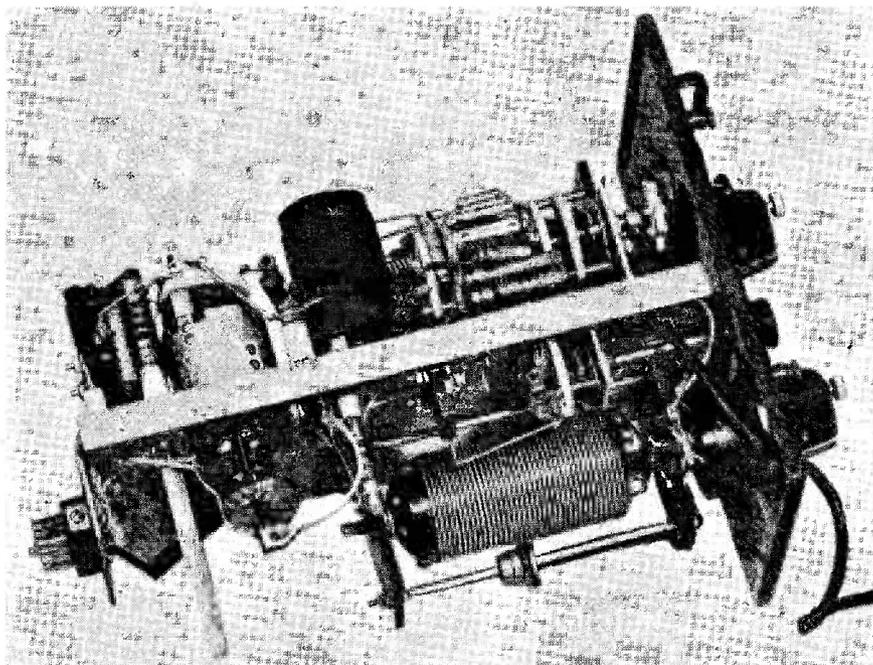
For 7 mc output the oscillator switch should be set to position 4 and the multiplier switch to position 3.

### Results

Tests were carried out using two different transmitters. In the first instance the VFO was coupled to a Type A Mk III Trans-Receiver by feeding the output to one side of the crystal holder, leaving the other socket free.

The unit gave ample drive for the 7H7 and running 10 watts to the 7C5 PA stage all reports received were T9x on both 3.5 and 7 mc. Similar comparison checks were made while working stations, with the same result.

Tests were then carried out on a 150-watt transmitter at 14 mc. This transmitter employed a tritet exciter stage using a 6L6 and the VFO was coupled in the manner described



Inside the well-known unit discussed in the text by G2VV.

under "Coupling" above. All reports received were T9x or T9 and agreed with results obtained on the monitor. Using the 7 mc output from the VFO and tuning the tritret to 14 mc monitor tests were tried at 28 mc (the other stages in the transmitter being an 807 doubling to 28 mc and feeding a PT15 PA stage at that frequency) the note remaining at T9 and perfectly steady.

### Conclusion

In the tests described, keying was effected in the driven stage. Time did not permit VFO keying tests but it is hoped to carry out some further work in this direction in the near future. Those wishing to experiment with VFO keying will probably find the most satisfactory solution is to key the screen lead. In this event it will be necessary to stabilize the HT supply. As the screen and cathode are associated in the oscillator tuning circuit it is essential that any keying leads be kept as short as possible and not subject to changing capacities. A small keying relay—mounted within the unit—would remove the chances of trouble from stray capacities. The relay should be mounted and wired in the top section of the unit.

Although no actual figures were taken for frequency drift a careful watch on this point, during the tests and in subsequent use, indicates that the VFO settles down in less than 10 minutes. In fact, several contacts have been

made without waiting longer than 5 minutes for the unit to warm up, with no adverse reports from the other stations.

There are two small criticisms relating to the operation of this unit. The first: Due to the large coverage of the oscillator tuned circuit, the amateur frequency bands are rather cramped on the dial and, secondly: Two tuning adjustments are necessary when changing frequency in a given band.

Relating to the first criticism it must be said that in operation little difficulty was experienced when using the zero-beat method of frequency setting. Rapid changing was possible in a matter of seconds. On the second point: Having set the oscillator for zero beat, it is again only a matter of two or three seconds to adjust the multiplier control for anode current dip on the meter. The multiplier setting is almost dead on over most of a given band. A third point is noise on the inductance track, which can result in a bubbly note if the mechanism is not kept clean—an immediate corrective is to swing the tuning control about the desired setting, which clears the track and enables the frequency to be accurately adjusted.

In the writer's opinion these minor criticisms—although considered worthy of mention here—are offset by the excellent results obtained coupled with the reasonable (surplus) cost of this very useful piece of well-built apparatus.

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## Double Superhet for Ten

### Modifying the 1196

By A. B. WRIGHT (G6FW)

#### PART II

THE first mixer and HF amplifier stages are assembled on a separate chassis, bent up from aluminium sheet to the same dimensions as the 1196 chassis. There is no need, of course, to keep strictly to these dimensions, as the 6J6, 6AG5 and their associated components can be built into a chassis much smaller than that used by the writer, which was, in point of fact, designed for another converter using valves of normal size. (This accounts for the EF50 valve holder which can be seen next to the 6AG5 in the photograph—it was left in as an anchor point for sub-chassis components.)

However, a chassis of the dimensions

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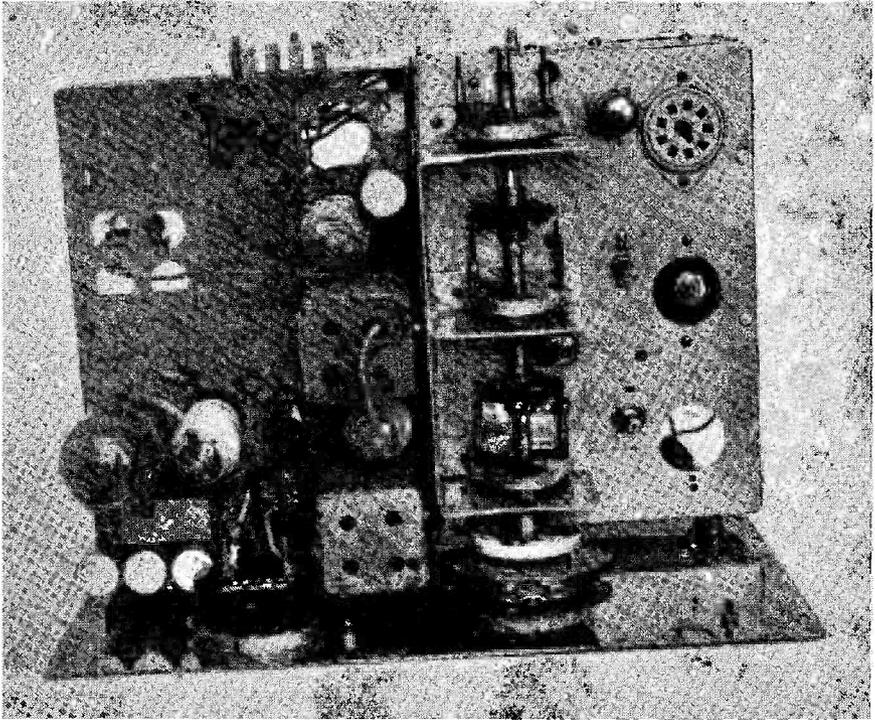
The first part of this useful article on a specialised receiver for Ten appeared in the August issue, which gave the full circuit diagram of the adapted 1196 Rx with the 28 mc converter unit.—Ed.

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indicated allows good component spacing, and makes the wiring a little less tedious.

The chassis is divided underneath into three compartments by means of two aluminium partitions. Care should be taken that the necessary holes for the wiring are drilled in the partitions before final installation, and it will be found easier to complete as much of the wiring as possible before they are screwed into position.

On top of the chassis three aluminium brackets are bolted, each about 3 in. by 2 in., on which the three ganged tuning condensers are mounted. To provide additional rigidity and shielding, a further strip of aluminium is bolted to the outside edges of the three brackets, as will be seen in the photographs. It is as well to make the fixing holes for the variable condensers slightly larger than



Chassis view of G6FW's receiver for the 28 mc band, showing the general layout.

necessary, so that when they are ganged together any undue friction can be eliminated, and thus any tendency to backlash corrected.

The holes for the two button-base valve holders should be drilled or punched out before the chassis is bent, together with the fixing holes for the variable air-spaced trimmers, resistor tag boards and aerial terminal strip.

The trimmer condensers are of the miniature air-spaced type, similar to those which are found mounted on the 1196 receiver. These four condensers can in fact be used, although their maximum capacity is a little too great, being about  $100 \mu\mu\text{F}$ , and some of the fixed and moving plates will need to be removed to make them suitable in the positions of C2 and C7, the capacities of each of which should be about  $25 \mu\mu\text{F}$  maximum. This is quite an easy job, however, as it will be found that the plates are simply held in place with nuts.

For C12 and C14, the condensers can be used without alteration, as in these positions their capacity will be approximately correct. Note that in the case of C14 the fixed and moving plates are both insulated from the chassis, and this condenser is best mounted on a small strip of insulating material. The spindles of the

trimmer condensers should be cut down to  $\frac{1}{2}$  in. in length and a hack-saw cut made across the end of each to provide for screwdriver adjustment. C2 is mounted on the rear wall of the chassis so that it can be easily peaked up when necessary.

The main tuning condenser assembly, consisting of two  $15 \mu\mu\text{F}$  and one  $35 \mu\mu\text{F}$  variables ganged together, was built up, using three ceramic insulated condensers of normal size. These were originally about  $75 \mu\mu\text{F}$  each. In the case of the HF and mixer stages, the number of plates in each was reduced to one fixed and one moving, while for the oscillator section the use of two fixed and two moving plates resulted in the correct capacity being obtained.

A tag board, bolted to the front wall of the chassis, forms a convenient anchoring point for the HF choke in the 6J6 anode, also for resistors R2, R3, R5, R7 and condenser C9. Besides making for a neater sub-chassis, the use of the tag board enables the components carrying HF to be efficiently spaced and wired, and spare tags act as connecting points for the incoming power leads from the 1196 chassis. By-pass condenser C5 is mounted on a small

tag-board bolted to the chassis in the centre section, and forms a convenient point to which the cold end of L3 can be soldered, thus supporting this coil rigidly above the chassis.

Coils L2, 3 and 4 should be wound accurately, according to the data given in the coil table. The original coils are silver-plated, and are taken from a set of spare coils intended for use with the SCR522 transmitter. These coils were at the time in plentiful supply at a local surplus store, and it is possible that readers may be able to acquire them from a similar source. They can, however, be very easily wound, and as long as the spacing, length and diameter are maintained, will prove just as efficient as the originals.

The HF coil L2 is supported between a long soldering tag bolted to the chassis, and a stator terminal on trimmer C2. L1 consists of 7 turns of thin insulated flexible wire, wound over the "earthy" end of L2, the ends being twisted and soldered to the aerial terminals on the chassis. Connection to the stator of C1 is made with bare wire passing through a grommetted hole in the chassis.

The mixer components are mounted in the centre compartment. One end of L3, as mentioned previously, is soldered to the tag carrying C5, the "hot" end of the coil being taken to a stator terminal on the trimmer condenser C7.

As with the HF stage, as many components as possible are grouped around the valve holder, with leads made as short as possible. The ceramic grid condenser C10 passes through a  $\frac{1}{4}$ -in. hole in the screen, one end being soldered directly to the valve holder, the other to the stator of the trimmer C12.

The output coils L6 and L7 are wound on a  $\frac{3}{8}$ -in. former 2 in. long, which is bolted to the screening partition so that the coil and its associated condensers, C14 and C15, are in the mixer section of the chassis. This coil is otherwise unscreened and no ill effects have been noticed in actual operation.

The remaining compartment houses the oscillator coil and trimmer, the large tag board and C13. L4 and L5 are wound on a grooved ceramic former, which also formed part of the 522 transmitter—only seven turns being left on the former, however. The reaction coil L5 consists of 3 turns of insulated connecting wire, wound around the former about  $\frac{1}{4}$  in. from the "earthy" end of L4.

This completes the constructional work on the first converter and HF stages.

### Modifying the 1196

The 1196 as it stands is not of much practical use as an amateur receiver.

It was originally designed for use on four fixed frequencies on the aircraft bands,

crystals being used in the oscillator section of the frequency changer. A form of amplified AVC was incorporated which is totally unnecessary in an amateur band receiver, and the audio output of the receiver was taken from the triode section of the double diode triode, *via* the output transformer (T5 in the original 1196 diagram), so that the output is only sufficient to operate a pair of headphones.

Incidentally, a diagram showing the disposition of all the components will be found pasted to the base plate of the receiver, and a further diagram showing the above-chassis components is fixed to the receiver top cover.

Some modification is obviously necessary before the set can be used as a second converter with its input tuned to 1,500 kc.

At the time the present receiver was built, the writer was unable to obtain the original circuit diagram of the 1196, but the would-be constructor is strongly advised to make sure of a copy with the set when purchased. This will save considerable trouble in tracing out the original wiring, which, as one of the accompanying photographs shows, is very compact and somewhat difficult to follow.

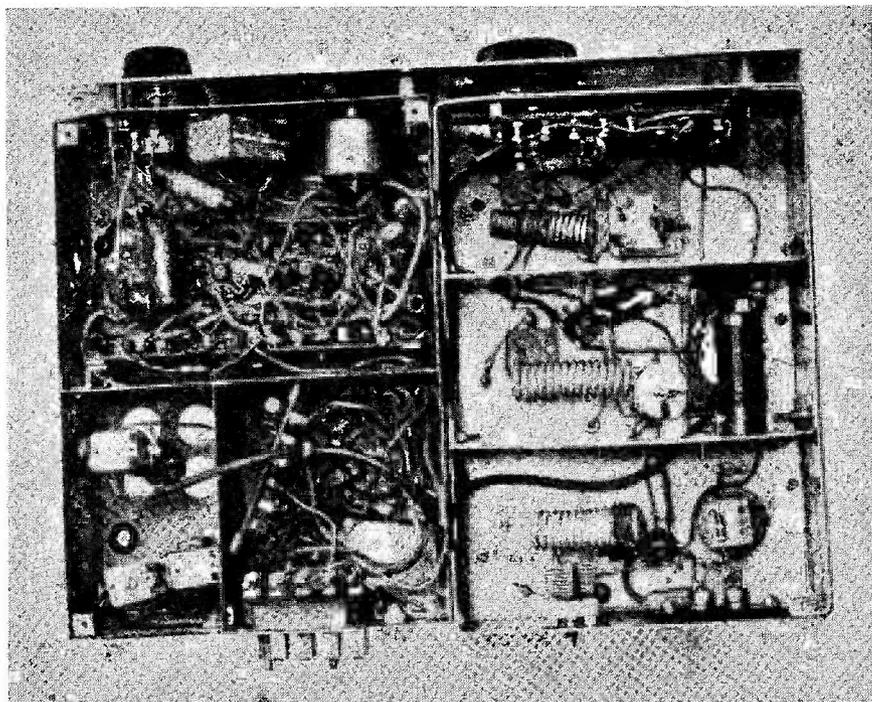
Commencing with the components on top of the chassis, remove first of all the box containing the crystal holders, trimmer condensers and switching arrangements.

The RF amplifier V1 (original diagram) is not used in the present circuit, so that the valve holder may be removed, together with resistors R2, R3 and R5. Two leads will be seen coming through the top of the first IF transformer can, one of which goes to the IF valve V3, the other to the AVC valve V4. The lead to the AVC valve must be cut at the point where it leaves the IF transformer can.

Reversing the chassis, components which may be removed are the microphone transformer T4, the output transformer T5, the large fixed condensers C35 and C37, variable resistor R18 (5,000 ohms) and R23 (0.5 megohms), the HF choke L1, and its associated condensers C25 and C29. The lead to the rotor of R18 should be earthed, as no HF gain control is incorporated in the modified receiver. R23 may be retained and used as an audio gain control if its spindle can be conveniently extended, but the writer found it easier to install a new control with a longer spindle. R18 may also be utilised in the S-meter circuit in the place of R19 in the new circuit diagram, if it is paralleled by a 2,000-ohm fixed resistor.

The Jones plug was retained for power supply and loud speaker connections, any leads which were no longer required being cut away.

C26, connected to the gain control R23, was also dispensed with, as were one or two of the resistors and condensers on the two tag boards, although it is best to remove the latter



Underneath the double superhet, the design and construction of which are fully described in the text.

components as the work of rewiring proceeds.

The valve holder for V4, originally the AVC amplifier valve, is retained, but all the wires connected to it, except the heater wiring, are cut away, and the cathode resistor R22 is also discarded, as this valve holder will eventually take a 6H6 as a noise limiter.

All the wires connected to the valve holder for the original V5 should be cut, except the heater wiring. In the original, this valve is used as a microphone pre-amplifier, and is replaced in the modified version by an output valve (a 6V6 or 6F6) and wired accordingly using components of the values specified with the new circuit diagram given last month.

V6 is a double-diode triode, an EBC33, which is retained to serve as 1st AF amplifier, second detector and AVC rectifier. The wiring to this valve holder should also be cut away as some modification to the original circuit is necessary. Having removed all unnecessary components and wiring, it is advisable at this stage to drill the chassis where necessary, so that the aluminium shell housing the higher frequency stages can be bolted to it, on the side to which the microphone transformer and R18 were fixed. The metal handle fixed

to one end of the 1196 chassis should also be removed.

With the two chassis firmly joined together, an aluminium panel, at least  $\frac{1}{2}$  in. thick, is bolted to the front walls. After carefully marking on the rear of the panel the positions of the tuning condenser spindle and the audio gain control spindle, the panel is removed for drilling. Only three controls are mounted on the front panel—the main tuning condenser dial, the audio gain control and the S-meter zeroing resistor.

The S-meter is placed in the top left-hand corner of the panel, so that it just clears the tubular condensers mounted on the 1196 chassis, the zero resistor being positioned two inches below it.

Any form of tuning dial may of course be used, the one in the original set being built up round a surplus "Velvet Vernier" movement taken from a TU5 tuning unit. These dials lend themselves readily to adaptation as calibrated dials, as can be seen from the photograph. They are noticeably free from backlash and have a useful reduction ratio. The pointer is of perspex, on which is scribed a hair-line indicator filled in with ink, one or

two small holes drilled along its length making the job of calibration quite easy.

Having completed all the necessary drilling of the chassis, we are now in a position to commence the wiring. Wire up the 6AG5/6J6 chassis first of all, commencing with the large tag board. No comment is necessary here except that the usual precautions should be taken regarding short HF leads and efficient earthing arrangements.

Complete the wiring as far as possible without the screening partitions in position, replacing these when necessary to finish off the job, small notches being cut in the bottom of each screen to fit over power wiring which runs along the floor of the chassis.

Small ceramic bushings were used to take the grid leads to the tuning condenser stators.

### Checking the Converter

After wiring the first converter, as it may be termed, it can, if desired, be tested out using a BC set tuned to 1,500 kc.

Couple up the HT and LT leads to a suitable power pack delivering 200/250 volts HT and 6.3 volts LT, and run a short length of screened wire from L7 to the aerial terminal on the BC set, the screening being connected to the BC set earth terminal.

A temporary single wire aerial should be coupled *via* a small condenser to the stator of the mixing tuning condenser C6. Fix a temporary knob to the tuning gang and set these condensers and the trimmers C7 and C14 at mid-capacity.

Rotate the oscillator trimmer slowly from minimum to maximum until a signal or a rushing sound is heard in the speaker of the BC set, then peak up signal or noise on C14 and then on C7.

Transfer the aerial to the grid of the 6AG5, and peak up C2 and C7 for maximum response. If the HF stage is operating correctly there should now be a great increase in the signal strength, although C2 will tune rather broadly, owing to the damping effect of the directly coupled aerial. Coupling a ten-metre dipole or beam to the aerial terminals and re-trimming C2 will result in much sharper tuning of C2 and increased QRK.

If no signals or noise can be obtained, check all voltages, particularly the voltage on the oscillator anode of the 6J6, and also the connections to L5. If these are reversed, the valve will not of course oscillate, and the set will appear dead.

The converter worked first time in the writer's case, but it was found difficult to peak up on noise as this was at an unusually low level (even car QRN being conspicuous by its absence, when for once it would have proved useful!). In fact, the absence of background

noise was at first quite disheartening, until a local suddenly roared in out of an almost silent background, at a strength far above normal.

There is little point in attempting to calibrate the converter at this stage, but if all component values have been adhered to the 28-30 mc band should spread over nearly 180 deg. of the dial, leaving very little spare at either end. If coverage of the eleven-metre band is required, it can easily be effected by adding another stator plate to each condenser in the tuning gang, and then re-aligning the receiver.

With an IF of 1.5 mc, however, it will be found that the set tracks quite well over the whole band when properly adjusted, without any necessity for altering the coil turn spacing or any such expedient.

The constructor can, of course, wait until the 1196 conversion has been completed before testing out the converter, but it is a good idea to check up the operation of the front end as described above, as any faults which may show up can more readily be traced.

Turning again to the 1196 chassis, the first task is to fix a pair of normal, medium wave-band mixer and oscillator coils in the vacant compartment which formerly housed the large fixed condensers, C35 and C37 and the output transformer T5. The trimmers C16 and C20 should be soldered to the coils before they are bolted down. Padders are not required as the set is operated on a fixed frequency. (Their presence in the photograph is explained by the fact that the 1196 was originally converted for use as a normal BC receiver.)

Having fixed the coils in position, the set may be wired up in accordance with the new circuit diagram. Identification of the various resistors and condensers is quite easy, as their positions are clearly marked on the plan fixed to the chassis bottom plate. The under-chassis is, however, rather cramped and where possible,  $\frac{1}{4}$ - or  $\frac{1}{2}$ -watt resistors were used to conserve space. The somewhat hazy appearance of the original chassis shown in the photographs is explained by the many experiments which were carried out with noise limiters and S-meters before the final circuit took shape.

Some care is necessary in wiring in the noise limiter and AVC components in the confined space, as it is only too easy to solder leads to the wrong tags on the tag board.

The double-diode triode is used in the normal way, one diode acting as IF rectifier, the other as AVC rectifier, the triode section being the first audio amplifier, with the audio gain control connected in its grid circuit. Resistance capacity coupling is used between the first audio and the 6V6 output stage.

The speaker transformer may either be

mounted on the chassis or on the actual speaker, in which case an extra lead should be taken to the Jones plug at the rear of the chassis.

It will be best to leave the wiring of the S-meter components until the set is in operation, and the HT positive lead should accordingly be taken straight to the IF transformer lead which connects to R18 mounted inside the IFT can.

When the rewiring of the 1196 chassis has been completed a short length of co-ax should be run from the aerial coil L8 to the "hot" end of L7, the screening being earthed to the chassis.

**Checking the 1196**

The wiring should now be carefully checked, the valves inserted in the 1196 chassis only and the power supply and speaker connected to the Jones plug, when this portion of the receiver may also be tested.

Switch on the power and connect a short aerial to the "hot" end of L8. Set the aerial trimmer C16 to about half capacity, and rotate oscillator trimmer C20 until signals or noise can be heard. The signals will be broadcast signals in the 1,500 kc vicinity, and a simple method of tuning to the first IF of 1,500 kc, in the absence of a calibrated frequency meter or signal generator, is to tune in the BBC Third Programme transmission on 1,474 kc. Having located this signal, using the oscillator trimmer, detune the trimmer slightly HF and peak up C16 on background noise.

The IF transformers will usually be already accurately lined up, but it is as well to touch these up by adjusting the appropriate trimmers for maximum output, as registered on the speaker or output meter.

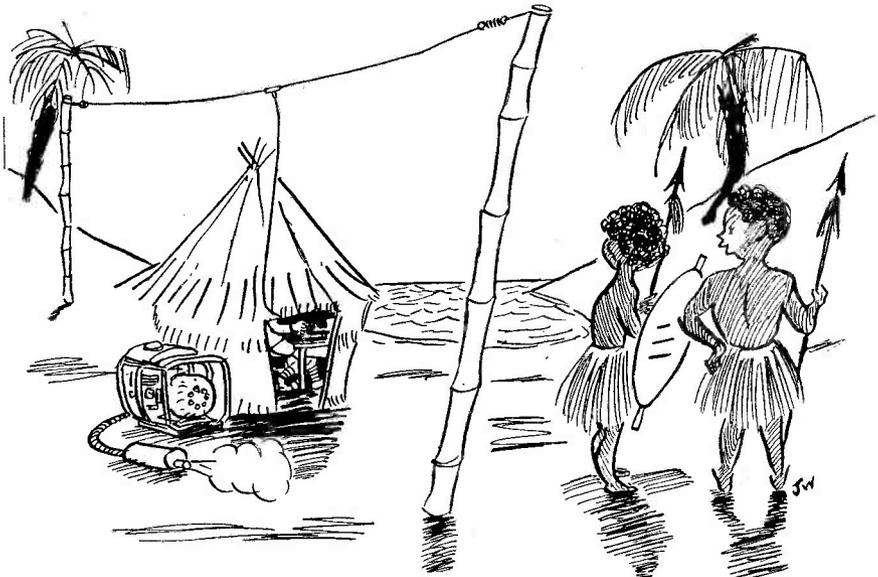
Having put the 1196 into working order, transfer the aerial to the junction of C14 and C15 and peak up the noise or signal on C14.

*(Some final notes follow next month)*

**PANEL MARKING TRANSFERS**

Further to the note on p. 459 of the August issue ("Here and There"), the firm of H. Norvall & Sons, Ltd., 5 Torrens Street, City Road, London, E.C.1, can meet the require-

ment and have sent us samples of the range produced by them. This is being extended to cover the markings called for in Amateur Radio applications.



" . . . White man boss gibben boys on Twenny DX thrill, 'huh . . . "

# DX COMMENTARY

## CALLS HEARD, WORKED & QSL'd

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

**T**HE month of August has been showing distinct signs of the awakening of the true DX season. Bands have been patchy, but the real stuff has been coming through from time to time, and there is no reason to suppose that the coming autumn and winter will be any less successful than the last.

Naturally the 28 mc band has been the least reliable. There is always DX of some sort on the band, but one never knows quite how good it will be from one day to the next. South Americans and South Africans (mostly on 'phone) have been terrific on occasions, and there have even been a few days when the W's have broken through in the evenings. On one occasion we heard a W6 at 1700, and on another the 2's, 3's and 8's were solid until nearly midnight.

The 14 mc band continues to bear the brunt of the DX, including the strenuous efforts made by all the professional chasers. It is impossible for a new or interesting station to show his nose on this band at any time of day or night without being rapidly submerged. We must remark, however, that the queues seem to have been pretty orderly of late. Witness ZD6DH (our old friend VQ2DH out with a portable), who hasn't wasted any time at all and has just been knocking off long strings of G's without too much confusion or perspiration. Can it be that the callers, at last, have learned to spread themselves out over a few kilocycles instead of striving for an exact zero-beat? It *could* be!

Regarding the other bands—7 mc is waking up with a vengeance, and 3.5 mc continues to attract the stalwarts latish in the evening. Sometimes they are rewarded by a VK or two, a smell of a ZS or even an LU or PY. Those that drag themselves out of bed in the small hours nearly always reap some sort of reward for their virtue.

### Twenty-Metre DX

Let us deal first with 14 mc, as usual; it attracts most of the correspondence and yields most of the results—witness the figures in the Four-Band Table.

The band is running true to type in one way, at least. Last year, and in 1947, we noticed that late August and early September are apt

to be interesting at about 0830-0900; it is too early in the year for the real welter of VK's and ZL's to arrive, but, instead, if we dig for them we can find FO8, VR2, VR5 and ZM6—all worth digging for. Well, there they are again; we gave VR2BG his first G contact at 0830 on August 19, and there wasn't even a queue. (Of course, we lucky types who can get on the air at such an hour have an unfair advantage.) FO8AC has been rolling through in grand style and stations have been heard calling ZM6AH. On one occasion all the ZL's were busy calling VQ2AC, but we don't yet know if he's genuine. We didn't know that anyone had put the Cocos Islands on the map again since G6CU's grand party in 1946.

For a period of a week or so CR10AA was to be heard every morning, and a few lucky ones managed to work him. The evening periods have been interesting chiefly for the enormous signals from VQ4 round about 1800 GMT. Our friend John of VQ3HJP is now VQ4HJP, and is putting out a terrific punch. VS1's have also piled up on occasions, with some of the best signals coming from VS1CW and VS1DF.

### CO's WORLDWIDE DX CONTEST

This will be run on the same lines as last year, with the exception that the 3.5 mc band will *not* be used. Activity will be on 7, 14, and 27/28 mc only.

Serial numbers will be exchanged, consisting of the RST report followed by two figures indicating the Zone in which the competing station is situated.

Contacts between amateurs in different continents will count three points; those between stations on the same continent but in different countries, one point; those between stations in the same country (for the purpose of adding to the multiplier) no points.

The score will be the sum of all points multiplied by the sum of the multipliers (a) for each Zone and (b) for each country.

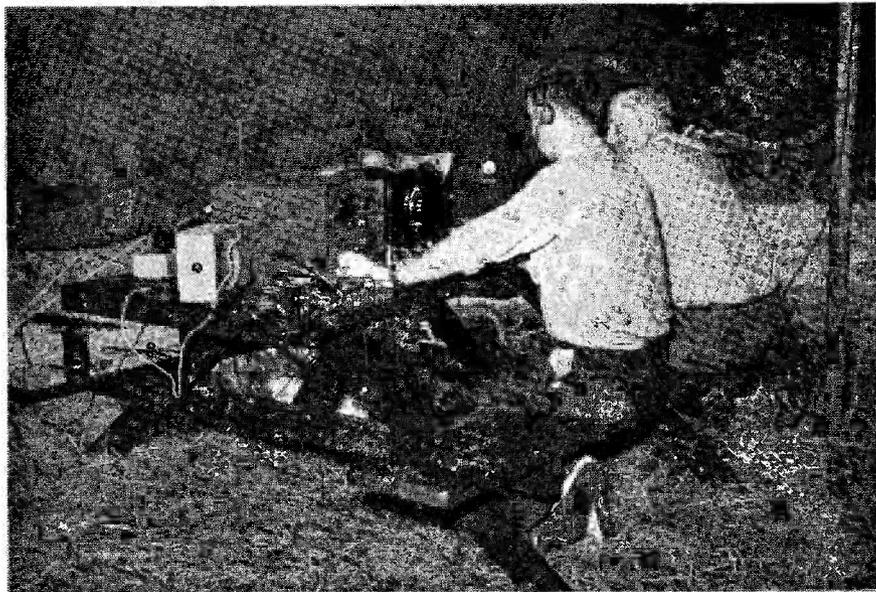
There will be awards for the leading stations on each band, as well as for the overall leaders who use three bands. Also there are awards for single-operator stations, as distinct from multi-operator stations.

Times are as follows:

'PHONE: October 29, 0200 GMT to October 31, 0200 GMT.

CW: November 5, 0200 GMT to November 7, 0200 GMT.

Log sheets will be available in due course from the *Short Wave Magazine* office at 49 Victoria Street, London, S.W.1.



This is not, as you might suppose, an impression of a /P station in this country, but a view of the Twenty-Metre tent manned by members of the Westchester Group for the recent Field Day in America. The Tx was VF0-6L6-807 and the receiver an HQ-129. Results are described as disappointing, and they had some trouble with the beam erected for the occasion.

We have already mentioned the ZD6 party, which, of course, only lasted for a few days.

G6CB (London, S.W.19) has managed to pass his century, with help from FQ8SN, ZC1AZ, ZD1SW, IS11EH, CT3AV and a few others. G5FA (London, N.11) has stacked up EA8FF, MD4GC, CX3CS, HE1IL and GM3ANO/VS6. He was also interested to work a station signing W6MBA/M6, using 30 watts in his car near Los Angeles, with a vertical quarter-wave aerial on the car and a home-built receiver. This can be regarded as a contact of unusual merit.

G2CDT (Sheffield) is unhappy about QSL's; he has sent one out for every QSO since he was licensed three years ago, but still lacks replies from such countries as ZB1, ZB2, ZS5, VP6, VU, KP4. He also mentions an Italian station who said: "I will send my card when I receive yours; so many stations have promised cards and they have never arrived. I only QSL on receipt now." If the DX stations would only QSL on receipt, lots of people would be happy.

G2HKU (Sheerness) confirms that the FT4 prefix has been changed to 3V8 "by Government order." Another interesting note from 'HKU is to the effect that the many EA stations running T5 or T6 notes rarely give *anyone* a T9. We can confirm this—a recent QSO with an EA8 (T4) blots our log with a solitary T8

on a page full of T9 and T9x. There must be some loose AC charging around over there—probably left over from their own transmissions. 'HKU wants to know if anyone has had a card from HZ1HZ yet? He asks for QSL's direct but doesn't seem to do much about it.

From G6AT (Hampton Hill) comes a list of DX including FE8AB MD4GC, MI3's EA8's, XZ2FK, HZ1KE and CE5AW. He also worked EK1FN, a new arrival out there who promised to QSL.

G6BS (Cambridge) has been very active on Twenty this month, and has polished off VQ4's, ZD2's, VQ2's, FF8GP, VS7NX, VS1's and 6's and ZD6DH. He now has a beam on South Africa. But he really uses 14 mc as a hunting ground for persuading elusive countries to keep schedule on 7 mc, on which band he is well away toward the century!

Nice DX, worked by G5WC (London, S.E.19) on his indoor bent dipole, includes KL7PM, KP6AB, VS2CH, UAØPA, VS1AE, JA2BQ and VU2JP. So 5WC remarks: "Don't let anyone say they can't work DX because their aerial is poor." Furthermore, he uses four crystals, not a VFO! On this subject we might mention G8OJ (Manchester), who lent his VFO to a friend and was rockbound for a time. He (*and* the friend) have now decided that a good VFO is worth a score of crystals. While firmly stuck to 14022 kc, 'OJ

## FOUR BAND DX

Station	Countries Worked					Power
	3-5 mc	7 mc	14 mc	28 mc	Total	
G8VB	50	49	122	59	142	120
G6QB	34	67	166	115	187	150
G3EIZ	34	23	39	15	53	25
G2AO	30	34	114	32	123	10/70
G3AKU	29	45	130	21	138	30/70
ZB1AR	29	38	87	40	100	25
G6BS	28	96	161	4	172	150
G2AVP	28	55	156	32	163	25/120
G2VD	27	52	160	84	165	150
G3ATU	26	60	158	81	166	10/150
G3DO	21	37	150	97	180	150
G2YS	21	23	110	25	121	150
G3ABG/A	21	36	76	3	79	45
G3FGT	21	23	63	11	71	25
G3ACC	20	13	101	5	110	150
G8VG	19	51	107	26	122	60/75
G6BB	19	35	105	30	118	10/70
G3FNJ	19	34	104	42	116	150
G4QK	19	26	98	3	102	150
G3BDQ	18	26	107	9	109	25/150
G2DHV	18	20	78	4	81	25/60
G5FA	17	83	122	55	138	35/150
GW3CBY	16	21	40	5	52	15/30
G8IH	14	57	179	30	186	7/150
G8IP	13	34	114	62	129	3/150
G3CBN	13	44	107	26	118	50/150
G8QX	12	18	107	70	129	150 (P)
G5GK	11	88	123	29	185	150
G8KU	9	26	125	48	134	120
G2HIF	6	9	42	44	71	150 (P)
G2BJY	4	24	74	88	121	25
G4CP	3	45	191	64	191	150
G5WC	1	50	116	12	117	45
G6CB	1	6	37	86	103	20/150
G2HKU	1	33	85	7	93	4/25

managed to work VS6AX, VU2MQ, HZ1KE, JA2AA, KH6UL and VS1BQ, so take heart, you crystal-bashers.

G3FGT (Birmingham) likes his 266-ft. aerial much better after a month's run, and has added VS9CC, UA9CQ, VS7AL, VS7AH, ZC1AR, MD2GO and lots of W, ZS, VQ4 and PY. He hasn't neglected the other bands, either.

## Exit the Commercials ?

G3ATU (Roker) passes on an ingenious method of ridding our bands of out-of-place commercial stations, as expounded by W3EVT at OZ7BO's station, with G3ATU also on the spot. Treat each commercial as a new country. Then the California Kilowatts will descend upon them and scare them clean off the air ! 'ATU has had a fine trip round PA and OZ, but says everyone was too busy coping with inch-thick steaks to worry overmuch about DX in the bad summer conditions !

G2FSR (Chingford) has put his score right up on the top line with HI6EO and HE1IL ; we also heard him working ZD6DH, but maybe he wasn't new. 'FSR spent a Sunday afternoon listening to nice things like PK5RU, VK1VU and AC4YN, but did not raise them. G3DO (Sutton Coldfield) improved his total with the help of CP5FA, HI6EC and MIB (all 14 mc 'phone). G2SO (Southend) added HZ, KZ5, EA8, XZ and ZE1, but thought conditions were shocking.

Nice ones from G5BZ (Croydon) were VQ5ALT, VP9SS, VQ8AX (all 14 mc CW) and VK1ADS (14 mc 'phone). G8KU (Scarborough) made quite a big jump with MIB, EA8, VQ4, MD4GC, CR6AI, XZ2FK and ST2WB. He is now stuck at 39 Zones and has C8YR's card for Zone 23, but can't find a Mexican for Zone 6 !

G3CNW (Ickenham) reports for the first time—he has scored 38Z and 122C in about eight months of operating, on 14 and 28 mc only. Some good recent additions have been AG2AG, DU1HR, FO8AC, KS4AI., MP4BAD, VQ8AN and XZ2FK. He also worked G3AQZ/FF8, flying over French West Africa, but, of course, can't count him as a country. Another station he mentions is VK4ZI on Thursday Island—an interesting one that we haven't met before.

## Grouse Department

G3CNW continues with a 'plaint that we most heartily endorse. Why, he says, do we still hear "Your sigs are Q 5 and S 9" ? What does that "Q" stand for ? QRM, he suggests ! It is sloppy ; you can either say R5 and S9, or, if you stick to twelve-year-old procedure, QSA5 and R9 ; but don't, for the love of Pete, mix up the Q's and the S's. What's wrong with uniformity, anyway, in the use of the RST code

and the dropping of ancient practices? "R" for Readability, please.

G3BNE (London, N.W.3) has now climbed to 38Z with the help of VP4TR, and his country total has jumped somewhat with MP4, MS4, SVØ, KV4 and other nice ones. All these were between 1730 and 2230 GMT.

GM3CSM (Glasgow) has now applied for his DXCC, with 105 cards, and is wondering whether he is the first of the GM "three-plus-threes" to do so. There will shortly be four GM DXCC's in about three square miles! 'CSM has recently worked MD4, MP4, KG6DI, KH6's, TI8RB, JA2AB, HZ's, FM8AD, VS1DA and a mysterious one, HB1IZ/TI, QTH lost in QRM. He would like to know whether anyone has had cards from VK9GW, VQ8AD, KB6AD, OQ5BU, VP3JM, FQ8SN or LX1BG. (We have the first two, but none of the others.)

G3AKA (London, W.5) comes in for the first time. With the grimmest of aeriels (10 ft. high, between two high walls and at an angle of 30 degs.), three weeks' searching brought in CE3CB, KV4AA, VS6AC, VQ4, KS4, KZ5, KH6, MI3, SVØ and lots more. Now, just what *does* this RF do after leaving the tank coil? 'AKA would like to know whether FY8R ("via REF") is genuine. He also tells us that CR4AC is on, and that EA8JM is in Rio de Oro. The YR's, too, seem to be changing their spots, as YR5KAA asks



"... You're so strong, Pedro old man, you might be right here in the room with me..."

for QSL's via Box 88, Moscow, and says the prefix is to be changed to YO.

New ones for G4QK (Croydon) were VS9AL, MD3MB, EA8RM, MD2GO and TA1AT. Funny stuff included OQ5N coming in on an East-West beam; "AC4AR" again, maybe, although now T9. Both 'QK and G6BB (London, S.W.16) mention VK3APV, using 2 watts to a stacked rhombic and roaring in. 'BB adds KP4JS, UF6AC, VK6DX, UH8KAA, HZ1JC, EA6EG and TA3FAS. He now has a nice VFO going, consisting of a single valve coupled straight through to the erstwhile CO, which sounds interesting.

G3DIJ (Gateshead) uses 60 or 70 watts to 807's, with an aerial below the level of the buildings in all directions; despite this he had a 589 from PY and an S8 'phone report from a W4. He offers to knock his power down to 10 watts if the other QRO people will do the same; at least he did work a W5 with 9 watts. Ah me, this QRP question! There's no end to the argument; the only thing we can all agree upon is that if *everyone* used QRP the bands would be far more pleasant and there would be very little less DX than there is now. G3FIT (Somerset) is another one contributing to this sore subject; he finds 10 watts on 7 mc pretty hard going these days.

And so much for that 14 mc band . . .

Overseas News

VQ3AA (Dodoma) sends his QTH (see panel) and says he is active with 40 watts on 7 and 14 mc 'phone and hopes by now to be on 28 mc as well.

ZONES WORKED LISTING  
POST WAR

Station	Z	C	Station	Z	C
Phone and CW			Phone and CW		
G4CP	40	191	G2YS	36	121
G2FSR	40	191	ZBIAR	36	97
G6OB	40	187			
G8IH	40	186	G6CB	35	103
G5GK	40	185			
G3DO	40	180	G3CVG	34	111
G3ATU	40	166	G3ACC	34	110
G2VD	40	165	ZD4AM	34	96
G2AVP	40	163			
G3AKU	40	138	G2FYT	33	100
G8IP	40	129			
G2AO	40	123	G4QK	32	102
G8KU	39	134	G2SO	31	87
GM3CSM	39	127	G2DHV	31	81
G5MR	39	118			
G6PJ	39	87			
G8VB	38	142	Phone only		
G5FA	38	138			
Z5ZAT	38	114	G2ZB	39	160
G3BNE	38	109			
			G2XK	38	126
G2BJY	37	121			
G6BB	37	118	G3DO	37	145
G5WC	37	117			
G3FNJ	37	116	G8OY	35	129
GM6IZ	37	98	G2ALN	35	120

SVØAL adds to last month's remarks by saying that SVØUN (the key-click specialist) operates with the blessing of the Greek Government, which makes 'AL's DX very difficult at times. His score to date with 5 watts is 82 contacts, 33 countries, 11 zones, with several "easy" ones still missing. An interesting point is that he is licensed for 21 mc.

DL2KW (Frankfurt) tells us that DL7's are now official, this prefix being reserved for the Western Sectors of Berlin.

WØUOX (Redwood Falls, Minn.) asks us to tell G4CP that FF8GP does send cards out—

he has seen them—and also that VR2BD does his stuff. 'UOX is now up to 167 confirmed. He thinks there will be some FY8 activity soon, and also hears that FB8AB is nearly ready to start up.

VQ4CUR sends a very interesting analysis of 3227 QSO's made since last September on 28 mc. Peak month for G's was October (291) with March giving 201 and September 162. Worst were June (25), November (32) and April (36). He also tells us that he hopes to spend the CW week-end of the CQ Contest in Zanzibar, as VQ1CUR. Brave chap! We wouldn't be in his shoes for anything.

ZD4AM (Tafo) has amassed some nice DX, such as VK9NR, ZD9AA, VR2AS, CR6AW, FQ8AA and some OX's. He hopes to be on 7 and 3.5 mc later in the year. One of Harold's 7 mc Calls Heard lists appears at the end of this feature.

"Just to prove that it does happen": That is the inscription on a card from VS7AD, who operated from a flying boat anchored at Male, Maldiv Islands. Yes, the card has Maldiv Islands stamps and all! 'AD says he would like the position of portable operation (*vice* DXCC and the like) clarified. If he *has* to be landborne, he says he will carry the Tx ashore next time! Did anyone work VS7AD/VS9?

ZS2AT asks why HZ1KE says "QSL via G2MI? 'AT says: "Don't see why he should be under cover." But many such instances merely mean that the chap is only going to stay put for a short time, and that was doubtless the case there. 'AT also tells us that ET3Y has now returned to his home country—Sweden.

A note from G3AAT/A (formerly H.M.S. *Collingwood*) tells us that he is shortly sailing in H.M.S. *Devonshire* and will be QRT, pending Admiralty/G.P.O. arrangements concerning ships afloat. He hopes, however, to get on the air from various ports of call on 14, 7 and 3.5 mc.

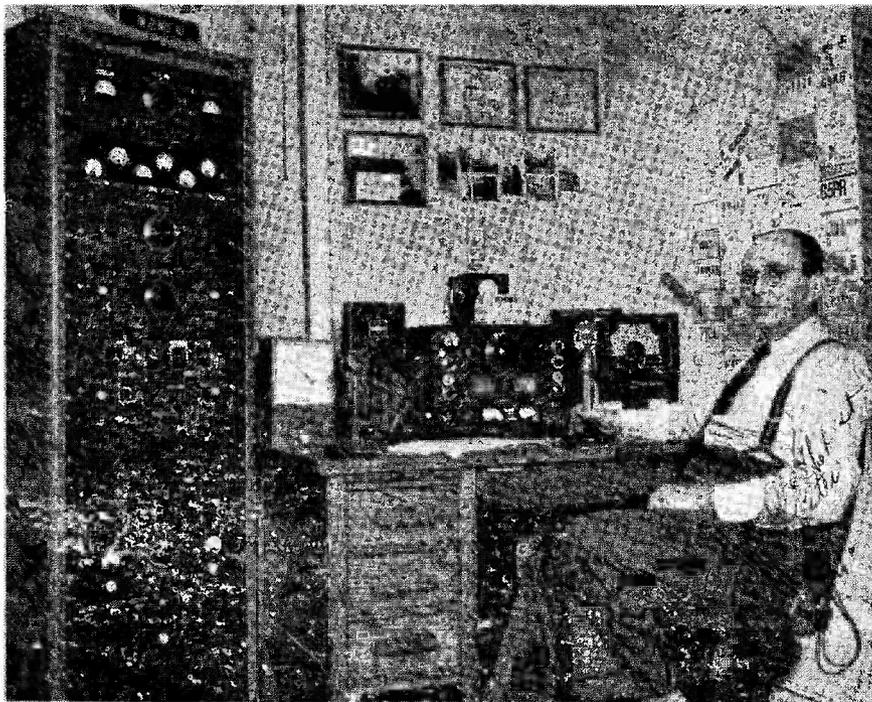
EA2LS (San Sebastian) springs a surprise on us by sending a short list of *Top Band* Calls Heard, which appears at the end of the story. He promises, also, to send "a wider list" next month. Fine work, this. And there is also a very interesting list (same band) from W. J. C. Pinnell (an SWL correspondent of ours), who lives in Sidcup but has been spending a holiday in Germany. He heard an absolute welter of *Top Band* stations between July 31 and August 10, including several on 'phone. Just watch that band this coming season!

MD7GR (Famagusta, Cyprus) writes to say that he commenced operations officially w.e.f. August 16, but is afflicted by "shocking DC mains, considerable voltage variation, and frequent break-downs." He will be looking for G's—QTH in the panel.

In a long and interesting letter, KG6DI

### DX QTH's

EA8TM	Tomas Morales, Box 8, Laguna, Tenerife, Canaries.
F9QU/FM8	Charles Bernicot, c/o C.G.T., Fort de France, Martinique.
FF8GP	G. Pijeau, Chef Reseau Radio, Gao, French West Africa.
FF8MM	Box 207, Dakar, French West Africa.
FF8PM	Box 566, Dakar, French West Africa.
FQ8SN	c/o S.C.K.N., Brazzaville, French Equatorial Africa.
HZ1KE	British Military Mission to Saudi Arabia, Taif, MELF.
KG6FH	Box 100, Guam, Marianas ( <i>ex-J9SIR</i> ).
MD7GR	G. H. Rathbone, Evridiki Street 28, Famagusta, Cyprus.
MD7WE	c/o R.A.F., Nicosia, Cyprus.
MF2AA	Major M. H. R. Carrogher, HQ VG Police, Trieste.
MI3GH	A.P.O. 843, c/o P.M., New York.
MP4BAC	R.A.F., Sharjah, Trucial Oman, Persian Gulf.
PJ5KO	c/o W6MEK, 2719 Richie Street, Oakland, Calif.
PK4KS	Tan Koon San, Pangkalpinang, Bangka, Indonesia.
PK5RU	Box 25, Bandjermasin, Celebes.
PZ1QM	Box 679, Paramaribo, Surinam.
VQ3AA	S. H. W. Tanner, c/o Traffic Dept., East African Railways, Dodoma, Tanganyika.
VQ3AD	c/o C. I. R., Arusha, Tanganyika.
XZ2TH	75 Montgomery Street, Rangoon.
YK1AC	Alan Rabbat, Salhic Shouhada Street, Damascus.
ZD4AC	J. C. Breakell, Box 933, Accra, Gold Coast.



General view of the station at W2NFU, Forest Hills, Long Island. The PA is a pair of 75T's run at 400 watts, modulated by push-pull 805's. The transmitter is entirely home-constructed and can be remotely controlled. W2NFU is on Ten only, and has worked 100 countries on phone, using a 4-element rotary beam.

(Guam Island) explains that his is a single-operator station at the U.S. Naval Base in the centre of the island. KG6DI himself is ex-W6DKM, vintage 1927, and was KA1AC before the war. He also operated as XU8CC, Shanghai, and XU3CC, Cheefoo, in those days, and then came back after the war as W7JEF before the present KG6 assignment. The 14 mc outfit at KG6DI is quite simple—a BC610 driving another BC610 converted to push-pull 250TH's, feeding a rhombic 90 ft. high with five  $\frac{1}{4}$ -waves in each leg, the whole thing aimed at Kansas. Happy days, Clark !

#### Top Band Comments

First, hardly any claims have yet been received for Top Band Counties and Countries worked. The best was from GW3CXY, with 16 Counties and 5 Countries. Let us have them next time—dating from August 1, 1949, as the starting line. And please note that we booped last month in stating that the Isle of Wight counts separately. It does *not*; we must come into line with the VHF boys on this, and they

count Hants. and the I.O.W. as one and the same, so we must do it too.

G3NT (Northallerton) has concentrated on the Top Band for some time and tells us that he only wants Bucks. and Hereford for *All English Counties*. Further, he has worked 10 Countries—G, GM, GW, GI, GC, GD, EI, OZ, OK and D. This is a good "stinger-up"—but remember that for our Top Band ladder, which we hope to start next month, everything begins from August 1. G3NT suggests a distinguishing call to make it clear that the caller is seeking new counties, but we imagine that things will straighten themselves out once the gang gets going.

#### More DX on Eighty

The Four Band Table is in the 3.5 mc Order of Merit this month, with the call G8VB (not unexpectedly) at the head with his wonderful score of 50 countries. G6QB lumbers along behind with 34, which score is also logged by G3EIZ (Liverpool). Considering how long 'EIZ has been licensed, together with his 25

watts, this represents a considerable amount of hard work on the band, and is a most creditable performance. G8VB (Ealing) descended to the CW end of the band to look for the VK, ZS and LU DX, but was thoroughly disgusted by the high-powered stations working locals right on top of the DX, to say nothing of the CQ-hounds. He worked PY7WS at 0330 (CW on 3515) and was afterwards called by ZP2DR, but is very suspicious about him.

Other points from 'VB: VO2BL is now VP9HH and should be on 3755 kc 'phone soon; VP6YB has promised to come on, either 3923 kc 'phone or 3595 kc CW.

And just as this issue was being sent down, in came an official ARRL letter confirming G8VB's "Worked All States," in the following terms: "... We have checked our records and you are indeed the very first European to receive the WAS award for work on 80-metre 'phone. . . ." This will finally clinch the matter for those who may have had doubts about the G8VB claim—it is without any question one of the outstanding feats in post-war Amateur Radio, and all credit is due to him.

G5BZ has broken into the CW DX on 3.5 and has worked PY7WS, LU3EL, VK5KO numerous W's and VE's, and has been received by ZS5YF. G3EIZ has raised OX3MG and LU3EL, and also found PY7WS an excellent signal, but hasn't raised him yet. He reports that there are rumours that 4X4BZ has been heard on the band—a nice Asiatic catch for those that want one.

G2BGG (also in Liverpool) worked PY7WS, using an input of only 18 watts; he was "helped across" by a QRO station and wishes to thank the high-powered stations on the band for their "excellent ham spirit." What a nice change it makes to hear a remark like this instead of the far more usual grouses!

Incidentally, we have received innumerable letters, after publishing various grievances, from others who heard the incidents referred to and indignantly state that the "grouser" was to blame and that facts were not in the least as reported by him. We never know, ourselves, who was in the right, but we do know only too well that the chap transmitting never hears *all* that goes on, and we would pin our faith to a third-party listener's report of proceedings every time.

More than once we have (so we thought) had a QSO busted up by sharp practice or Spivvery, only to find ourselves accused, afterwards, of butting in on a QSO that was already under way! If we have ever done this we humbly apologise; but we know of *scores* of cases where others have cheerfully blasted their way into a party to which they were not invited, instead of just waiting until the end of a short QSO. So let's soft-pedal on the grouses and concentrate on a little more friendliness all round; maybe the bands will get better that way, too.

ZS5YF told us the other day (on 14 mc) that on 3.5 he had, so far, only worked G5DQ and G6QB, but had heard G5BJ (569), G8AX (589) and G5BZ (449). G5DQ (Cambridge) also told us that G2PL (Wallington) has worked TG9RB on the band.

### Forty Metres

A notable increase in 7 mc activity is reported. G6BS, with his score of 96 countries, is obviously hot-foot after the century, and may have passed it by next month. G5FA (London, N.11) says he is also going to make a special effort to score his century before the end of the year. G4RZ (Harrow), running his usual 12 watts, had a stroke of luck and worked ZL4CS (the first ZL he had ever called on the band) at 0615 one morning,

## G CALLS HEARD OVERSEAS

### 1.7 mc

EA2LS, Joe Azurza, Matia 14, San Sebastian, Spain. G2KF (569), 3CBC (559), 3EPZ (559), 4XB (579), GW3CBY (579), 3EHN (569). August 9, 2240-2320 GMT. (Rx: 10-valve Super).

W. J. C. Pinnell, c/o Kastanienallee 73, Braunschweig, Germany.

\*PHONE: G2ACV (56), 2DTD (33), 2FLK (44), 2FXK (56), 2KO (33), 2NV (56), 2PX (45), 3CTN (55), 3DAQ (55), 3DBD (56), 3EIW (44), 6IO (45), GM3BQA (45), 8FM (55), GW2BG (55).

CW: G2AAS (55), 2AKU (55), 2AOP (55), 2CPT (55), 2CWY (55), 2CXW (55), 2DLO (55), 2DTD (55), 2DWN (45), 2FFY (55), 2FNW (55), 2HNB (55), 2HW (56), 2JF (55), 2KF (55), 2OG (45), 3ADI (56), 3AFL (55), 3AKW (55), 3ARS (55), 3ART (56), 3BEJ (56), 3BEX (55), 3BQB (45), 3CBC (55), 3CST (55), 3CHW (54), 3DBD (44), 3DO (55), 3DRL (44), 3DSW (44), 3DXA (55), 3EAE (44), 3EBG (44),

3EES (56), 3EKT (56), 3EMU (54), 3EPK (55), 3EPZ (55), 3EQK (55), 3ERN (56), 3FDS (55), 3FEX (55), 3FMB (55), 3FNL (44), 3LP (45), 3OA (55), 3PU (56), 3TA (55), 3ZP (55), 4FB (55), 4JB (55), 4MR (55), 5OF (55), 5UH (56), 5XB (55), 6DV (56), 6ZR (56), 8DF (44), 8FG (56), 8GB (55), 8MU/P (56), 8OD (43), 8TK (55), GC2BMU (56), GM2HIK (44), 3EHI (55), 8FM (57), GW3CDH (44). (All CW stns. T9; Period: July 31-August 10; Rx: S9).

### 7 mc

ZD4AM, West African Cacao Research Institute, Tafo, Gold Coast Colony.

CW: EI6X (44), G2CIY (55), 2FBU (34), 2FGQ (45), 2RD (33), 3AGG (45), 3BII (44), 3BYD (55), 3CYQ (32), 3DHS (23), 3ETU (44), 3FJB (33), 3IV (34), 3UZ (44), 3WL (44), 4JS (33), 5CX (34), 8DR (55), 8IA (22), 8PX (45), 8WC (45), GI3ELN (44), 5UW (34), GM4NR (22). July 3-30. RS in brackets, all T9. (Rx: R.107).

getting a 559 report. Others worked on 7 mc include CO8FH, YV5AL, EA8BC and PJ5ZZ, as well as VE's and W's. G2HKU also mentions raising ZL4FT "apart from the usual W's and U's."

G3GEX (North Harrow) has been a keen listener on Forty for some time and will doubtless be stirring up the band himself now. He heard HZ1KE at S8/9 about 2200 one night. Referring to the GR2 station mentioned last month, he says he heard GR3AP giving

his location as "on the Berlin airlift." He also mentions the "EZ" prefix, which, of course, doesn't mean a thing at present, as the future government of the Saar is unsettled.

Next month's reports by the 14th, please, and first post at that to 49 Victoria Street, London, S.W.1. Mark them "DX Commentary," and keep your Four-Band scores, Top-Band Counties claims, and so on, on different pieces of paper or postcards. Until then, 73, Good Hunting, and BCNU.

## FIRST CLASS OPERATORS' CLUB

The duties of assistant honorary secretary have been taken over by G5PS, and he will forthwith assume full responsibility for the Club Circular Letters. Will members please note, therefore, that correspondence relating to the C/L's should be sent direct to G5PS, but on all other matters to G2ZC. As the C/L's will now circulate regularly each month, members are reminded that the rapid passing of the various rotas is essential if the maximum benefit is to be derived from these circulars, which have always been a feature of the FOC organisation.

### Club Dinner

This will take place in London on Friday, November 25 next, at the Aldwych Brasserie, 346 Strand, W.C.2. Members who have not already booked for the Dinner are asked to do so as soon as possible now, since seating may again be restricted. A hospitality list has been opened of those living in or near London who offer accommodation as hosts to members coming from afar. Members willing to act as hosts, and those wishing to be accommodated as guests, should write G2ZC or G5PS so that the necessary arrangements can be made. Incidentally, we already know that three overseas members of the FOC are coming to London specially to attend the Club Dinner.



President :

GERALD MARCUSE, G2NM

Hon. Secretary :

Capt. A. M. H. FERGUS, G2ZC

### Marathon Contest

In order to give a clear field to those taking part in the QRP Contest, already announced, the FOC Marathon will start on Monday, October 3 next. As in former years, Club members not taking part in the QRP event are requested to keep off during that contest period.

The Committee has decided that for this year's Marathon, the first FOC member to work 50 other members will be declared the winner. Contacts may be made on any amateur band, and arrangements are in hand to notify the official ending of the Contest. These will be explained in the September C/L. The rules for the Marathon are already in members' hands, as they appear on the reverse side of the reprinted Club rules and by-rules, recently distributed.

### DX Items

Two members have worked LU on 3.5 mc, using QRP, one giving an LU3 his very first G contact; another bit of QRP DX was a member QSO'ing a PY on Eighty. During the recent VHF Field Day, G3VM worked PAØLU for an FOC-member QSO, though the first Club contact with PA was made by G5NF/PAØLU in November, 1948. A chance contact on 3.5 mc from the South revealed that two members far in the North were not only portable up in the mountains with QRP, but were using a kite to hold up their aerial.

### Election Notice

In accordance with the Rules of the Club, the following are declared elected to the active membership list of the FOC :

H. S. Bradley, W2QHH (Hamilton N.Y.)

Mrs. M. Kramer, ZS6KK (Johannesburg)

F. E. King, XZ2FK/G2FK (Rangoon)

R. Baker, G6QN (London)

J. Harvey, G2CQJ/VS2CH (London)

B. C. Oddy, G3FEX (Bramber, Sussex)

All FOC correspondence on matters other than the C/L's should be addressed direct to Capt. A. M. H. Fergus, G2ZC, 89 West Street, Farnham, Surrey.

## Amateur Radio in the United States

### A Visitor's Impressions

By B. RANDELL, B.Sc. (GW3ALE)

**D**URING last summer the writer was lucky enough to be in the United States on business, and to visit a number of large towns in the industrial parts of that country. This gave him opportunities of meeting many American amateurs, including a number worked from this country on one or other of the DX bands. In the course of visiting these stations, some of the impressions gained were in accordance with preconceived ideas of Amateur Radio in the States—but others proved to be quite contrary to what had been expected.

Although, during the course of the trip, other American cities were visited, it was not always convenient (owing to business obligations which were not even remotely connected with radio) to make contact with amateurs in all. However, it was found possible to visit stations in the areas of Cleveland, Ohio (W8), Pittsburgh (W3), and New York (W2), and these notes form some record of impressions gained, not only from personal observations but also from many hours spent in conversation with American amateurs.

Further, the writer had an opportunity of meeting Lawrence LeKashman (W2IOP), editor of *CQ*, who was instrumental in arranging a visit to K2UN, the United Nations' amateur station at U.N. Headquarters, Lake Success, New York.

#### The Power Angle

It must be admitted that from what had been heard from W's in contacts with them from this country, one rather expected to find a transmitter run at a half-kilowatt or more in each station visited. This conception was soon proved wrong, and while it is probably true that the average American amateur uses about 500 watts, there are still very many of them who are keen on low-power working. Of course, there are a very large number of stations running the full gallon and many of these are supposed to favour the "Californian," or rubber variety, of kilowatt! For example, the writer was fortunate in being able to have a very long contact with two close friends in South Wales by courtesy of a Middle Western amateur. The contact had been in progress for some considerable time on CW with reports of 599 both ways (which was not too bad for

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Our contributor made the most of his opportunities during a business trip to the States, and in this article is able to discuss in a general way the differences, and the similarities, in the practice of Amateur Radio as obtaining in this country and the U.S.A.—Ed.

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a very busy time on the low frequency end of 14 mc) before the owner of the station was persuaded to reduce his input from 1,800 watts to a mere 350 watts! And that with a three-element beam . . . no wonder that we had a clear channel all through the contact!

But on the other hand, one of the happiest amateurs met over there—and one who certainly got as much fun out of Amateur Radio as the QRO types—had a simple 6L6-807, tritet-PA rig, and a modulator with a pair of 6L6's; he had never used more than 40 watts, although he was a radio engineer by profession and had ample facilities for the construction of a high-power transmitter.

In general, the stations visited were just as cramped for space in which to erect aerials as most of the G's situated in towns. Some of them, especially those in the New York area, have been most ingenious in their aerial systems. The result is that almost all of the stations seen could only operate efficiently on one band, as, owing to the QRM situation in congested areas, they have been forced to adopt some form of beam. Incidentally, before going to the States, one had heard all sorts of hair-raising stories about the magnitude of the interference commonly experienced, the usual comment being that European amateurs know nothing of bad QRM.

#### Interference Problem

From personal observation, by listening on various bands in different parts of the country and on receivers of varying degrees of merit, one's impression was that the American amateur has little more to put up with than the European when the bands are open. True, much of the interference is from stations in other parts of the Continent and most of it is high-powered (and America is just as much troubled by the radio spiv as are we), but on Twenty at least, on which most of the listening was done, things sounded very little worse than they are over here. The most difficult band on which to operate in the States is Eighty without any doubt, as it is simply full of high-powered signals, and a contact which starts out with reports of S9 'phone both ways, frequently ends up by neither station being able to find the other, let alone make solid copy of the transmission.

Surprisingly enough, the 7 mc band did not seem so bad and a number of pleasant contacts were made from one station with an input of 30 watts and a mediocre aerial system. The

explanation of this is probably that the Americans are only allowed to use CW over the whole 300 kc of the band.

### Receivers in Use

In every station visited, without any exception, was found a commercially built receiver. This is probably explained by the fact that the large demand over there allows quite a good receiver to be built at a reasonable price, and it would probably be impossible for an amateur to build a receiver as cheaply as he could buy one of equivalent performance. Of all the stations visited, only a few possessed any commercial transmitting equipment, and most of that was Government surplus gear. Quite a lot of the owners of high-power stations explained that they would never have been able to afford to build a kilowatt station had it not been for the availability of surplus equipment—this probably also explains the popularity of the push-pull 250TH PA!

All the operators met were keenly interested in Amateur Radio conditions in Britain and much time was spent in answering questions on this subject. Furthermore, all were most hospitable, and these notes would certainly not be complete without a full acknowledgment of that fact and of the whole-hearted co-operation of the W's in doing their utmost to make schedules with stations in this country so that all the latest could be heard from home.

### K2UN—United Nations

So much has already been written about K2UN that it seems superfluous to give a further description of the set-up again here. It is not generally realised, however, that the station is operated by members of the U.N. staff entirely in their spare time. The object is to keep the station on the air as much as possible, and in order to achieve this the

operators have a regular watch-keeping rota. Visitors are always welcomed at K2UN, and every opportunity is given for those from overseas to have a chat with a station at home, whether the visitors be amateur operators or not. The most impressive thing about K2UN is the extreme ease with which it can be controlled on the air.

The operating console, which spreads in a semi-circle round the operator, is arranged for this. (See photographs pp. 328-329, July 1948, *Short Wave Magazine*.) The console carries remote-control gear for the two transmitters, giving selection of several frequencies in the bands for which the transmitters are set up. 'Phone or CW working may be selected by the turn of a switch and the pre-amplifier for the modulators is built into the console, as is a modulation monitor, frequency meter, receiver and panoramic display equipment for the latter. The net result is that all the necessary controls and monitoring equipment are near at hand and conveniently placed to allow of adjustment and observation. It really does make K2UN a joy to operate and forms a good model on which a station should be planned.

It will have been noticed that it was stated that the control equipment gives a selection of several frequencies in the bands for which the transmitters are set up. These frequencies are crystal controlled and no provision is made for the use of VFO drive. The intention is to keep to a few spot frequencies in each band so that those amateurs wishing to work K2UN will always know where to tune for the signal.

The writer would like to conclude this brief survey by expressing, once more, his deep gratitude to all the American amateurs he was fortunate enough to meet during his travels. Without exception, they (and their families) were extremely kind and helpful on every possible occasion—and some of them have even continued their generosity since.

### BRITISH OLD TIMERS' CLUB

The list below brings the total current membership of the B.O.T.C. up to 164. From this it seems more than possible that the Double Century will be reached by the end of this year.

The new members are:

- A. L. Megson, G2HA (UAX "about 1900")
- T. Geeson, G2ML (G2SO in 1919)
- M. H. Wilkinson, G2JO (G2YU in 1925)
- J. Woodage, G2HL (G5WO in 1925)
- B. Groom, GM6RG (1925)
- J. W. Brown, G4WB (G6QT in 1926)
- A. L. Partelow, G3EZL/ZL2KZ (1928)
- G. Edwards, G2UX (1929)

If you held a full radiating licence before September, 1929, issued by any British

authority, and *still* have a full licence (but not necessarily under the same authority), you are eligible for membership, provided that one or both licences were taken out in this country. The qualification is thus not less than 20 years as the holder of a British licence, and new members are eligible as soon as they reach 20-year status.

A revised and up-to-date membership list is in preparation (the last was issued in December) and will be circulated to all members in due course. Names and addresses will be given in callsign order, with the year of origin. A distinctive Old Timer lapel badge has been suggested—any member interested is invited to get in touch with G6MN, address as given in the "1927 section" of the December B.O.T.C. Circular.

## Visiting a Ham

### That Personal QSO

By JIMMINY

**D**O not write or ring first ; this gives him time to think up a refusal—just call round. Knock up a spot of CW on the bell push ; it may wake the baby but why should you worry ? (You cannot be expected to know that the brat's only just gone to sleep.)

When he opens the door, say "73," just like that. It is possible to get an idea at this stage how good a ham he is—he may say "Good evening" and at one stroke give himself away for a lid. Should he be a dyed-in-the-wool ham with all the gen, he will immediately say "88."

Then introduce yourself and step in, asking him the way to the shack. Precede him all the way if you can guess where he keeps his gear ; this will give you a large measure of moral superiority and is well worth the risk of wandering into the wrong room.

Once in the operating room (sorry—shack) you should immediately sit yourself in the operating chair, tilting it on its back legs and surveying the gear the while. If you can get a mildly surprised look on your face then it is permissible to say "Nice little place you have here," if not, say "Hm."

At this stage a strong line is to begin looking for the TX main switch, remarking how inaccessible it is. Then switch on. Good manners are shown by asking the owner *before* actually calling, but do not be put off by his mumbles about "TVI" and "After 8.30" ; tell him he must be firm with the neighbours—then get on the air and call CQ. 'Phone of course ; it is only beginners who have to use the key. Let him know that you can send at 30's and that you have not bothered to learn receiving as you do not intend to use CW anyway when you get *your* ticket. (Here comes a good opportunity to tell him what call you are going to ask for from the GPO.)

#### All-round Check

If by this time he has managed to fight his way to the transmitter and switched it off, turn your attention to his auxiliary gear. Should he be tuning his receiver, it does not require a great deal of elbow work to get at it yourself. All the better if it has carefully adjusted flywheel tuning. Give the dial a good hearty spin ; the stop should be made solid enough to stand the bump. You might mention here the various disadvantages of his particular receiver. If he has a frequency meter, then give that a

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Some readers at least will know exactly what it means to suffer this sort of an experience. It is all part of the game—but need it be ?—Ed.

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look over. In case the xtal does not oscillate, give the case a bang on the bench ; that is also a good test of the frequency stability.

The ham you have favoured with your visit will also be immediately grateful when you tell him his receiver is out of alignment—take a look inside and ask him for the trimming tools. You know how easy it is to trim the thing on a signal. Not for one moment can you hope for the trimming tools to be forthcoming—hams are awkward people, but do not be dismayed, a small screwdriver or a penknife blade will do the trick. When the instrument is working to your satisfaction, the time should be about 11.30 p.m.

#### Sealing the Friendship

This is the moment to ask him for his QSL card and exchange it with one of your own. The more livid your own card is, so much the better. What may appear to be a wince on his face is only chagrin at the poor showing his own card is making. It is as well to mention that you do not get your cards from the printer mentioned on his cards—their printing is so lousy. Your own card can be one that you have already filled up to send to another "G"—don't waste a new card on him.

Then, do not overstay your welcome. Make your way to the front door and stand just outside for half-an-hour or so. It always adds to the pleasurable feeling you leave behind if you can start an argument—in a loud voice, of course. Take no notice of windows opening and closing in the neighbouring houses. They are not your neighbours, anyway.

As you proceed down the garden path, shout "73 OM" and "88 to the XYL" together with a promise to come again soon.

You can be sure he will look forward to your next visit.

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#### THE COMING SEASON

All the indications are that this coming DX season will be one of the busiest periods yet experienced on our communication bands in the history of Amateur Radio. With more stations licensed all over the world than ever before, improved equipment and keen interest in each of the various contest activities, 1949-50 will emphasise all that has ever been said about better receivers and improved operating techniques. Are you ready ?

# VHF BANDS

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

**New Contacts on Seventycems—  
GI2FHN/G3BLP Establish 330-  
mile GDX Record for Two,  
August 20—**

**VHF Reports and Station News—  
Increased Activity on 70 cm.**

TWELVE months ago the Two-Metre band was opened and the initial contacts were effected. In spite of the rapid increase in distances covered and DX progress made, many of us were a little disappointed. At G2XC, for instance, only one station was heard in those early hours of September 1, despite the fact that many of the operators who were regularly received at S9 on 5 metres were known to be active on the new band. In Portsmouth, contacts with such stations as G2AJ, G2NH, G5MA and others in the London area (who had been considered almost locals on Five) were regarded as real achievements on Two, and one went to bed happy after such QSO's! November, of course, showed that the 145 mc band could produce good DX, but through the winter generally it was a struggle to work what had been easy going on 58 mc.

Now, it may be that summer weather favours two metres. It probably does, but it is also undoubtedly true that the coming of the longer evenings and brighter days has seen an intensive and widespread attack on aeri-als. Few stations now have the same aerial as they had before Easter. Many have changed it several times.

Multi-element stacks have emerged, masts have risen to 60 feet or more and signals have improved by an almost unbelievable number of dB. It is undoubtedly true that on Two a standard of efficiency has now been reached by the whole body of 2-metre workers which, having regard to certain of the equipment limitations, such as valves and feeders, is, in general, unsurpassed on any other band. Next winter should see much more *consistent* results and far fewer "dead band" periods than last—provided, of course, that activity is maintained.

G6VX wrote on much the same topic in his "Food for Thought" last month, and anyone who missed it is advised to read it forthwith.

This article, with the results being obtained by the ever-increasing number of stacked arrays, has made aeri-als the chief topic of discussion among the 2-metre operators. General feeling is that there is something magical about "stacks," but the personal opinion of G2XC is that the magic is mainly correct matching and low-loss feed systems. The 16-element stacked array has about 5 dB gain over a 4-element Yagi, and that figure includes "increased horizontal radiation." Hence, if a new stack gives more than that 5 dB improvement over a previous 4-element job, then there was something wrong with the 4-element job!

At G2XC, the 4-element 0.2 spaced array was replaced early in July with a much wider spaced beam and signal reports leaped up by an average of 15 dB. At first, it was thought perhaps something new had been discovered, for assuming the old beam to have had its supposed 10 dB gain over a dipole, then this new one was 25 dB up. However, sober reflection and further tests revealed that when these two beams were *correctly fed* from 300-ohm ribbon the difference in their performance did not exceed 2 dB. The original beam must, therefore, have been working at *minus* 5 dB compared with a dipole! And all this loss was due to a feeder which (according to data taken from a well-known handbook) should have been a *perfect match*! It is not suggested that everyone has been wasting valuable RF in this way, but the fact remains that if your 16-element stack gives you more than 5 or 6 dB over your 4-element Yagi, then some of your RF has been going elsewhere than into the beam.

The moral is that those who for various reasons cannot get up a stacked array should not give up all hope, but instead make *sure* their 4-element rotary is *properly* matched to the feeder, and that the feeder itself is as low-loss as possible.

## 70 Centimetre News

The results achieved during the 70 cm. Field Day, on August 21, are still coming in as this is being written, so there may be even greater things to record than we can tell you here. But first, the outstanding Seventycem work of

## Seventy Centimetre Contest

The first week-end is September 10-11, from 1200 on the Saturday till 2359 on Sunday. See p. 450 August issue for rules. Reports by September 14, please, for mention in the next issue.

Second half of the Contest takes place October 8-9, same times.

The rules for this Contest have been made sufficiently flexible to encourage every sort of 420 mc activity, either fixed or /P, and cross-band operation is also permitted.

G3APY (Kirkby-in-Ashfield) prior to the Field Day, must be mentioned.

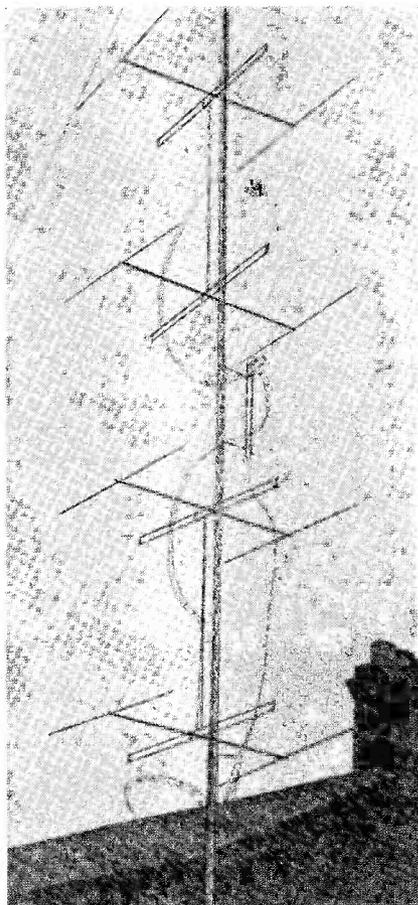
It has been reported that a large number of contacts have taken place between G3APY and G3ENS using ICW, over a 26-mile point-to-point path. These are fixed stations, and, having personally visited G3APY's QTH, your conductor can affirm that there is nothing very special about the site and that all the credit must go to the equipment. Much is undoubtedly due to the P58 receivers with their lighthouse RF stages. Those who were at the Nottingham VHF meeting in July had an opportunity of seeing one of these receivers. The lighthouse stage is, of course, an addition to the receiver, produced by G3APY himself. Prior to these contacts with G3ENS, G3APY had heard G3LN (Cotteridge) at 57 miles, signals peaking to R5, S6. This is a most important result, of the greatest significance for the future of 420 mc working. Though as yet one-way only, it is again QTH-to-QTH.

To continue the tale of G3APY's 70 cm doings, there followed a contact with G3MY/P at 26 miles, using crystal control at both ends, CW signals being RST 599 both ways. On August 21, G3APY went out to Ambergate, Derbyshire, and a contact was made with G5BM/P on Barrow Wake Hill, near Cheltenham, over an 86-mile circuit; reports were S8 and S6. The congratulations of all VHF workers will go to the operators responsible for this very meritorious result; as G3APY says in his letter, "this band is going to be good."

Other news includes a report from G5BM, who, as mentioned above, went portable on August 21, with the assistance of the Cheltenham Radio Society. They contacted G3BUR/P (Walton Hill, Wores.), at 42 miles, G2FKZ/P (Wantage) 33 miles, G8QX (Malvern) 22 miles, and G8JI/P (nr. Birmingham) 35 miles, in addition to the 86-mile QSO with G3APY/P. This represents 5 counties worked! The equipment at G5BM/P was a pair of 8025's in a SEO for Tx and a 6J6 super-regen receiver, with an 8-element stacked array, horizontally polarised.

On the same date G6XM/P (Aldershot) was audible on Two while operating on 70 cm. and so unintentionally enabled the 2m. operators to realise that there was quite a bit of activity on the higher frequency. His actual 70 cm. transmission was heard at S9 by G3LV (Southsea). This also is no mean achievement, as at least two ridges of high ground are in between, and G3LV is at sea-level among the houses. In addition, G6XM/P was presumably beaming on London!

Further /P doings on August 21 are contained in very interesting 420 mc reports from G3MY/P and G5RP, who was at G2FKZ/P. Up on Burbage Moors, nr. Sheffield, always a



The beam array at G1ZFHN, Belfast. Four stacked 3-element wide-spaced sections, with half-wave separation, are fed with equal lengths of 300-ohm line taken from the Q-Bar matching system. It was on this array that G1ZFHN established the new GDX record by working G3BLP (Selsdon, Surrey) over a 330-mile path on August 20.

happy VHF hunting ground for G3MY/P, he had contacts with G3APY/P (30 miles), 3BUR/P (75 miles) and 3ENS/P (48 miles), using MCW and phone. G3LN and G8JI were heard but could not be raised. The G3MY Tx was a CC 12-watt job with a CV16 in the final, working into a 16-element "double-diamond" reflector array fed with 300-ohm line. G3MY's receiver, which was *too selective* to take SEO transmissions, was a design incorporating a 1N21B crystal mixer with concentric-line coupling circuits, of which we hope to give full details in an early issue.

From G2FKZ/P, near Wantage, Berks.,

**The Two-Metre Zone Plan**

*Effective October 1, 1949*

<b>ZONE A</b> All Scotland.	144.0 to 144.2 mc
<b>ZONE C</b> All England from Lancs and Yorks northward.	144.2 to 144.4 mc
<b>ZONE D</b> All Ireland.	145.8 to 146 mc
<b>ZONE E</b> Cheshire, Derby, Notts, Lincs, Rutland, Leics, Warwick, Staffs.	144.4 to 144.65 mc
<b>ZONE F</b> Flint, Denbigh, Shropps, Worcs, Hereford, Monmouth, and westwards.	145.65 to 145.8 mc
<b>ZONE G</b> Northants, Bucks, Herts, Beds, Hunts, Cambs, Norfolk, Suffolk.	144.65 to 144.85 mc
<b>ZONE H</b> Dorset, Wilts, Glos, Oxon, Berks, Hants.	145.25 to 145.5 mc
<b>ZONE I</b> Cornwall, Devon, Somerset.	145.5 to 145.65 mc
<b>ZONE J</b> London, Essex, Middlesex, Surrey, Kent and Sussex.	144.85 to 145.25 mc

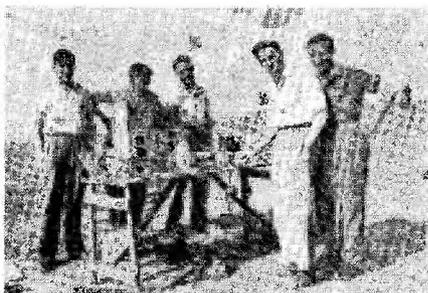
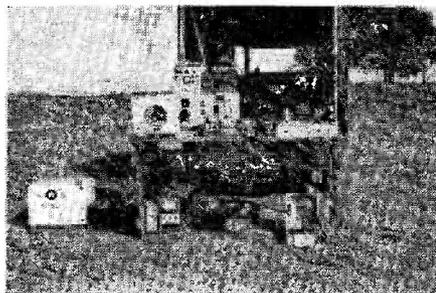
G3CGQ/P, 5BM/P, 5RP, 6XM/P, 8DM/A and 8TS/P were worked, with G3BEX/P (75 miles), 3BUR/P, 3CU/P and 8JI/P (60 miles) heard. The G2FKZ receiver was a modified 1294, with two transmitters: One SEO with a CV82 in a Type 105 oscillator; the other CC with a pair of CV53's as final doubler. Both ran about 5 watts input, and the aerial was six stacked sets of two half-waves in phase, with a plane reflector, horizontally polarised.

G5RP writes as follows: "In the opinion of G2FKZ and myself, the most important conclusion to be drawn from the 420 mc portable tests on August 21, is that, in spite of poor equipment, DX was heard. With receivers having a 10 kc band-width (instead of a megacycle or so), CC transmitters running the

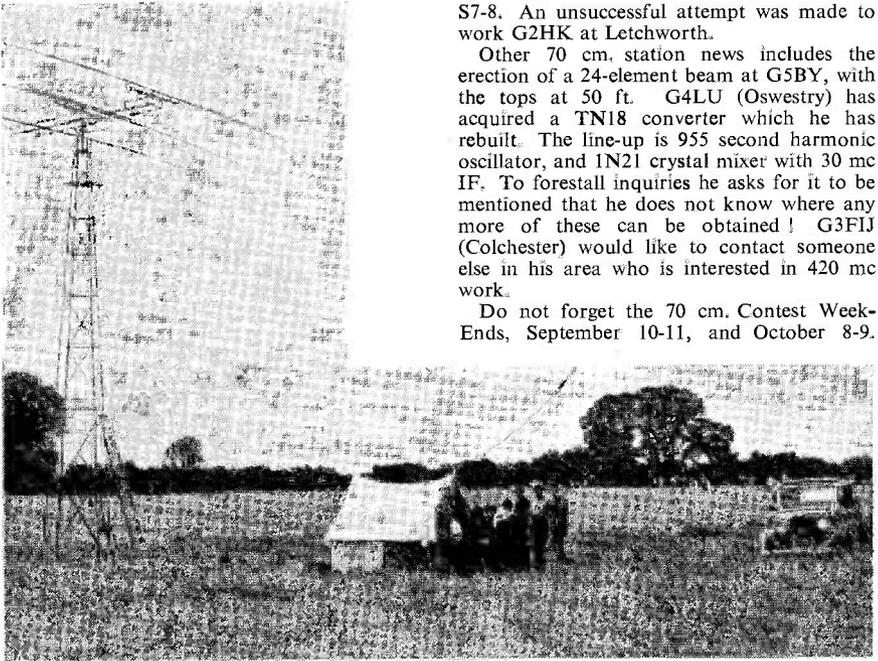
full 25 watts at 50-60 per cent. efficiency (instead of SEO rigs with low RF output), and the use of CW (instead of MCW and phone), much greater distances would have been covered. As always, the Rx seems to be the limiting factor at many stations. I think one might sum up the whole position by saying that the equipment used on 70 cm. at the moment is comparable with that employed on five metres in about 1935—and the results are also comparable."

This is an interesting comment and, in the broad sense, does summarise the position on 70 cm. at the present stage in the development of the band. But most operators realise to the full the importance of much improved equipment, and some at least are already running stabilised transmitters and receivers. No doubt correspondents will have something to say about all this next time.

Reports are also in for the same occasion (August 21) covering the activities of G3BUR/P and G3AHB/A. The former was on Walton Hill, about 9 miles SW of Birmingham, at 1,036 ft. a.s.l. It had been intended to use CC at G3BUR/P and though the Tx (8 mc CO-EL91 tritet-6J6 tripler-6J6 tripler-6J6 buffer-CV82 final doubler) functioned well on the bench, it refused to play on the day and had to be operated as an SEO (CV82 Type 105 oscillator). Rx was a modified ASB8 and the aerial 24 1/2-wave stacked driven elements backed by a similar system of 1/2-wave reflectors at 0.25 wave spacing. This outfit produced nine 70 cm. QSO's for the G3BUR/P party, of which the best were with G3ENS/P (42 miles), G3APY/P (49 miles) and G3MY/P (67 miles). Nearly all contacts were R5, S9 both ways, and every station heard was worked; it was particularly interesting to find that locals at a few miles range were no stronger than the DX—how reminiscent of the portable tests of the early days on the old 5-metre band!



We have recently discussed some of the /P results obtained on 70 cm. by G3BEX and his helpers. Here is an impression of the 420 mc gear, powered from a 24v DC rotary converter giving 230v AC. In the right-hand view are, l. to r.: G3BNR, G3BEX jr., G3DYQ, G3BEX and SWL Onslow. This team has done some excellent work from the Devil's Dyke.



When G5BM became GW5BM/P on July 3, this was the sort of set-up which produced those two-metre signals.

At G3AHB/A (E.M.I. roof, Hayes, Mdx.), the tale is six /P stations worked on MCW, with that old campaigner G2WS/P at 38 miles (56/57) and G3FZL/P (57/58) at 62 miles as best DX. G3AHB notes that conditions appeared to improve during the evening and G3FZL was worked at 2000. Stations heard but not worked at G3AHB/A were G8TS/P and G3CGQ. The ASB8 receiver was found rather unsatisfactory as, due to the wide IF channel, most stations were on top of one another. Flutter caused by aircraft relections were also a nuisance, producing an audio beat-note of low pitch; altimeters also caused QRM. The G3AHB/A Tx was an 8012 in SEO, running 25 watts, and the aerial a 16-element stacked array.

At G8JI/P (Frankley Beeches Hill, six miles SW of Birmingham, 800 ft. a.s.l.) six 420 mc stations were worked on August 21, with the redoubtable G3APY/P at 50 miles as best DX; the G8JI Tx was a CV82 in SEO, with a corner reflector, and the receiver a P/P diode mixer with P/P oscillator into 5 IF stages.

Earlier, on July 24, G3BEX/P on Devil's Dyke worked G2WS/P at Charing, Kent, the distance being 50 miles, and signals were

S7-8. An unsuccessful attempt was made to work G2HK at Letchworth.

Other 70 cm. station news includes the erection of a 24-element beam at G5BY, with the tops at 50 ft. G4LU (Oswestry) has acquired a TN18 converter which he has rebuilt. The line-up is 955 second harmonic oscillator, and 1N21 crystal mixer with 30 mc IF. To forestall inquiries he asks for it to be mentioned that he does not know where any more of these can be obtained! G3FIJ (Colchester) would like to contact someone else in his area who is interested in 420 mc work.

Do not forget the 70 cm. Contest Week-Ends, September 10-11, and October 8-9.

Full details were on page 450 of last month's issue of the *Magazine*.

### Three Centimetres

G3FNZ (Catford) would be glad to hear from anyone else in his area interested in 3 cm work. He has managed to transmit about 75 yd. using an ex-Government klystron with about  $\frac{1}{2}$ -watt and a crystal Rx. Well, it is a start, anyway!

### Two Metre News

As so often happens, a rather unexciting month suddenly came to life just as your conductor was starting on his story. Until August 18, conditions were generally agreed to be below the standard of the previous month, and with the exception of a spell on July 27 (when G5BY and G5GX had an excellent phone contact), and August 5 (when quite a few people up north heard G2XC) things had been rather monotonous. The holiday season, no doubt, accounted for the absence of many well-known VHF calls from the band, and activity seemed low. In spite of that, however, many stations worked over 50 different calls during the month, and G2XC, trying out a new beam, managed to contact 75

stations during July. G2KG (Chelmsford) worked 9 PA and 3 ON stations, bringing his total of PA's worked to 14. Conditions during the PA contest week-end were not too favourable and only the East Coast G's had any luck.

Then, on August 18, things started to happen, and on the evening of August 20, a new two-metre GDX record was established between G3BLP (Selsdon) and G12FHN (Belfast).

The contact was a little shaky, it is true, but has been confirmed both ways. The distance appears to be 330 miles, but this is subject to final correction when the exact grid references become available. However, the figure is right to within a mile or two, and the congratulations of us all go to both operators on the passing of yet another VHF milestone.

During the whole period under review, the 100-mile schedule paths have remained open, and proved their reliability. Such are the G2CPL-G2NH, G5BD-G5WP, G2NH-G3EHY and G2OI-G12FHN circuits. All this confirms what has already been said, that equipment generally has become very much more efficient.

For the county hunters there is good news. Four new ones are available; Anglesey (GW3KY), Caernarvon (GW5YB), Carmarthen (GW8AI) and Huntingdon (G3AKU).

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

Worked	Station
40	G3BLP (155)
38	G2NH (183), G5MA G5WP
36	G2IQ
35	G5GX
34	G5BY
33	G2OI, G3COJ
32	G3ABA
31	G2KG (110), G2MR, G3EHY, G4DC (137), G4LU, G6NB (131)
30	G2XC (155), G3APY
29	G3CUJ, G3DMU
28	G2ADZ, G5BM, G8WV
27	G3DAH, G5JU, G8QX
26	G3BKQ, G5MI
25	G2AXG, G2XS, G4AU, G6PG (109)
24	G2CIW (108), G5NF (111)
22	G2HDY
21	G3CCP, G6UH (130)
20	G2NM, G8IP, G8KZ
19	G5RP, G6VC
18	G2RI, GM3OL, G6DT
17	G2CPL, G3AUA
16	G8SM
15	G2FLC, G3VM, G3WW
14	G3BW, G4HT, G6LK

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

**Points from Letters**

G2IQ (Sheffield) draws attention to the need for adequate insulation at the feed points of stacked co-linear arrays. He mentions that a commercially-built 144 mc stacked array which he recently encountered was very poor in this respect. Being fed at high-impedance points the insulation required is much greater than that which will suffice with the low-impedance feed to a Yagi.

After 2215 is not the best time for long distance work, according to G2KG (Chelmsford). Data to which he has access show that long-range paths are often open when there is no amateur activity to take advantage of it.

G3VM (Norwich) and G5QA (Exeter) both remark on the weak phone carriers they hear from time to time, indicating that the band is open, but numerous CQ's on CW fail to produce any replies. They are not the only ones to experience that, and the probability is that those weak carriers belong to the very stations who say they never hear any DX. The answer often is that they never listen for it anyhow! But, please sign occasionally on CW even if you do prefer phone working.

G3EHY (Banwell) complains of the lack of a reply QSL from certain stations in spite of the fact that he sent them an addressed envelope.

G3BKQ (Leicester) expressing agreement with last month's Editorial, points out that he obtains much more reliable contacts on 144 mc than on any other band, at distances up to 40 miles or so, and this is only one of its advantages. He has been giving much thought to the subject of radiation angles, and is considering trying out a corner reflector which he thinks should be superior in some ways to his 24-element stack.

Also, on the subject of aerials, G4LU (Oswestry) commenting on G2KG's remarks

in last month's "VHF Bands" asks for suggestions for cases like his where the attic is the only available space for the beam. It must be recorded here that in spite of G4LU's difficulties his signal in the South of England holds its own with the other Northerners.

G8AO (South Shields) asks that operators outside TV range should not follow the lead of the London area, which only comes to life after 2230. The London difficulty is fully understood, but G8AO's point is that there could be much more activity at more favourable times. For instance, 0800-0900 and 1800-2000, when conditions are frequently very good. G8AO also remarks that the Band Plan will have the full support of operators in the North-East.

G8WV (Hanslope) is able to measure 144 mc frequencies to within a few kilocycles and

offers to help anyone who wants assistance in that direction.

G2AOL (Oxford) asks to be recorded as against the Two-Metre Band Plan, as he fails to see that any reasons have yet been advanced which would convince him of its worth. His main argument is that Two should be allowed to develop as an "experimenter's band" and not planned for easy GDX QSO's—as if GDX was ever easy! For our part, we are convinced that had G2AOL been at the Nottingham VHF meeting, he would think otherwise.

#### Station News in Brief

G2AUA (Wellingborough) has a CC Rx with 900Z mixer and 6AK5 RF; he should be active soon. G2FLC (Cheveley) has heard GM30L. G2OI (Eccles) runs a stack of four

## TWO-METRE ACTIVITY REPORT

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

#### G3DH, Bramhall, Cheshire.

**WORKED:** G2OI, 3BY, 3CHY, 3CZP, 3DA, 4LP, 5CP, 6LC, 6TL, GM30L.

**HEARD:** G3BW, 5VN, 6YO.

#### G3AYT, Hyde, Cheshire.

**WORKED:** G3AOO, 3BND/P, 3CHY, 3DTK/P, 3ELT, 4LP, 6LC, 6ML, 6TL, 8FI, GM30L, GW2ADZ, 4OS/P.

**HEARD:** G2AOA, 2OI, 3ALD, 3ALY, 3BW, 3DA, 3DH, 5CP.

#### G8IP, Hampton, Middlesex.

**WORKED:** G2BMZ, 2CPL, 2WJ, 2XC, 2XS, 2YL, 3ABA, 3ABH, 3BTL, 3DEP, 3EHY, 3VM, 5BD, 5GX, 5JU, 6DT, 6K, 6NB/A.

**HEARD:** G2APJ, 2IQ, 3ALD, 3BKQ, 3BOB, 3DAH, 5BY, 5JO, 5UF, 8LY, 8QC. (July 18 to August 8.)

#### G8KL, Wolverhampton, Staffs.

**WORKED:** G2ATK, 2AVQ, 2BUJ, 2JZ, 4LU, 8QY, GW2ADZ.

**HEARD:** G2BFT, 3BKQ, 3BLP, 5JU, 5ML, 6NB, 6XY, 8WV. (August 1 to 14.)

#### G4HT, Ealing, Middlesex.

**WORKED:** G2ABN, 2AHP, 2FPP, 2KG, 2PU, 2XC, 2XS, 2XV, 2YC, 3CGO, 3DEP, 3FP, 3NR, 4OO, 5IB, 5TP, 5UM, 5YM, 6HG, 6JK, 6NB/A, 6PG, 6YP, 8SK.

**HEARD:** G2ASC, 2ATV, 2CPL, 2DCV, 2IQ, 3ABH, 3ALD, 3AUA, 3BKQ, 3ENY, 4LU, 4ZU, 5DT,

5RP, 6WT, 8QY, 8TB, GW2ADZ (July 3 to August 14.)

#### G2CIW, Harold Park, Essex.

**WORKED:** G2CPL, 2XC, 3ABH, 3AUS, 3CFR, 5NF, 5TP.

**HEARD:** G2BMZ, 2IQ, 3DEP, 3EHY, 5BY, 6WT.

#### G3EHY, Banwell, Somerset.

**WORKED:** G2AJ, 2AOK/A, 2ATK, 2AVQ, 2BMZ, 2IQ, 2KG, 2MV, 2NH, 2OI, 2RI, 2XC, 3AEX, 3ALY, 3APY, 3BKQ, 3BY, 3CCO, 3COJ, 3CPP, 3CUJ, 3CXD, 3DAH, 3DEP, 3DJQ, 3DMU, 3DA, 3EEZ, 3EJL, 3MY/P, 4CI, 4OS, 5BD, 5CP, 5GX, 5JU, 5TP, 5WP, 6DT, 6OH, 6OS, 6PG, 6UH, 6YP, 8IP, 8MZ, 8QY, 8UZ, 8WV, GM30L, GW2ADZ.

**HEARD:** G2BFC, 2MA, 2MR, 2XS, 3AHT, 3ALD, 3DMK, 4AP, 4RK, 5LJ, 5ML, 5MX, 6CJ, 6SN, 8MZ. (July 15 to August 16.)

#### G5MR, Hythe, Kent.

**WORKED:** F8OL, G2AJ, 2FZR, 2KG, 2QV, 3WS, 5UM, 6PG.

**HEARD:** G2FJD/A, 2HDY, 2NH, 2PU, 3BKQ, 4CG, 4RO, 5IB, 5MA, 5RO, 6NB, 6NB/A, 6OT, 6UH, 8VR. (July 10 to August 10.)

#### G2OI, Manchester, Lancs.

**WORKED:** G2FJD/A, 3AGS, 3BKQ, 3BLP, 3BW, 3CCP, 3CXD, 3DEP, 3EHY, 3EEZ, 5BM, 5BY, 5KX, 5MA, 5WP, 6VX, 6ZQ, GM30L, G12FHN, GW2ADZ,

**HEARD:** G2BTO, 3CUJ, 3ENS. (July 8 to August 13.)

#### G3BLP, Selsdon, Surrey.

**WORKED:** G2OI, 3ABA, 3BW, 3CXD, 3DA, 3EEZ, 4LU, 4OS, 4RK, 6OS, G12FHN, GW2ADZ.

**HEARD:** G2FZX, 2MA, GM30L.

#### G6PG, Dartford, Kent.

**WORKED:** G2ABN, 2FJD/A, 2FZR, 2IQ, 2MV, 2XC, 2XS, 2YL, 3ABH, 3ADD, 3ALY, 3BOB, 3CCP, 3EGD, 3EHY, 3VM, 3WW, 4HT, 4RO, 5BD, 5GX, 5KH, 5MR, 5UM, 6CB, 6DT, 6OH, 8IP, PAØPN, ØUN.

**HEARD:** G2CPL, 2RI, 3APY, 3ALD, 3BKQ, 3BM, 3EEZ, 6SN, 6WT, 8QX, 8QY.

#### G2KG, Chelmsford, Essex.

**WORKED:** G2BMZ, 2IQ, 2QV, 2VA, 2XC, 2XS, 3ABH, 3AKU, 3CFR, 3CJY, 3DEP, 3DA, 3DCC, 3EGD, 3VM, 3WW, 4MV, 4OO, 5BY, 5MR, 5NF, 5UF, 6DT, 6WT, 8SY, 8UZ, ON4FG, 4IF, 4VL, PAØCB, ØHRL, ØIK, ØLU, ØPN, ØUHF, ØUN, ØUW, ØWL.

**HEARD:** G2ATK, 3BKQ, 3BW, 3DMU, 5TP. (July 12 to August 14.)

#### G2XC, Portsmouth, Hants.

**WORKED:** G2AVR, 2BMZ, 2CPL, 2IQ, 2OI, 2RI, 3ABA, 3BKQ, 3CXD, 3VM, 3WW, 4LU, 4RK, 5BD, 5BY, 5JU, 6WT, 8QY, GW2ADZ.

**HEARD:** G2ATK, 2DPD, 3CUJ, 3NR, 5GX, 6YO, 8OX, 8UZ. (July 18 to August 18.)

## TWO-METRE ACTIVITY BY COUNTIES

### *The South*

**Beds**  
G3CGQ

**Berks**  
G3CCP, G6OH

**Bucks**  
G6CJ, G6JK, G6NB/A, G8WV

**Camb**  
G2FLC, G2PU, G2XV, G3WW, G8SY

**Cornwall**  
G3AGA

**Devon**  
G2BMZ, G3AUS, G5BY, G5QA, G6WT

**Dorset**  
G3ABH, G3TN, G5UF

**Essex**  
G2CIW, G2KG, G2WJ, G3ANB, G3BTL, G3FIJ, G3WS, G6DH

**Glos**  
G5BM

**Hants**  
G2NS, G2VH, G2XC, G3ARL, G3BHS, G3BNC, G3CFR, G3CGE, G3DEP, G3DFR, G3EJL, G3LV, G3RI, G4QL, G5PB, G5SP, G6DT, G8JB, G8LY.

**Herts**  
G3FD, G3NR, G4RO

**Kent**  
G2AJ, G2FZR, G2UJ, G3AEX, G3BOB, G3DAH, G5MP, G5MR, G6PG, G6VC, G6VX

**London**  
G3DCC, G4DC, G5DT, G8KZ

**Middlesex**  
G3QK, G4HT, G5BC, G6UH, G8IP

**Monmouth**  
G4GR

**Oxon**  
G5TP

**Somerset**  
G3CMT, G3EHY

**Suffolk**  
G2CPL

**Surrey**  
G2ANT, G2DPD, G2MV, G2NH, G2YL, G3BLP, G4CG, G5MA, G5MI, G5NF, G5WP, G6CB, G6HC, G6LX, G6NB, G8SM

**Sussex**  
G2AVR, G2JU, G2QV, G3EBW, G5RO

**Wilts**  
G2BUJ, G4AP

**Worcs**  
G8QX

### SOUTH WALES

**Carmarthen**  
GW8AI

**Glamorgan**  
GW5SA

*Northern and Midland Counties  
next month*

3-ele Yagis. G2BTO reports active in Bolton, and says G6QT and G8UF are also there; signal reports are wanted. SCR 522 Tx's are in use. G2CPL (Lowestoft) was disappointed with conditions during the PA contest, but worked five of them and ON4FG. G2RI (Leicester) with an acorn Rx and an 829B in the Tx worked 18 counties in a month. G2XS (Kings Lynn) raised Huntingdon, and has an 0715 schedule with G2XC until September 11. G2CIW (Romford) wants contacts to the North, and has 16-element beam under way.

G3DH (Bramhall) asks for contacts to the South, and asks if anyone down South ever beams North! He has a CC converter into an SX28A and a 4-ele. beam; best DX has been GM30L. G3AYT (Hyde) is active in Cheshire. G3AKU (St. Ives) has put Huntingdon on the map; an RF27, SCR522 Tx and 4-ele. beam complete the set-up. G3WW (Wimblington) has replaced his ZB2 with an ARC5 with good results. The thrill of the month to G3VM (Norwich) was a 275-mile QSO with G5BY. G3FIJ (Colchester) and G3ANB (Brightlingsea) are active in Essex. In North London, G3DCC is quintupling with a TT11 from 7 to 35 mc and shows an unusual way of getting to 144 mc. Any crystal between 7.2 and 7.3 mc will finish in the band. So there's a use for those redundant 7 mc crystals! G3CWW is active once again in Hendon. In Somerset, G3EHY has at long last established a consistent path to the Hampshire area; he has also worked GM30L again. And associate membership of the VHF Century Club has been achieved by G3EHY after only eleven months with a transmitting licence.

G4HT (Ealing) working under difficulties due to the refusal of the flat owners to allow him to erect a beam, has nevertheless been active on the band and has got as far as Norfolk with an "invisible" aerial. G4LU (Oswestry) has 6J6 converter with noise factor of 5 dB. G4RO is now in St. Albans.

G5BY (Bolt Tail) found July 27 excellent; G3BKQ of Leicester was blocking the IF stages at G5BY! Some new QSL's are now to hand and he will be catching up on them soon. At the other end of the South Coast G5MR (Hythe) has a 3-over-3 beam up, and finds it superior to a Quad. G5QA (Exeter) plans an 8-ele. array.

G6DT (Horndean) reaches the Counties table, in spite of a not-too-good location; a new, very-wide spaced 4-element beam up at 45 ft. is partly responsible and G2IQ, G3AGA and GW2ADZ have been worked. G6CB (Wimbledon) asks everyone to note that his frequency is 144.36 and not as shown in the Fiveband Club List. G6VC (Northfleet) has a 3-over-3 beam under way, and has worked Northern DX. The addition of a 6J6 pre-

amplifier to his RF27 has improved things at G6UH (Hayes); and he has worked the Hull stations. G6LX provided some of us with a new county by going /P in Rutland, and hopes to visit Herefordshire for the same purpose!

G8KL (Wolverhampton) is preparing to build the G2IQ 6J6 converter, and in the meantime uses the SCR522 Tx and Rx. G8IP (Hampton) worked G5BD with one side of his Y-matched 300-line disconnected from the beam. G8QX (Malvern) has reached the VHF Century Club. G8WV (Hanslope) is comparing results on a 6-ele. c.s. beam and a 3-over-3.

GM3OL (Dumfries) added Fifeshire to his counties by working GM3EGW and says that GM3BDA and himself will comply with the Zone Plan. G12FHN (Belfast) continues to provide a DX signal for many parts of the country and has worked G3DA, G5CP and G6LC; his beam is 4 stacked 3-ele. wide-spaced Yagis. GW3KY (Holyhead) on 145-494 has an 829 PA, 6AK5 converter and a 12 ele. stack. GW4OH (Llandudno) and GW5YB (Bangor) are also active. In South Wales GW8AI (Pendine Sands) has a 6-ele. array. With a good open view to South and East he should get a large number of contacts when conditions are good. He will be on a Zone F frequency.

#### Other Two-Metre News

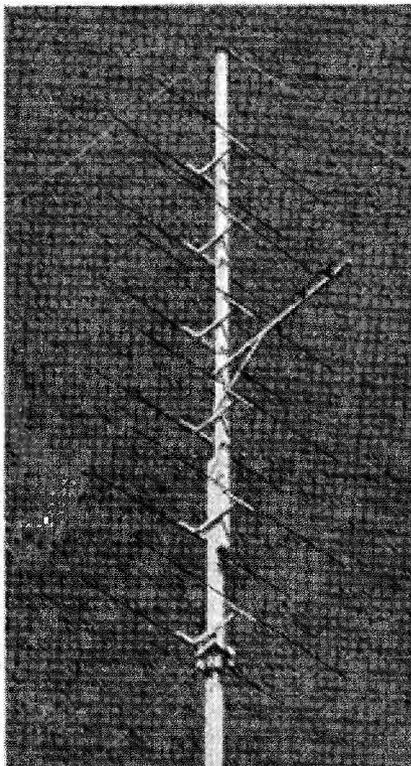
The DL4's are holding a convention on October 1-2, at Garmisch, which is 11,000 ft. a.s.l. They will have a two-metre station in operation and will be beamed on G.

The *Short Wave Magazine* Two-Metre Contest is scheduled for November 12 and 13. The conditions will be very similar to those of last year, but Continental contacts will be allowed to count for points. The full rules will be published next time.

The Zone Plan, as described last month, has gained approval from all parts of the country. A number of crystal exchange requests have come in. There is a heavy demand for crystals in Zones C, E and G, that is, 8012 to 8047 and anyone with a crystal in that part of the band is asked to send details, if it is available for exchange. The Zone Table is printed again this month, for easy reference.

#### The Counties Table

With so many stations approaching the maximum figures in the Counties Table, several correspondents have suggested that perhaps some new target is now required to maintain the keenness of the leaders—and keep them up to scratch! Amongst the suggestions received are that the Table should run on a yearly basis, and that there should be a monthly competition for the 20 best contacts.



The 24-element two-metre beam now in use at G5BY, Bolt Tail, South Devon. The mast is rotatable, supported by collars at the guying points, and the whole assembly is strong enough to withstand the strong winds blowing across his very exposed location.

Acting on the first of these suggestions, from September 1 (which is the anniversary of our starting up on the band) you should send in two figures. First, your "all-time" total of two-metre counties, and secondly, the number worked since September 1, 1949. This will give the newcomers a chance to shine and at the same time will not lose sight of the good work done in the past by some of our keenest VHF men.

Regarding the second suggestion, the idea would be to send in a list of 20 contacts of over 100 miles, made during the month, together with their mileage, which would give an aggregate of miles. If this appeals, mention it in next month's report and a start can be made in January. This will encourage DX working in a way quite distinct from the Counties Table, and will give good chances to the more

remotely located stations—who can get the miles but not the counties.

On the subject of Counties and other achievements, it is becoming a habit to pass these figures to G2XC during QSO's. The correct method is to send a written statement together with details of the contacts on which the claim is based. This is much the better way, as not only does it enable the list to be checked, but there is much less chance of it being lost! And, by the way, the Isle of Wight is part of Hampshire! We have had this one out with colleague G6QB!

#### Fiveband Club

Membership of the Club has been increasing rapidly, and is open to all VHF transmitters

#### XTAL XCHANGE

This is a free service to readers, in respect of exchanges of crystals only, and the few simple rules covering appearance in this space were given on p. 441 of the August issue. Notices should be sent in on separate slips, headed "Xtal Xchange—Free Insertion," and set out in the form shown below.

#### G2ATD, 21 Barham Road, Dartford, Kent.

Has QCC 7038 kc crystal, holdered. Wants frequency in 1.7 mc band.

#### G2DFL, 29 Haylease Crescent, Hunderton, Hereford.

Has QCC 7092 kc crystal, certificated; also Bliley 7086 kc. Both  $\frac{1}{2}$ -in. mounting. Wants 7010-7045 kc.

#### G2FAY, 62 Chestnut Street, Chadderton, Oldham, Lancs.

Has QCC Type P5 1950 kc crystal, certificated; also GEC 7078 kc, no holder or certificate. Wants frequencies 3510-3590 kc and 7010-7030 kc.

#### G3CZM, 1 Evelyn, Branksome Hill Road, College Town, Camberley, Surrey.

Has 7094, 7153 and 7171 kc crystals. Wants frequencies 7000-7150 kc.

#### G3FOO, 8 Withert Avenue, Bebington, Wirral, Cheshire.

Has American 7010 kc crystal,  $\frac{1}{2}$ -in. pin spacing. Wants similarly mounted 7030-7060 or 8020-8030 kc crystal.

#### SWL, 270 Spotland Road, Rochdale, Lancs.

Has American 6030, 6040 kc crystals,  $\frac{1}{2}$ -in. mounting, also 6030, 6050 kc with  $\frac{1}{2}$ -in. pin spacing. Wants 560 kc crystal gate or band-pass IF, also 100 and 1000 kc bars, and frequencies 7000-7100 kc.

#### SWL, 79 St. Mary Street, Woolwich, London, S.E.18.

Has 100/1000-kc bar in sealed holder, three-pin mounting, no certificate. Wants HRO type open 456 kc crystal, holdered, for two-pin  $\frac{1}{2}$ -in. mounting.

who are prepared to send in a written statement of their work on one or more of the VHF bands, and give an undertaking to support VHF activities to the best of their ability. The Fiveband Club, which is wholly supported by the *Short Wave Magazine* (there are no entrance fees or other dues) issues a membership certificate, and is closely associated with the VHF Century Club; full membership of the latter is open only to those who can show cards for 100 or more stations worked two-way on the VHF bands. For rules, see p. 891, February, 1949, *Short Wave Magazine*.

#### In Conclusion

Again, it has not been possible to include all the Activity Reports received this month, and many of those printed this time are lists which had to be dropped last month. This does *not* mean that it has become a settled policy to print *your* list every other month! With the passing of the DX season the space available for lists of calls worked should become greater, so please continue to send lists (omitting all local calls unless they are new on the band) and every endeavour will be made to get them into print. Many thanks for the very large and most interesting mail again this time, and we hope everything has been covered in full detail. The latest date for reports for next month is September 14 (it is another tight one), and the address is E. J. Williams, G2XC, *Short Wave Magazine*, 49 Victoria Street, London, S.W.1. With you again on October 7.

#### MORE LICENCE FIGURES

The GPO official return to the end of July discloses that there were then very nearly 12 million BC licences in force, of which 155,150 were in respect of TV receivers—an increase of 7,250 over the June figure.

#### CARDS IN THE BOX

If your call is here, we want your name, address (on a large S.A.E.) and callsign to clear cards held for you in our QSL Bureau. And if you want your call to appear in "New QTH's," please mention that at the same time; it ensures eventual publication in the *Radio Amateur Call Book*.

G2ABN, 2BYB, 2DKH, 2FCG, 2FTS, 2PF, 3AYN, 3BSS, 3CRJ, 3DHA, 3EGO, 3EKE, 3EPT, 3ERM, 3ESZ, 3ETZ, 3EVC, 3EZN, 3FNL, 3FPB, 3YC, 4FT, 5OZ, 8VO, G13FNA, GM3CEJ, 3FLM, 5PJ, GW3DXP.

## NEW QTH's

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

- G2ALL T. A. T. Davies, Meadow Side, Comberton, Cambridge.
- G2BSA W. D. Clague, Lamana, Hannafore, Looc, Cornwall.
- GW2BUF J. G. Price, 23 Powell Street, Abertillery, Mon., S. Wales.
- G2CIC H. S. G. Clark, 27 Charlcombe Lane, Larkhall, Bath, Somerset.
- G2CZU S. G. Marsh, 10 Vernham Grove, Odd Down, Bath, Somerset.
- G2FAY F. Clarke, 62 Chestnut Street, Chadderton, Oldham, Lancs.
- G2FXZ J. B. Hodgetts, 43 Regis Road, Blackheath, Birmingham.
- GW2FYF M. Arthur, 36 Llanelly Place, Fforesthall, Swansea, Glam., S. Wales.
- G2HII R. S. Ashley, 73 Elvaston Road, Nottingham.
- G2JO M. H. Wilkinson, Greenbank, Hawksworth Lane, Guiseley, nr. Leeds, Yorks.
- G3AGZ S/Ldr. R. A. Evenett (*ex-ZE2J1*), 4 Clifton Road, London, N.22. (*Tel.: Bowes Park 5608*).
- G3AJR R. Denman, 161 Sumatra Road, London, N.W.6.
- G3BIY A. Bailey, 5 Albion Place, Stafford.
- G3CAC N. J. Chapman, 28 Mackenzie Road, Beckenham, Kent.
- G3DES T. H. Weeks, 8 Potacre Street, Torrington, Devon.
- G3DIT Portsmouth & District Radio Society, (*Hon. Sec., H. G. Martin*), 184 Kirby Road, North End, Portsmouth, Hants.
- G3DKZ F. A. Lynes, No. 1 Bungalow, Oxford Radio Station, Leafeld, Oxford.
- G3DMN L. E. Flint, Marlavna, Woodbridge Road, Rushmere, Ipswich, Suffolk.
- G3DSW D. L. Wood, 48 Havering Road, Romford, Essex.
- G3EEQ K. C. Gill, School House, Clowne, nr. Chesterfield, Derbyshire.
- G3EFD M. A. Thompson, Westleigh, Hextof Terrace, Hexham, Northumberland.
- G3EIF A. F. Gray, 173 Tulse Hill, London, S.W.2.
- G3EPQ R. F. Parr, Ph.C., Parkside, Springfield Road, Wigan, Lancs.
- G3EQJ J. F. Acquirer, 107 Brancaster Lane, Purley, Surrey. (*Tel.: Uplanders 5796*).
- G3EQS Maj. A. E. W. Hewitt, 17 Lowestoft Road, Gorleston, Great Yarmouth, Norfolk.
- G3ERI W. Davies, The Bungalow, Kingsley Fields, Nantwich, Cheshire.
- G3EVA B. Pearce & A. Parker, 11 Purwell Lane, Hitchin, Herts.
- G3EVG W. A. G. Davidson, 27 Jubilee Street, Newark, Notts.
- GM3EZQ C. White, West Lodge, Westhall, Oyne, Aberdeenshire, Scotland.
- G3FCC F. R. G. Martyr, Horwell House, Launceston, Cornwall.
- G3FET L. F. Rawlings, 137 The Ridgeway, North Harrow, Middlesex.
- G3FGQ M. Gibbs, The Orchard, Wooburn Green, Bucks.
- G3FGT L. F. Crosby, 616 Church Road, Yardley, Birmingham, 25.
- G3FIC J. Glover, 8 Farnworth Street, Kensington, Liverpool, 6.
- G3FIT N. E. Ashman, 20 Stradling Avenue, Weston-super-Mare, Somerset.
- GM3FIU W. B. Gray, 79 South Esk Street, Brechin, Angus, Scotland.
- GM3FIW A. T. Gillies, 6 Adele Street, Motherwell Lanarkshire, Scotland.
- G3FJG Southport Radio Society, 38a Forest Road, Southport, Lancs.
- G3FKU D. Barlow, 15 Kinnerley Street, Walsall, Staffs.
- G3FKV H. Collinson, 38 Brook Street, Driffield, Yorks.
- G3FLR H. Priestley, 11 Mons Avenue, Spotland, Rochdale, Lancs.
- G3FMP W. D. Hart, Woodlands, Shootersway Lane, Berkhamsted, Herts.
- G3FNK C. Drinkwater, 307 Burton Road, Derby.
- G3FNK/A C. Drinkwater, 8 Kewferry Road, Northwood, Middlesex.
- G3FNZ J. A. Lambert, 28 Canadian Avenue, Catford, London, S.E.6.
- G3FOE A. Royle, 31 Park View, Cheadle Heath, Stockport, Cheshire.
- GM3FOM J. F. Lamb, Balnacake, Brechin, Angus, Scotland.
- G3FOO A. Seed, 8 Withert Avenue, Ebbington, Wirral, Cheshire.
- G3FOP R. G. Barrell, 4 Bromyard Road, Tenbury Wells, Worcs.
- G3FOS W. A. L. Francis, 23 Pulteney Street, Bath, Somerset.
- G3FOT K. E. Brailington, 8 Beresford Street, Shildon, Co. Durham.
- G3FOU H. F. Bradley, 9 Riverholme Drive, Ewell West, Surrey.
- G3FPD R. Surman, Franklyn, New Cross Road, Guildford, Surrey.
- GW3FPH J. W. Hayes, 12 Brookside Crescent, Northop Hall, Mold, Flintshire.
- G3FPJ A. A. Littlewood (*ex-D2GT*), 10 Elms Drive, Kirk Ella, E. Yorks.
- G3FPK N. A. S. Fitch, 79 Murchison Road, London, E.10.
- G3FPQ D. L. Courrier-Dutton, Hilland, Headley, Bordon, Hants.
- G3FPS A. E. English, 13 Church Road, East Molesey, Surrey.
- G3FPZ A. W. R. Pearson, Slab Lane, Morgan's Vale, nr. Redlynch, Salisbury, Wilts.
- G3FQA K. R. Gilbert, 48 Chilton Grove, Yeovil, Somerset.
- G4WB J. R. Brown (*ex-G6QT*), 31 Bamburgh Grove, Monkton, Jarrow-on-Tyne, Co. Durham.
- G5BC J. Blake, 292 Torbay Road, Harrow, Middlesex.
- G5QQ Rawdon Radio Club, c/o Rowallan, Canada Drive, Rawdon, Leeds, Yorks.

## CHANGE OF ADDRESS

- G2FDF W. F. Limehouse (*ex-Y12FDF*), 52 Gordon Road, High Wycombe, Bucks.
- G2HKJ A. R. Knight, Greengates, Alderney Avenue, Parkstone, Poole, Dorset.
- G2HNO L. J. J. Morgan, Flat D, 6 Warren Edge Road, Southbourne, Bournemouth.
- G3DCJ J. E. Wootton, 4 Daniel Place, Penzance, Cornwall.
- G3DLD E. Lawson, Upwaps, Viewlands Rise, Chevin End, Menston-in-Wharfedale, Yorks.
- G5JJ D. C. Hall, 12 Sunbury Gardens, Mill Hill, London, N.W.7.

## CORRECTION

- G8CO F. Barrett, 2 Whitehall Road, Grays, Essex.

# Here and There

## Humble Apology

It will not have escaped the notice of a large number of our readers (and our trade friends on the wholesale and retail distributing side) that the August issue of the *Short Wave Magazine* was over a week late in making an appearance.

While it is neither excuse nor defence to say "It was not *our* fault" (meaning the staff of the Short Wave Magazine, Ltd.), the fact is that our printers have accepted full and unqualified responsibility for the delay, and we for our part can say that all possible steps have been taken to ensure that in future the entire home distribution of the *Short Wave Magazine* will be completed on the day of publication.

Publication has been put on by two days to the Friday after the first Wednesday—which is *not* always the first Friday in the month, be it noted.

Hard words have been spoken about the August *debacle*, and we were left in no doubt as to what many readers thought of us! We hope that they will accept the foregoing statement and note that future issues of the *Short Wave Magazine* will be published on Fridays, October 7, November 4, December 9, and so on.

To those who did not write, wire or telephone to complain or enquire—our thanks for your forbearance on this unhappy occasion.

## The Amateur Reserve

In this space last month we mentioned the proposed formation of an Army Amateur Reserve. Further discussion makes it clear that the scope is wider and that the emphasis is not entirely on the Army. The intention is that the Reserve should operate on civilian lines as an emergency communications service, with the Army as the liaison authority. Thus, personnel of the Amateur Reserve need not be ex-Service (though this is an advantage) and the immediate aim is to obtain the support of active operators who are interested in an Amateur Reserve in the widest sense.

Clearly, this is a project calling for careful organisation and a plain statement on the duties, function and responsibilities of members. At this stage, those who send in their names to Capt. D. W. J. Haylock, G3ADZ, 230 Devonshire Avenue, Southsea, Hants, do not in any way commit themselves, since the first step is to find out how many licensed operators are prepared to join an Amateur

Reserve which is to work as an emergency communications service under official control.

## Contributor Note

While the *Short Wave Magazine* is not wholly dependent on the work of outside contributors, we publish a great deal of material which reaches us by way of casual contribution. This is reflected in the fact that during our last financial year we paid over £1,500 for technical articles by outside contributors alone—of whom there were no less than 75, and many of them had never before appeared in print.

There is no Amateur Radio journal in the world which offers such scope or opportunities to the writer with something useful or interesting to say.

## Unusual Offers

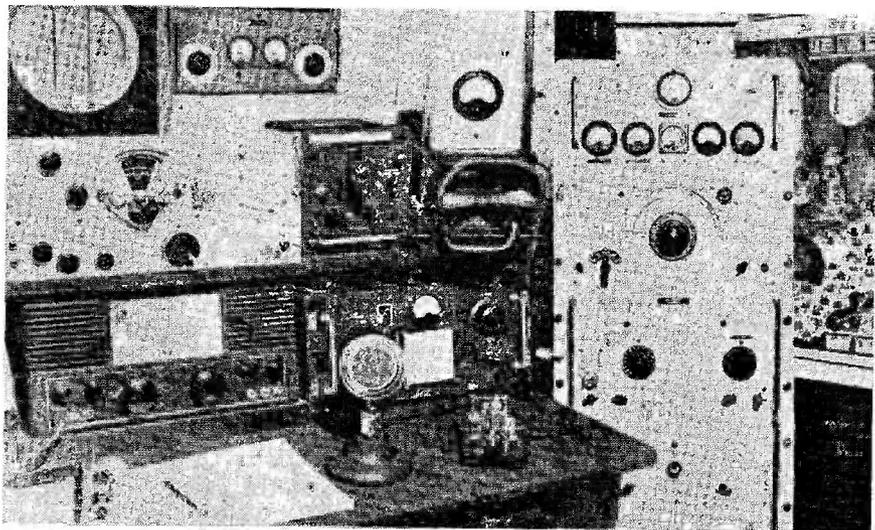
In our Small Advertising in this issue, a South Wales reader has a house to sell, *with* a complete amateur station and a rotary beam installed! Another offer is that of G5BY, of South Devon, the well-known VHF operator. He has an unfurnished house to let to a retired married amateur who is licensed and interested in sharing in the activities at G5BY. As he says, he would like to do someone a good turn.

## Valete

Early in August, G5RN of Torquay passed on at the age of 63. He was one of the Old Timers, and had been active since the 1920's. A pioneer of the cinema—he opened the old Electric in Devonport as early as 1910—he built up a circuit of nine picture theatres in the West Country, and retired to Torquay in 1944. Until about twelve months ago, G5RN was regularly to be heard on 80-metre phone, and was also a DX operator on the 28 mc band.

## Suggestions

We constantly receive enquiries of a kind which are answered completely in the *DX Operating Manual*, to which we would refer those readers who want to understand amateur procedure (in the operating sense), or require a list of zones and prefixes. All this, and much else about working DX and operation on the amateur bands generally, is covered in the *DX Operating Manual*, which is 2s. 8d., post free, of the Circulation Manager, Short Wave Magazine, Ltd., 49 Victoria Street, S.W.1.



## The other man's station GI3CDF

At GI3CDF, the station owned and operated by L. Lyske at 63 Church Street, Portadown, Co. Armagh, Northern Ireland, the equipment is in a room in the basement which is only 6 ft. square. The photograph above is actually a composite picture, very well contrived by GI3CDF himself, to show all the gear in the one view.

Since the operating space is so small, the main object has been to get as much as possible of the necessary equipment into it! Hence, the transmitter is somewhat unusual in that everything has been constructed "plug-in"—each chassis picks up all its own connections when inserted in its place in the rack; similarly, the meters on the top deck are all connected in by plugs. This arrangement not only makes for convenience when working in such a restricted space, but also eliminates the mass of untidy wiring often to be found behind an otherwise handsome rack-built transmitter.

The rack is home-constructed, finished in grey plastic, and is in six tiers. Bottom deck, PA and exciter power supplies; second panel,

power units for speech amplifier and modulator, with control relays; third, speech amplifier and modulator, running 6J7-6J5-6L6-P/P 807's in Class-B; fourth deck, all-band exciter and PA, using 6V6-807 into P/P 807's; fifth, a much modified R1155, with the top panel carrying the meters, as already mentioned.

On the operating table is the EF50-6V6 VFO unit, with an Eddystone 640 receiver, with which a BC-453 is also available. Auxiliary equipment includes a BC-348, an LM7 frequency meter, a 3-in. oscilloscope, a monitor field-strength meter and a 10-in. speaker built into the wall. Additional items not shown are a self-contained 1.7 mc transmitter and an 8-watt QRP rig for 7 mc CW.

The aerial is a 67-ft. Zepp, connected through an aerial coupling unit which can be seen in the window. This is used on all bands.

Altogether, it can fairly be said that GI3CDF is yet another example of a well-engineered amateur station on modern lines, with the best use being made of the available facilities.

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*Mention the Magazine when writing to Advertisers—It Helps  
You, Helps Them and Helps Us*

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# THE MONTH WITH THE CLUBS

## FROM REPORTS

Despite the fact that many Clubs close down for the month of August, reports received from 27 of them indicate a good deal of activity and preparation for the long autumn and winter session.

The steady increase in the number of licensed Club stations is particularly noticeable and very gratifying; a record entry for this year's "MCC" is confidently expected.

Next month's deadline for reports is first post on September 14; address them, as usual (together with any Club photographs of interest, which are always welcome) to Club Secretary, *Short Wave Magazine*, 49 Victoria Street, London, S.W.1.

**Lothians Radio Society.**—The new season will open with a meeting on October 3 in the Members' Room at 25 Charlotte Square, Edinburgh, and fortnightly meetings will continue from that date. An interesting programme has been drawn up, and the search for permanent premises continues.

**Kingston & District Amateur Radio Society.**—The recent demonstration of Test Gear, by Mr. Pratt of Messrs. Automatic Coil Winders, proved very interesting and made a successful meeting. A Club Field Day is being arranged, and the next regular meeting will be on September 14 at the Kingston Hotel—7.30 p.m.

**Forfar & District Amateur Radio Club.**—We have been notified by the Hon. Sec. of this Club that it is active, with a clubroom at 156 East High Street, Forfar, Angus. The Hon. President is GM2HIK, Hon. Vice-President GM3FEU, and the Hon-Sec./Treasurer Mr. R. E. Ascoli (QTH in panel).

**Lincoln Short Wave Club.**—During August the Club hopes to have held a successful Field Day and to have paid a visit to the local generating station. The next meeting will be at 7.30 on September 14, with the usual Morse class preceding it. A Radiolympia Trip is being arranged for October 1; there are still a few vacancies.

### South Manchester Radio Club.

—The committee was re-elected at the recent AGM, with no changes except for the appointment of a Publicity Manager. Twelve members visited the Port Radar Station at Liverpool recently, and at the last meeting there was a lecture and demonstration of a home-made oscilloscope.

### Surrey Radio Contact Club (Croydon).

—Monthly meetings continue on the second Tuesday. At recent meetings there have been demonstrations of VHF "Business" equipment (160 mc), a Junk Sale, and a "re-cap" of NFD. Overseas visitors to the Club have included VK3JP, VK4HR and W3EVT. Next meeting, September 13, at the Blacksmiths Arms, South Croydon.

### Barnsley & District Amateur Radio Club.

—Lectures have been given at recent meetings

by G8WF and G6LZ. The AGM will be held in the Clubroom on September 9; thereafter the meetings are on September 23, October 14 and 28, November 11 and 25, December 9 and 23.

### Wirral Amateur Radio Society.

—A film show sponsored by C.O.I., and a talk by G8BM on Two Metres, proved to be of great interest to members at recent meetings. The AGM is scheduled for October 12; the next meeting after that will be on the 26th—both at YMCA, Whetstone Lane, Birkenhead, at 7.30.

### Southend & District Radio Society.

—During August this Club ran a portable station with the call G5QK/A at the International Scouts' Jamboree at Belchamps, near Hockley, Essex. On August 21 they were visited by Medway, and the return visit will be paid on September 4. On August 28 Southend collaborated with Romford in a DF contest at Havering-atte-Bower. The next indoor meeting will be on October 4, Room 1, Municipal College, Southend.

### South-West Essex Radio Society.

—This Club closed for a few weeks on account of holiday-making, but will reopen on the third Tuesday in September. It has been well supported during the last year by a small but enthusiastic group of members. During the coming season it is hoped to

### TOP BAND CLUB CONTEST—1949

The Fourth Annual *Short Wave Magazine* 1-7 mc Club Transmitting Contest will take place during the period November 12-20 next. The event is open to all Clubs on our Active Register (compiled from those Clubs reporting to us at any time within the six months to September 30), and the Rules, with entry forms, will shortly be circulated to all secretaries concerned. In the meantime, make sure your Club is on our Register; it will be if we have had a report, printed in these columns, at any time during the last five months.

build a Top Band Tx for 'phone and CW, also an oscilloscope and a communications receiver.

**West Middlesex Amateur Radio Club.**—Lack of permanent accommodation restricts the practical side of club activity here, but all meetings have been well attended, and several outdoor visits are being arranged. A welcome was recently extended to Mr. E. Soudergaerd (OZ1Z) and Mr. H. Schlaipymi (from Switzerland). Both gave interesting talks on radio in their respective countries. Meetings are on the second and fourth Wednesdays, 7.30 p.m., at the Labour Hall, Uxbridge Road, Southall.

**West Bromwich & Handsworth Radio Society.**—Activity continues and membership increases. During August Mr. H. H. Jones gave an interesting lecture, with a demonstration, on the Moving Coil Pick-Up. Members brought their favourite records, which were reproduced on high-fidelity equipment. Meetings are held on the last Wednesday of the month. New members and visitors will be welcome.

**Brighton & District Radio Club.**—During August there

were some interesting talks by members on the subject of their own gear. For the autumn programme several members have volunteered to give demonstrations and talks on their own pet subjects, and it is also hoped to rope in visiting speakers on specialised topics. There is growing interest in 144 mc work, and co-operation between transmitting and SWL members of the Club should foster some useful activity in this direction.

**Eastbourne & District Amateur Radio Society.**—This Club is commencing its meetings again on September 2, at the Friends Meeting House, Wish Road. Following meetings will be held on the first Friday. Prospective members and visitors will be welcomed.—Secretary's QTH in panel. An application for a Club Licence has been lodged, and it is hoped to be able to open up on the Top Band shortly.

**London Short Wave Club.**—Membership is increasing steadily and the Club now meets every Thursday at 8 p.m., at Ostade Hall, Brixton, where full canteen facilities are available. Meetings have hitherto consisted of discussions on widely varied subjects, but a programme of

lectures and so on is being prepared for the coming season. The Club Tx also operates each Tuesday evening, from Lansdowne Gardens, Brixton; a 'phone licence is now held.

**Spenn Valley Radio and Television Society.**—The Club wish to thank G3CMI, G2SU, G2FIS, G3CUM, G6BX and Mr. B. Cost for lectures and talks during the past successful season. The winter syllabus includes a visit to the Royal School of Signals at Catterick Camp.

**Southport Radio Society.**—At the last meeting G3FGG gave an interesting lecture on the Automatic Telephone System. Three members have passed the RAE and hope to be on the air shortly. The Club Tx is in much demand and has been on the air a lot, despite the summer weather. Lectures, including a course for the RAE (commencing September 14), have been arranged for the winter season; on Tuesdays (starting September 12) the Morse classes will be resumed.

**Derby & District Amateur Radio Society.**—Members are busy putting finishing touches to the home-built equipment

#### NAMES AND ADDRESSES OF CLUB SECRETARIES :

The list below represents only those Clubs reporting for this issue of the *Magazine*. A similar list appears every month and the Active Club Register complete is periodically printed in our *Short Wave Listener*.

BRADFORD : W. S. Sykes, G2DJS, 287 Poplar Grove, Great Horton, Bradford.  
 BRIGHTON : L. Hobden, 17 Hartington Road, Brighton.  
 CLIFTON (S.E. LONDON) : W. A. Martin, 21 Brixton Hill, London, S.W.2.  
 DERBY : F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.  
 EASTBOURNE : R. Nugent, G2FIS, Field House, Windmill Hill, Hailsham.  
 EDINBURGH : N. H. McLean Ross, GM2DYP, 64 Thirlestone Road, Edinburgh, 9.  
 FORFAR : R. E. Ascoli, Prospect House, Letham, Angus.  
 KINGSTON : R. Babbs, 28 Grove Lane, Kingston, Surrey.  
 LINGCOLN : G. C. Newby, G3EBH, The Vicarage, Nettleham, Lincoln.  
 LONDON, S.W. : R. Lisney, G3FLI, 6a Ongar Road, London, S.W.6.  
 LOTHIAN : J. Mackenzie, 41 Easter Drylaw Drive, Edinburgh, 4.  
 LUTON : E. Radford, 37 Wilsden Avenue, Luton.  
 MIDLAND : A. W. Rhodes, 135 Woolmore Road, Birmingham.  
 NORTH-EAST : A. Cherrett, G3BEJ, 22 St. Julien Gardens, Newcastle, 7.  
 PONTEFRAC : C. H. Gould, G2FQH, 51 Pontefract Road, Ferrybridge.  
 SOUTHEND : J. H. Barrance, M.B.E., G3BUJ, 49 Swanage Road, Southend.  
 SOUTH MANCHESTER : M. I. Wilks, 57 Longley Lane, Northenden, Manchester.  
 SOUTHPORT : F. H. P. Cawson, G2ART, 113 Waterloo Road, Southport.  
 SOUTH WEST ESSEX : L. G. Barratt, 367 Rush Green Road, Romford.  
 SPEN VALLEY : N. Pride, 100 Ralkeas Lane, Birstall, Leeds.  
 SURREY (CROYDON) : L. C. Blanchard, 122 St. Andrews Road, Coulsdon.  
 WALSALL (Tech. College) : J. F. Young, Walsall Technical College, Bradford Place, Walsall.  
 WALSALL (A.R.S.) : L. G. Barlow, 15 Kinnerley Street, Walsall.  
 WEST BROMWICH : G. Johnson, G2BJY, 22 Lynton Avenue, West Bromwich.  
 WEST CORNWALL : R. V. A. Albright, G2JL, Greenacre, Lidden, Penzance.  
 WEST MIDDLESEX : H. C. Bostock, G3BWC, 1 Grange Road, Hayes, Middlesex.  
 WIRRAL : R. A. Browning, 24 Norbury Avenue, Bebington, Cheshire.

to be exhibited on the Society's stand at the forthcoming Model Engineering Exhibition, which will be held in the Queens Hall, London Road, Derby, from September 20 to 24. This has been organised by the Derby Society of Model and Experimental Engineers.

**Walsall & District Amateur Radio Society.**—During the Walsall Bank Holiday Show this Club exhibited a complete 100-watt station (G2ADJ/A), and other transmitting and receiving gear was on show. A similar display will take place at Bloxwich on September 17, and the Club is again taking a hand. Fortnightly meetings continue; new members will be welcomed.

**Walsall Technical College Radio Amateurs' Club.**—Final arrangements are under way for the Walsall Field Day; the Club-Headquarters Station possesses an imposing array of gear, but as yet is without a permanent home. The Hon.

Sec. would be glad to hear from ex-students of the College who are interested in the Club. Meetings are held every Tuesday, 7.30 p.m., in the Wisemore Annexe of the College.

**Clifton Amateur Radio Society.**—Highlight of August was the Field Day, won by Messrs. W. Woller and R. G. Poppi. The second team, captained by G3EQM, also did very well. An ambitious programme has been planned for the autumn season, and the AGM will be held at the end of August.

**Bradford Amateur Radio Society.**—This Club's winter season opens on September 20 with the AGM, at which the new officers will be elected. The meeting will be at 7.30 p.m., Cambridge House, 66 Little Horton Lane, Bradford. Old and new members will all be heartily welcomed.

**Luton & District Radio Society.**—This Club, although a newcomer to our columns, is now

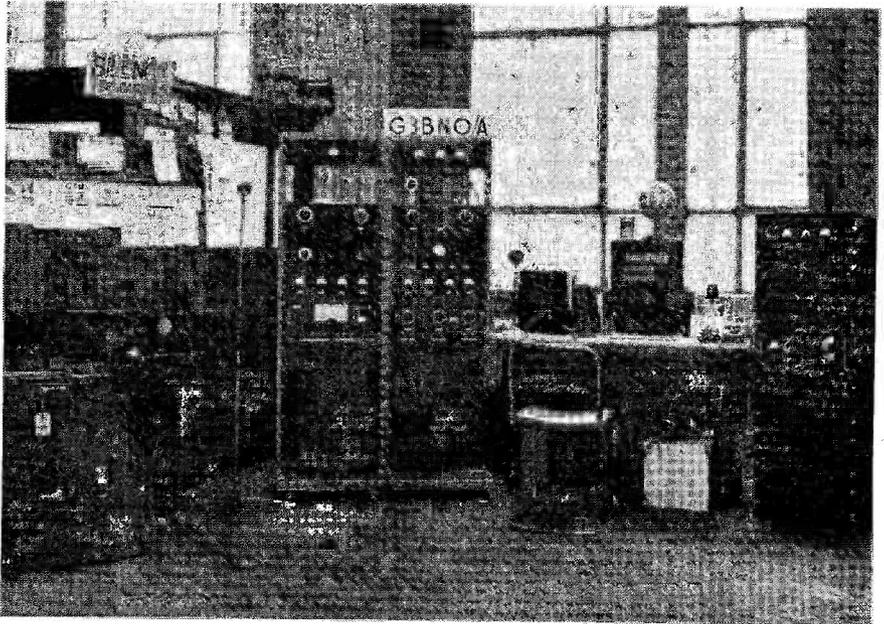
in its third year and has a membership of 40. It meets every Monday at 7.30, at the Surrey Street School. Next meeting after publication is September 12; new members will, of course, be welcome.

**West Cornwall Radio Club.**—The Redruth section of this Club will be holding an Amateur Radio Exhibition in December. Redruth's central location will, it is hoped, enable all members of the club to get there. A large attendance is expected from the general public, as electrical appliances will also be shown.

**Midland Amateur Radio Society.**—Recent meetings have been well attended, and a lecture by G2RQ on transmitter design was particularly interesting, as was the second, by G3BUR, on Aerials. September 10-11 will be a weekend under canvas. The VHF enthusiasts are particularly asked to look out for G3BUR/P on 145 and 420



The museum section of the Liverpool Amateur Radio Exhibition in May, which was probably the most successful show of its kind yet staged in the Provinces.



G3BNO/A was in action at the Liverpool Exhibition, jointly organised by the four radio Clubs covering that area—Wirral Amateur Radio Society, Liverpool and District Short Wave Club, Merseyside Radio Society and Ellesmere Port Amateur Radio Club.

mc; callsigns on the other frequency bands will be G5IW, G6DL and G2AK. Times are 1600 BST on the Saturday until 1700 BST on the Sunday.

**North-Eastern Amateur Transmitting Society.**—Forty members attended the recent AGM, when new officers were elected and policy discussed. G3ZP is the new Chairman and G3BEJ the new Hon. Sec. Membership tops the 80 mark and includes 52 licensed

amateurs. Meetings (third Monday of the month) take place at the British Legion Rooms, 1 Jesmond Road, Newcastle.

**Pontefract & District Amateur Radio Club.**—Meetings are now held every Thursday, with a Morse class every week. An Amateur Radio exhibition is to be held, and many visits to places of interest are planned. Permanent accommodation is now available and the Club hopes soon to

be on the air from its own Clubroom.

**Edinburgh Amateur Radio Club.**—Meetings now take place in the new Clubroom at 10, Atholl Crescent, on Tuesdays and Thursdays at 7.30 and on Sundays at 7 p.m. In a few weeks a start will be made on the Club's Tx; members have already given equipment towards this good cause, as well as various items for the workshop.

#### MINIATURE STATION DESIGN

The word "miniaturising," like that other "tropicalising," is one of those regrettable but very apt expressions coined during the War (and used even in official papers). In the radio field, it meant reducing the size of components and equipment to the smallest practicable dimensions. And, indeed, it was quite extraordinary how much reduction in space and weight was possible over a wide range of

apparatus. The point of this comment is that there is ample scope for the design of amateur equipment in the same sense. It is probably a fair generalisation to say that the room taken up by the essentials in the average amateur station could be reduced by two-thirds if it became necessary to economise to the utmost in space.

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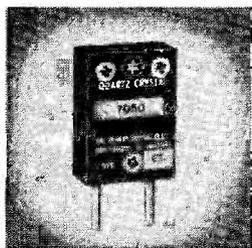
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**PT15** NEW boxed, 12/6. VT105, 6F6, VR99, 6/-; Driver Transformer, Ratio 1-2, CT Sec., 2/-; postage 6d.—Nevanas, 84 Colledge Road, Gt. Crosby, Liverpool, 23.

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READERS'—continued.

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READERS'—*continued.*

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**SMALL ADVERTISEMENTS  
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**R1155A** for sale. Internal power and output (EL32). Good working order. Cheap. What offers ?—Bruce, 113 Forest Lane, Harrogate, Yorkshire.

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**G5RS**, 20 Hedgeway, Guildford, Surrey.

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**B2 Tx/Rx/P/Pack**, complete with access, in transit cases: brand new, 11 gns. New 250TH, 35/-; 803's, 15/- Wanted, new 832's, 6J6's, 6AK5's.—G3DSC, 26A Longton Grove, Sydenham, S.E.26.

**HRO** power pack, 4 coils and spares, in home-built rack, £30 or offers.—16 Hallas Grove, Dalton, Huddersfield.

**SX28** re-valved, re-aligned, buyer collect, £40. TG10 keyer/amplifier, unused, original packing, £10; B2 complete, as new, xtals 3510, 3520, £14. Lionel "bugs," new, 47/6; BC-221T, unused, £12/10/-; 1147B, 47/6; 813's, unused, 39/6. Pair 830B, unused, 25/-; 2C26's, new, 7/6; Bryce 16H 300mA chokes, unused, pair £4/10/-—Parker, 9 Cheltenham Road, Broadway, W.orce.

**BC3129v** communication receiver, 1-5-18 mc, external power pack, 230v AC, 8-in. speaker. All in new condition. 10-metre converter (requires new valve), £15. Offers ?—Botley, 71 Meadfield Road, Langley, near Slough, Bucks.

**WANTED.**—B2 Power Pack. Buy or part exchange for MCR1 complete. G3CZM, 1 Evelyn, Branksome Hill Road, College Town, Camberley, Surrey.

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**F**OR SALE.—B2 Tx/Rx, Power supply, all coils, spare EF32 valve and cables, £14. Brand new RCA 813's, boxed, all tested, 42/- each (6 off). Hermes Radio, 5 valve superhet communication Rx. covers 160 and 80 metres, AVC, BFO, RF, LF gain controls, LS. separate power pack, 200-230 AC input. £5/10/-—GW8BW, 7 Neath Road Bungalows, Rhigos, near Aberdare, S. Wales.

**S**ALE.—25w Tx, CO/PA, 20 and 40 metre CW, complete 400v power supply, £8/15/- or near offer. Or part cash, good make prism binoculars.—G5U, 80 Bawtry Road, Rotherham.

**AR88D** receiver 540 kc-32 mc, perfect condition as new, in black crackle steel cabinet, manual, £45.—G3AQO, 237 Worplesdon Road, Guildford.

**BC348** new condition, perfect, built-in power pack, speaker and phones to match. £18 or near offer.—Flay, 30 St. Georges Road. Gillingham, Kent.

**S**ALE, 1155 with P/P and Speaker. Excellent job—£12. Or exchange for complete B2, or similar—G3ENB, 67 Broad Street, Dewsbury, Yorks.

**BC348R** Noise Limiter, additional AF valve, 6SH7 1st RF, LR output, S-Meter, voltage stabilizer, incl. ext. P/Pack. Webb's Class-D wavemeter, unused, in original box. Portable Decca Gramophone and P.U. Offers? Require B2453. Box 597.

**W**ANTED, information on AR77E. Buy or borrow, Bundle, 7 Ryhill Avenue, Higher Ardwick, Manchester 12.

**VCR97** mask, base, transformer, seen working, £2. 35T (2), new, £1 each. 10/100/1000 kc, crystal calibrator, £3. G3CLL, *Emberbrook* k 4841.

**N**EW American Valves. 6SN7, 6SH7 3/-, 12SK7, 6SL7, 4/3. 6F6G, 1629, 5/6. 1625, 9/-, 6H6, 1/-, pair 837's, 22/-. Most others available. NU13A 2-5 kc 250 mA H.Vac. Rect., 17/6. S.A.E. queries please. Box No. 598.

**BC348** excellent condition, built-in AC power pack, fitted signal-strength meter, bargain, £18/10/-. Two Jefferson Travis UHF Transceivers, Model UF-1, range 60-75 mc, perfect, £10 pair, G3DUZ, 18 Smith Moor Avenue, Stocksbridge, Nr. Sheffield.

**BC348** spare set IFT's, crystal filter, crystals, etc.—needs aligning, carriage paid, £12/10/-. 64 St. Bernards Road, London, E.6.

**250** watt Tx—80, 40, 20, 10—Phone/CW. En closed rack 80 in. x 20 in. x 14 in. Crackle, fully metered, band switched, relay controlled. Lovely job with neutralised 813 final and TZ40's modulator, 21 valves. 5 Power packs, biggest 1,800v at 250 mA, £60. London area. Box No. 601.

**V**ALVES, 6L6, KT66, 6B4, no valve over 3/-. Must sell, emigrating. S.A.E. for list. Mayne, 10 Elmbridge Drive, Ruislip, Middlesex.

**C**AN anyone help with cure for frequency drift in the 640? Payment made if suitable and really effective. Box No. 600.

**D**OOR-KNOB VHF triodes, four matched pairs only. (Equiv. U.S.A. Type 703A). See OST January, 1949, for circuit detail. 50/- pair. G3BLN, Leven Close, Leven Avenue, Bournemouth.

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**W**ANTED BC221, less valves and crystal, also 3C22's and UHF valves. Sale: Hallicrafter 5/10, £12 or offer. ZB2, 30/-, R1355, 30/-, 9003's, brand new 5/-, BC453, £2. Systoflex, 100 yd. rolls 4/-, Box No. 599.

**W**ANTED. Leather carrying case, as manufactured by Automatic Coil Winder and Electrical Equipment Co., Ltd., for AVO all-wave oscillator. In any condition, please state price. Watts, 62 Belmore Road, Thorpe, Norwich.

**E**DDYSTONE Model S640 Communications Receiver, nearly new (30 hours' operational time), complete with set of Brown's phones and Eddystone speaker. What offers? Fistrhal House, Westfield Road, Bengoe, Hertford.

**C**OMFORTABLE home and use of well-equipped shack offered to keen amateur (nr. London). BRS studying for ticket.—Box No. 602.

**B**RAND new rack mounting AR88D and speaker. Free delivery on route Ebbw Vale, Monmouth, Gloucester, Oxford. Otherwise buyer collects. Nearest £40.—Box No. 604.

**155** MODIFIED AC mains, 6V6 output, separate power pack, speaker, £9.—32 Curling Vale, Onslow Village, Guildford. Phone: *Guildford* 2101.

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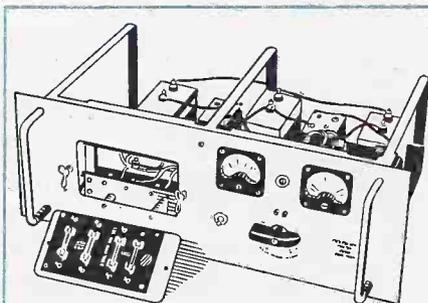
This ex-R.A.F. equipment comprises a 3-commutator rotary transformer with its associated smoothing systems, consisting of screened suppressor units and an L.F. choke and condenser. Input is 24v D.C.; output is 250v 30/65 m/a and 6.3v, 2.5 amps D.C. Brand new, 10/- (Post and packing, 2/6)

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# ERIE *Stud* Potentiometer

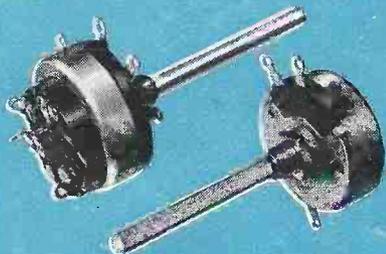
This neat, totally enclosed Potentiometer with its smooth movement, has many advantages over the conventional wafer switch with its often untidy array of external resistors and its stiff, jerky movement. Its few moving parts give long life and low contact resistance, and simplicity and economy in design lend themselves to rapid bulk production at very low cost.



Internal View  
of Contacts

## Abridged Specification and Data

- Series :** SKC 2100.  
**Resistor Elements :** Erie Type 5B. Any standard value 10 ohms to 10 meg-ohms. Tolerance  $\pm 20\%$ .  
**Types Available :** Non-switch 9 steps; DPST switch 7 steps.  
**Tappings :** A tapping can be provided at any step except the 3rd and 6th.  
**Diameter :**  $1-\frac{9}{16}$ " excluding tags.  
**Bush :** 0.375" 32 T.P.I.  
0.263" 32 T.P.I.  
**Spindle :** With standard Erie and RECMF flats in  $\frac{1}{8}$ " integers up to  $2\frac{1}{2}$ " maximum inclusive of bush.



# ERIE

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