

*R.S.G.B.*



# BULLETIN

**December 1950**

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# Radio Society of Great Britain

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## Forthcoming Events

### Christmas and New Year Greetings to Members ♦ Everywhere ♦

#### REGION 1

**Ashton-under-Lyne.**—January 7, 3 p.m., New Jerusalem Schools.  
**Blackpool.**—December 19, January 16, 7.30 p.m., Barclays Bank Chambers (2nd floor), 2 Birley Street.  
**Bolton.**—January 2, 8 p.m., Y.M.C.A.  
**Bury.**—January 11, 7.30 p.m., Y.M.C.A.  
**Darwen & Blackburn.**—December 29, January 12, Y.M.C.A., Limbrick, Blackburn.  
**Oldham.**—Alternate Wednesdays, 7.30 p.m., Civic Centre, Clegg Street.  
**Manchester.**—January 8, 7.30 p.m., Reynolds Hall, School of Technology, Sackville Street.  
**Freston.**—December 22, January 5, 7.30 p.m., Three Tuns, North Road.  
**Rochdale.**—January 7, 3 p.m., Drill Hall, Baron Street.  
**Southport.**—January 15, 8 p.m., 38a Forest Road.  
**Liverpool.**—January 6, 2.30 p.m., 29 Derby Lane, Old Swan.  
**Wirral.**—December 20, 8 p.m., Y.M.C.A., Whetstone Lane.

#### REGION 2

**Barnsley.**—December 22, January 12, 7.30 p.m., King George Hotel, Peel Street.  
**Bradford.**—December 19, January 2, 7.30 p.m., Cambridge House, 66 Little Horton Lane.  
**Catterick.**—Tuesdays, 7 p.m., Loos Lines, Catterick Camp.  
**Darlington.**—Thursdays, 7.30 p.m., 25 Coniscliffe Road.  
**Doncaster.**—January 10, 7.30 p.m., Black Bull, Market Place.  
**Gateshead.**—Thursdays, 7 p.m., Y.M.C.A., Sutherland Hall, Durham Road.  
**Hull.**—December 27, 7.30 p.m., R.E.M.E. Barracks, Walton Street.  
**Leeds.**—Fridays, 7.30 p.m., Swarthmore Educational Settlement, Woodhouse Square.  
**Middlesbrough.**—Thursdays, 7.30 p.m., All Saints Hall, Grange Road.  
**Newcastle-upon-Tyne.**—January 22, 8 p.m., British Legion Rooms, 1 Jesmond Road.  
**Rotherham.**—Wednesdays, 7 p.m., Oddfellows' Hall, Westgate.  
**Scarborough.**—Thursdays, 7.30 p.m., L.N.E.R. Rifle Club, West Parade Road.  
**Sheffield.**—December 27, 8 p.m., Dog and Partridge, Trippett Lane; January 10, 8 p.m., Albreda Works, Lydgate Lane.  
**Saithwaite.**—Fridays, 7.30 p.m., 3 Dartmouth Street.

**Spennborough.**—December 27, Annual Dinner, 7.30 p.m., Star Inn, Roberttown; January 10, 7.30 p.m., Temperance Hall, Cleckheaton.  
**Wakefield.**—January 10, 7.30 p.m., Service House, Providence Street.  
**York.**—Wednesdays, 7.30 p.m., Community House, Falsgrave Crescent.

#### REGION 3

**Birmingham (South).**—December 17, 10.30 a.m., Stirchley Institute.  
**Birmingham (M.A.R.S.).**—December 19, 6.45 p.m., Imperial Hotel.

#### REGION 4

**Derby (D. & D.A.R.S.).**—December 20, January 3, 7.30 p.m., Club Room No. 4, School of Art, 119 Green Lane.  
**Leicester (L.A.R.S.).**—December 18, 7.30 p.m., Holly Bush Hotel, Belgrave Gate.  
**Nottingham.**—January 8, 7.30 p.m., Lord Nelson Hotel, Carlton Street.  
**Spalding.**—December 28, 7.30 p.m., 10 South Parade.  
**Retford.**—January 7, 3 p.m., The Community Centre, Chapel Gate.

#### REGION 7

**Barnes & Richmond.**—January 9, 7.30 p.m., 22 Lowther Road, Barnes.  
**Brentwood.**—January 5, 19, 8 p.m., Drill Hall, Ongar Road.  
**Chingford.**—January 4, 18, 8 p.m., A.T.C. H.Q., Pretoria Road.  
**Croydon (Surrey R.C.C.).**—January 9, 7.30 p.m., "Blacksmiths Arms," South End, Croydon.  
**Dulwich & New Cross.**—January 1, "Kentish Drovers," Rye Lane, S.E.15.  
**East Ham.**—December 19, January 4, 18, QTH from T.R.  
**East London District.**—January 21, 3 p.m., Ilford Town Hall.  
**Edgware (E. & D.R.S.).**—Wednesdays, St. Michael's School.  
**Enfield.**—January 21, 3 p.m., George Spicer's School, Southbury Road.  
**Finsbury Park.**—December 19, 7.30 p.m., 164 Albion Road, Stoke Newington, N.16.  
**Gravesend.**—Wednesdays, 7.30 p.m., 30 Darnley Road.  
**Guildford.**—January 28, 3 p.m., Royal Arms Hotel, North Street.  
**Hayes & Uxbridge.**—January 5, 7.30 p.m., "The Vine," Uxbridge Road.  
**Hoddesdon.**—January 4, 18, 8 p.m., "The Salisbury Arms."  
**Holway (G.R.S.).**—Mondays, Wednesdays and Fridays, 7.30 p.m., Grafton School, Ebure Road, N.7 (one minute from the "Nag's Head").  
**Ilford.**—January 11, 8 p.m., QTH from T.R.  
**Lewisham (R.A.R.C.).**—Wednesdays and Thursdays, 7 p.m., Childerich Road School, New Cross.  
**New Barnet.**—January 20, 7.30 p.m., "Bunny's Restaurant," Station Road.  
**St. Albans.**—January 10, 8 p.m., "The Beehive," London Road.  
**Sough.**—January 18, 7.45 p.m., The Golden Eagle Hotel, High Street.  
**Sutton & Cheam.**—January 2, 16, 30, Sutton Adult School, Benhill Avenue.

(Continued on Page 225)

## MORSE CODE TRAINING

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25mV. to 10,000V. (Input Resistance 110M $\Omega$ ).

**D.C. Current:** 0.25 $\mu$ A. to 1 amp. (250mV. drop on all ranges).

**A.C. Volts:** 0.1V. to 2,500V. R.M.S. up to 2 Mc/s. With diode probe external 0.1V. to 250V. R.M.S. Useful measurements can be made up to 200 Mc/s., the applied voltage being limited to 100V. above 50 Mc/s.

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E.T.M.3

# R.S.G.B

# BULLETIN

For the advancement of Amateur Radio

VOLUME XXVI No. 6

DECEMBER 1950



## ACCENT ON EXPERIMENT

**T**HE visit of the Postmaster-General (the Rt. Hon. Ness Edwards, M.P.) to the Amateur Radio Exhibition, set the seal of Government support for Amateur Television.

By the keenness of his questions Mr. Ness Edwards showed that he fully appreciates the importance of encouraging experiments in all branches of radio engineering. Mr. Ness Edwards has also shown himself to be a practical man willing to take reasonable risks to prove a point. When his advisers pointed out to him at a recent meeting with Society officials that Amateur Television signals if transmitted on frequencies within the 420-460 Mc/s. band *might* interfere with other services using that band, he forthwith suggested that the Society should arrange for a "guinea pig" TV station (his own term) to be brought into operation as soon as possible on that band so that the effects of interference could be checked in a practical manner.

The P.M.G. made it clear both prior to and during his visit to the Exhibition that he is anxious to provide the Amateur Television experimenters of this country with facilities at least equal to those which are at present enjoyed by the amateurs of the United States and Holland. Mr. Ness Edwards recognises that the experience gained by enthusiasts who use their experimental television transmitters may well prove of vital importance to the country at some later date. This clear recognition by the present P.M.G. of *Experimental Amateur Radio* provides a sharp contrast with the attitude adopted by one of his recent predecessors who, unwittingly no doubt, allowed his advisers to change our status after the war from *experimenters* to *amateurs*.

Yes, indeed, the accent today is on experimentation, as all must have seen who visited the Exhibition and examined, with critical eye, the many items of experimental V.H.F. equipment displayed on the Society's stand. Incidentally the P.M.G. showed great interest in this equipment and asked that his congratulations should be conveyed to those whose ingenuity and ability had produced such outstanding examples of first class design and workmanship. Many of the items displayed

embody techniques which are well ahead of current scientific and commercial practices—and are similar in many respects to the equipment which has helped British amateurs in recent weeks to capture two new U.H.F. world records.

Already the results achieved by British U.H.F. enthusiasts have aroused widespread interest in official circles—interest that increases each time another U.H.F. or V.H.F. record is announced.

It is little more than a year since the first British 420 Mc/s. two-way fixed station contacts took place over a distance exceeding 25 miles. A few weeks ago the British record was raised to 160 miles. Even on frequencies as high as 2300 Mc/s.—the lowest of the three bands at present allotted for Amateur Television in the United Kingdom—a distance of 150 miles has recently been spanned by two U.S. amateurs. These outstanding performances have been, in general, achieved with improvised gear and frequently with the aid of valves which were not designed for use at such high frequencies.

If Amateur Television on micro wave-lengths is to make *real* progress in the United Kingdom the radio industry *must* be prepared to subsidise the initial experiments, even as they subsidised the experiments of those who pioneered the short waves 25 years ago. At current list prices, valves and camera tubes are beyond the financial resources of all but a very small section of the amateur fraternity.

Unless the industry is prepared to co-operate in some practical manner many of the young pioneers of Amateur TV may be compelled to rely on philanthropy. In a movement so widely extended as Amateur Radio it seems strange that no one has yet come forward with an offer to provide a series of Amateur Radio scholarships. Yet there must be many members who—in spite of high taxation—could do much to ease the financial burden which today rests heavily upon the shoulders of any young man who seeks to emulate the pioneering spirit of his forebears.

If such an offer were ever made the accent would indeed be on experiment because the selection would surely be on the basis of original work.

J.C.

# A 14 Mc/s. S.S.B. EXCITER

By N. G. HYDE, Assoc. Brit. I.R.E. (G2AIH)\*

THE apparatus to be described generates a single-sideband signal, with carrier suppressed, at a frequency within the 14 Mc/s. amateur band. Either upper or lower sideband working may be obtained.

The exciter utilises the phase-shift system of sideband elimination, which has been briefly discussed in a previous issue of the BULLETIN, and the circuitry follows closely a design already outlined<sup>(1)</sup> with various refinements and modifications that have been found to be desirable during the development of the equipment.

the phase-shift networks, and an additional valve (V4) acting as cathode follower output for each channel.

The network, however, differs from the one described in *QST* in that the output circuits are single-ended instead of push-pull. This limits the A.F. voltage level obtainable from the circuit, but unfortunately suitable push-pull transformers could not be obtained. However, two small transformers (T1 and T2) were available from ex-Government surplus equipment,<sup>†</sup> and these have functioned quite satisfactorily; the audio output from the

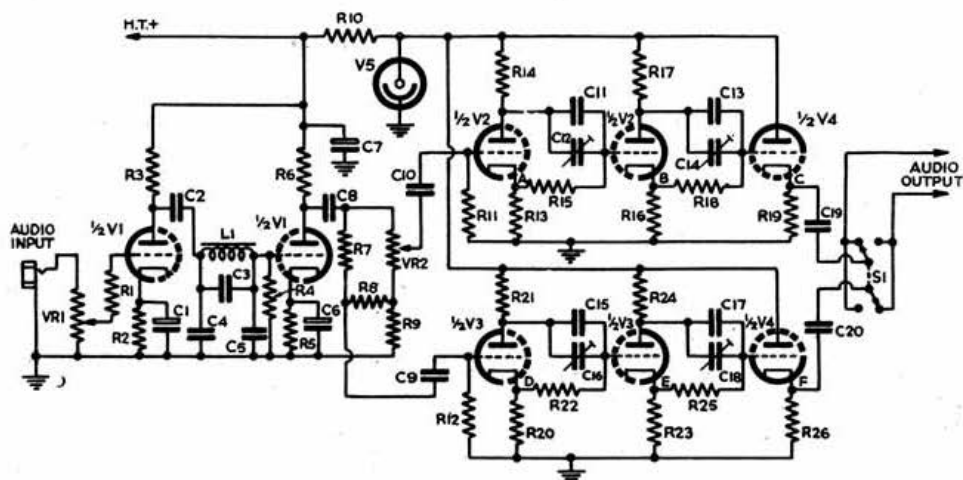


Fig. 1  
Audio frequency amplifier and phase-shift network.

## Audio-Frequency Stages (Fig. 1)

A two-stage A.F. amplifier consisting of the two sections of a *Brimar* 12AU7 twin triode (V1) is incorporated. The output of the normal microphone pre-amplifier is fed to the grid of the first section, via an A.F. gain control (VR1), and is resistance-capacity coupled, through a low pass "pi" type filter (L1, C3, C4, C5) to the second section of the valve. The purpose of the filter, which has a cut-off frequency of approximately 3 kc/s., is to limit the upper range of speech frequencies to a band that is within the capabilities of the audio phase-shift network, i.e., approximately 300 c/s. to 3 kc/s. A band pass filter has not been incorporated as it is felt that this would complicate the design of the apparatus unnecessarily, the frequencies below 300 c/s. being attenuated to a sufficient degree in the microphone pre-amplifier.

The output of the amplifier is fed to the A.F. phase-shifter (V2, 3 and 4) via a potentiometer network (R7, 8, 9 and VR2) which enables the audio level applied to one channel of the phase-shifter to be varied above or below that applied to the other channel. This is necessary in order to obtain voltages of equal amplitude at the output of each channel of the phase-shifter, the attenuation of each channel not being equal.

The audio phase-shift network is based on a design in *QST* for January, 1950, (2) with minor modifications. Here again 12AU7 valves are employed, two being used as buffer valves between

phase-shifter being sufficient to provide greater than 100 per cent. modulation.

It is essential that the H.T. supply to the phase-shifter shall be properly stabilised. It is also desirable to use a heater supply transformer with an earthed centre-tap, as incorporated in this design. The usual method of earthing one side of the 6-volt supply is not recommended. Stabilised H.T. of approximately 110 volts is obtained by means of a VS70 voltage regulator (V5).

In order to ensure that equal voltages are developed across anode and cathode loads of the 12AU7s, the resistors in these circuits must be matched. *Erie* 1-watt high-stability resistors with a tolerance of  $\pm 1$  per cent. are used throughout the phase-shift network. The condensers employed should preferably be of the silvered mica type.

Operation on either the upper or lower sideband is obtained by reversing the phase of the audio applied to the grids of the balanced modulators. This is achieved by the double-pole change-over switch (S1) connected between the output of the cathode followers and the modulation transformer primaries.

## Radio-Frequency Stages (Fig. 2)

Carrier voltage—in the case of the unit described here, at a frequency of 14240 kc/s.—is generated by a conventional crystal-oscillator-frequency double circuit consisting of two *Mullard* EL91 A.F. pentodes; V6 being the oscillator, using a 7 Mc/s. crystal, V7 doubling the output frequency

\* 44 Ancaster Crescent, New Malden, Surrey.

<sup>†</sup> From the U.S. Signal Corps Microphone Amplifier Type BC-347C.

of this valve, and feeding the R.F. phase-shift network. The latter is link coupled to the doubler via the tuned circuit L6, C29, this being tuned to the output frequency of the doubler. The R.F. voltage appearing across C29 is then applied to L7 and C30, which together with the 680-ohm resistors R34 and R35, form the R.F. phase-shift network.

L7 and C30 are adjusted during the alignment of the unit so that their reactances at the operating frequency are 680 ohms. In this condition, the phase of the R.F. voltages applied to the grids of

the transformers T1 and T2. In the unit from which these items were obtained (BC347C) they were used to couple from a 6F8G push-pull amplifier to a 600-ohm line. Using the 600-ohm winding as the primary, and the push-pull anode-to-anode winding as the secondary to the balanced modulator grids, the transformers function quite satisfactorily in their present rôle. Condensers C35, 36, 39 and 40 are used to by-pass R.F. across each half of the transformer secondaries.

L8, C37 and C38 form the anode tuned circuit of the balanced modulators, being link coupled to

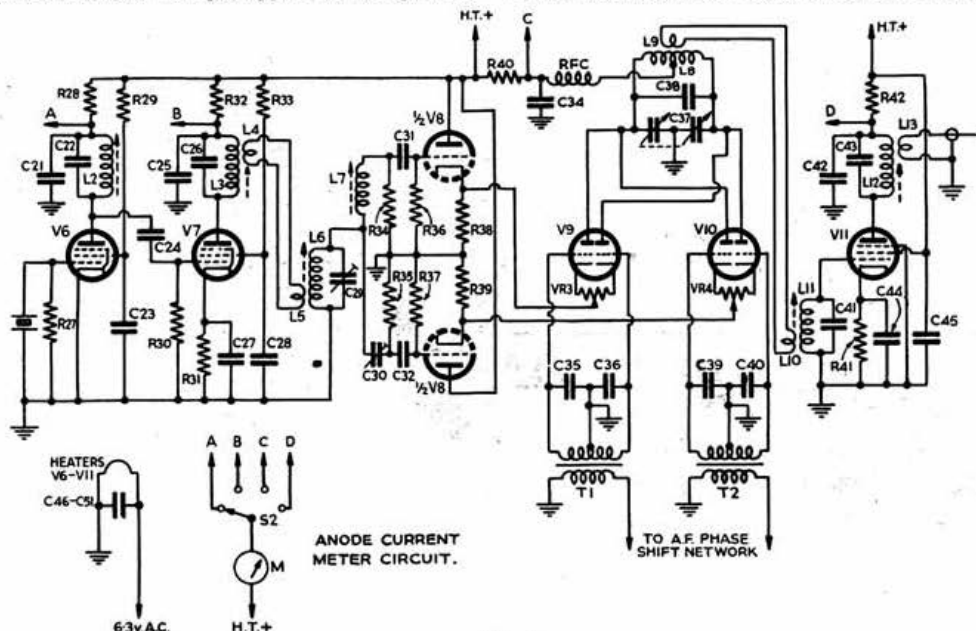


Fig. 2

Radio frequency stages and balanced modulator. C33, not shown, is connected between the anodes of V8 and earth.

each cathode follower (V8)—both sections of a 12AU7—will differ by 90 degrees.

The phase-shifted voltages thus obtained are next applied in phase to each push-pull balanced modulator, V9 and V10 (12AU7s)—in this case to the cathode—via 500-ohm *Morganite* carbon potentiometers, VR3 and VR4, which form the controls for balancing-out the carrier. It has been found to be quite unnecessary to incorporate any additional method of balance in the anode circuit of the valves.

Audio from the A.F. phase-shifter is fed in push-pull to the grids of the balanced modulators, via

the amplifier V11. This employs a *Mullard* EF91 operating as a Class A amplifier, or an EL91 working under Class AB1 or AB2 conditions. Using the latter valve, neutralisation may be necessary. This is simply achieved by taking the H.T. feed to the valve to a centre tap on L12, and connecting a short length of insulated wire to the end of the latter coil remote from the anode, and projecting through a hole in the screen to a point near the grid of the valve. Neutralisation is effected by moving the position of this wire relative to the grid tag on the valveholder, and is not critical. If an EL91 is used, the value of

# COMPONENTS LIST—14 Mc/s. S.S.B. EXCITER

## RESISTANCES

- R1. 20,000 ohms ½-watt.
- R2. 2,000 ohms ½-watt.
- R3. 100,000 ohms ½-watt.
- R4. 27, 30, 100,000 ohms ½-watt.
- R5. 1,200 ohms ½-watt.
- R6. 47,000 ohms ½-watt.
- R7. 8, 47,000 ohms ½-watt.
- R9. 0.39 megohms ½-watt.
- R10. 5,000 ohms 3-watt wire-wound.
- R11. 12, 0.47 megohms ½-watt.
- R13. 14, 20, 21, 1,000 ohms
- R15. 0.27 megohms
- R16. 17, 23, 24, 3,300 ohms
- R18. 3.0 megohms
- R19. 26, 4,700 ohms
- R22. 1.0 megohms
- R25. 1.1 megohms
- R13-25—Erie 1-watt, ±1% tolerance.
- Type 100, High stability.
- R28. 32, 40, 42, 120 ohms ½-watt.
- R29. 10,000 ohms ½-watt.
- R31. 600 ohms ½-watt.

- R33. 5,000 ohms ½-watt.
- R34, 35. 680 ohms ½-watt.
- R36, 37. 5,600 ohms ½-watt.
- R38, 39. 680 ohms 1-watt.
- R41. 470 ohms ½-watt.
- VR1. 1 megohms carbon pot'meter.
- VR2. 100,000 ohms carbon pot'meter.
- VR3, 4. 500 ohms carbon pot'meter (*Morganite*).

## CONDENSERS

- C1. 6, 25μF, 12V.
- C2. 21, 23, 25, 27, 28, 33, 34, 42, 44 to 51, .001μF.
- C3, 31, 32. 100μF.
- C4. 5, 400μF.
- C7. 16μF, 350V.
- C8. .01μF.
- C9, 10, 19, 20. .1μF.
- C11, 13, 15. 80μF, ±5% silvered mica
- C12, 14, 16, 29. 3-30μF, trimmer.
- C17. 200μF, ±5% silvered mica.

- C18. 1,000μF, mica trimmer.
- C22. 47μF.
- C24. 50μF.
- C26, 41. 11μF.
- C30. 50μF, air spaced trimmer.
- C35, 36, 39, 40. 500μF.
- C37. 25μF. + 25μF, split stator.
- C38, 43. 15μF.
- L1. 8H.
- L2-L13. See Table I.
- V1, 2, 3, 4, 8, 9, 10. *Brimar* 12AU7, V5, VS70.
- V6. 7. *Mullard* EL91.
- V11. *Mullard* EF91 or EL91.
- S1. Double-pole double-throw wafer switch.
- S2. Single-pole 4-position wafer switch.
- T1, 2. See Text.
- M. Meter, 0-25 mA.
- R.F.C. 2.5 mH.

the cathode bias resistor must be increased to 1,000 ohms.

Metering is provided for alignment purposes, a 4-position switch enabling anode current of V6, V7, V9, V10 and V11 to be checked.

#### Layout and Construction

The exciter is constructed on a 16-gauge aluminium chassis, 18 in. x 10 in. x 3 in. deep, behind a 19 in. x 7 in. aluminium panel.

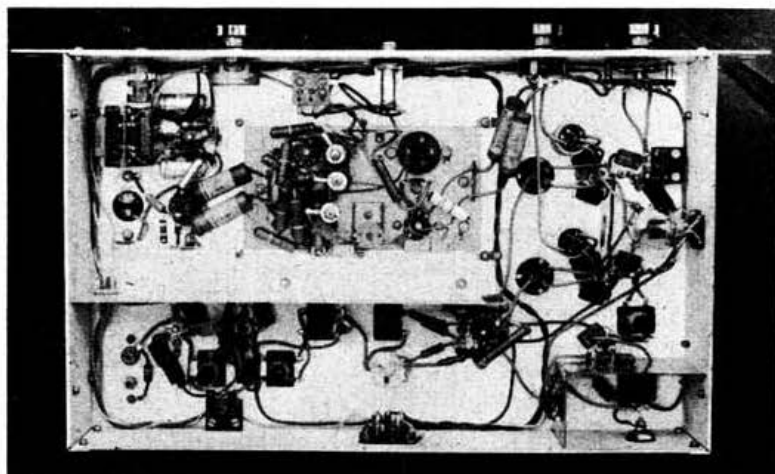
The layout can best be followed by referring to the photograph showing the underside chassis view.

voltage of 250 at 120 mA. and two L.T. supplies of 6.3 volts, one with earthed centre tap, are required.

Controls, etc., looking at the front of the chassis, are (see photograph) from left to right:

- (1) A.F. input jack.
- (2) A.F. gain control.
- (3) Pilot lamp.
- (4) Sideband selector switch.
- (5) Meter switch.

All tuned circuits, with the exception of L8, C37, C38 are slug tuned by pre-set controls on



Under chassis view of 14 Mc/s. single sideband exciter.

At the left-hand side, towards the front of the chassis, is the 12AU7 A.F. amplifier, with the filter choke (L1) and condensers, directly behind the input jack. The potentiometer network, R7, R8, R9 and VR2 is near the screen between A.F. and R.F. sections.

The audio frequency phase-shift network is located near the front centre of the chassis. This is constructed on a sub-chassis of 16 gauge aluminium, 7 in. x 3½ in., which drops through a rectangular hole in the main chassis, to which it is bolted. It was felt desirable to construct the A.F. phase-shifter as a separate unit, as this facilitates its alignment, being bolted in position after alignment is completed. It will be noticed that the high stability resistors occupy most of the space on the sub-chassis. It is recommended that these be mounted on a tag panel underneath the valveholders, because with the arrangement used in this unit, it is rather a difficult matter to reach the cathode tags of the valveholders for alignment purposes.

The output of the phase-shifter feeds, via the sideband selector switch, S1 (second control from right) to the two modulation transformers, which together with the two balanced modulators and the tuned anode circuit of the latter are at the extreme right-hand end. The linear amplifier stage, with its output link terminated in a *Pye* plug on the rear chassis drop, can be seen at the right-hand rear corner of the chassis.

The crystal oscillator is at the left-hand side of the chassis towards the rear, followed by frequency doubler, R.F. phase-shifter, R.F. cathode follower and the two R.F. balance potentiometers, which are located slightly below the modulation transformers.

Power supplies are connected to the unit via a 5-pin plug and socket, the latter being located in the centre of the rear chassis drop. H.T.

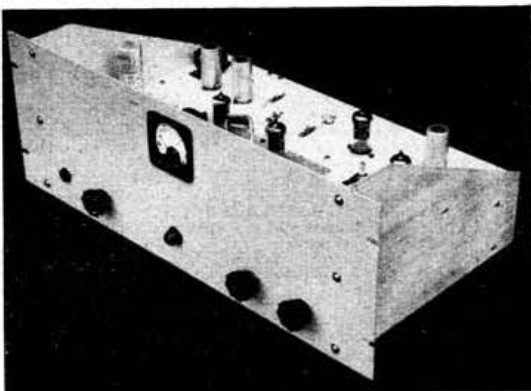
the top of the chassis. All coils are wound on ½ in. diameter formers obtained from ex-Government surplus equipment. Details of coil construction are given in Table I. C37 (balanced modulator tuning) is also pre-set, as are VR2 (audio balance) and VR3 and VR4 (carrier balance controls).

#### Alignment and Test

The most difficult job in the construction of an S.S.B. transmitter using the phase-shift system is the alignment of the various phase-shift networks, to give the required phase-shift of 90 degrees, within fairly narrow limits. Considerable time and patience must be devoted to this stage of the work, and the use of certain items of test equipment is essential.

The apparatus necessary for alignment of the A.F. phase-shift network is:

- (i) An A.F. oscillator, with a frequency range



Panel view of 14 Mc/s. single sideband exciter.

of 100 c/s. to 10 kc/s., and an output that is as free from harmonic distortion as possible.

(ii) An oscilloscope, having vertical and horizontal amplifiers with negligible phase-shift over the band of frequencies stated in (i).

Details of the alignment of the audio phase-shift network are given here, but any reader who undertakes the construction of this exciter, or one of a similar nature, is strongly urged to read the article<sup>(2)</sup>, already quoted, in *QST*, where detailed information is available.

### Alignment of A.F. Phase Shifter

This is best carried out with the phase-shift unit removed from the main chassis. Grids Nos. 1 of V2 and V3 are strapped together, and connected to earth through a 1 megohm resistor.

The audio oscillator is set to give a frequency of 6363 c/s., and the vertical and horizontal amplifiers of the oscilloscope adjusted to give equal deflection at this frequency. The oscilloscope

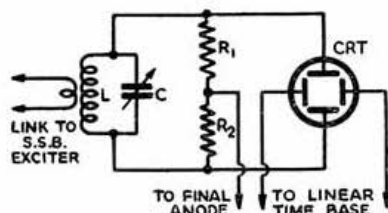


Fig. 3

Oscilloscope for R.F. alignment.

L, C To tune to 14 Mc/s.  
R1, R2 1 megohm  
C.R.T. Emiscope 4/1 tube.

amplifiers are checked for phase-shift, which must be eliminated before proceeding with the alignment. This can be done by connecting the audio oscillator to the input grids of the phase-shifter, and both vertical and horizontal inputs of the oscilloscope to test point A, when the oscilloscope trace should be a straight line inclined at an angle of 45 degrees. Care must be taken throughout the whole alignment process to ensure that the audio level does not overload the phase-shifter or oscilloscope amplifiers.

Next, disconnect the horizontal oscilloscope input from point A, connect to point B, and adjust C12 for a circular trace on the oscilloscope.

The oscilloscope is then transferred to test points B and C, the A.F. oscillator set to 610 c/s., and C14 is adjusted for a circle, having first checked for equal deflection and phase-shift of the oscilloscope amplifiers at this frequency. Then with the A.F. oscillator set to 7492 c/s., and oscilloscope inputs on A and C, a circle should again be obtained. With the A.F. oscillator set to 518 c/s., a circle should also be obtained, and when set to 1970 c/s. a straight line at an angle of 45 degrees should appear. If these results are not obtained, adjust C12 at 7492 c/s. and C14 at 518 c/s.

Alignment of the second channel is carried out in the same manner. With a frequency of 1640 c/s., and the oscilloscope connected to D and E, adjust C16 for a circle; at 157 c/s., and the oscilloscope on E and F, adjust C18 for a circle. To check the adjustment, with an A.F. input of 1903 c/s. and the oscilloscope connected to D and F, adjust C16 for a circle; similarly adjust C18 with an input frequency of 134 c/s. A straight line should be obtained at 508 c/s.

To check the operation of the complete network, connect the oscilloscope to test points C and F; a circle should be obtained over a frequency range of approximately 300 to 3000 c/s.

If the alignment is to be satisfactory, it is important that the A.F. oscillator has a pure waveform, that phase-shift does not occur in the oscilloscope, that no circuits are overloaded, and that the phase-shift network H.T. supply has good regulation.

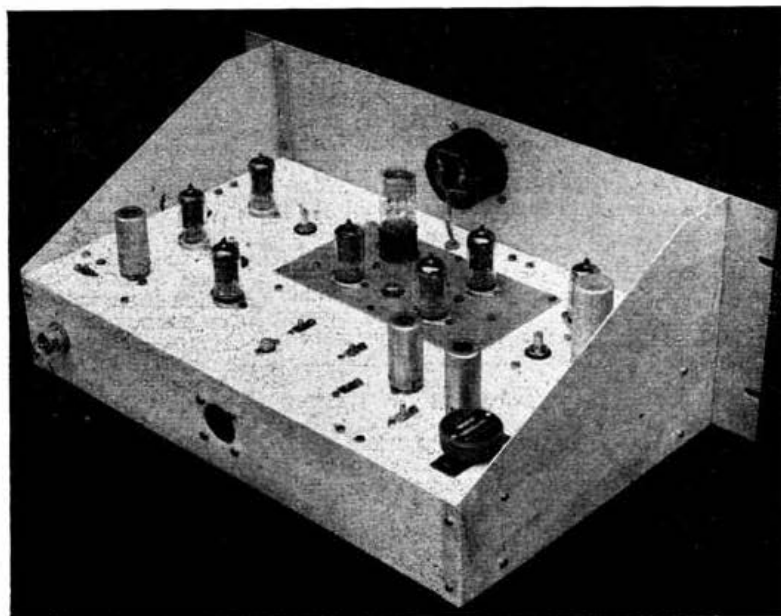
Once adjusted, the trimming condensers should be sealed, and on no account altered during alignment of the remainder of the circuit.

### Alignment of R.F. Circuits

The crystal oscillator and frequency doubler (V6 and V7) are tuned in the normal manner for dip in anode current as indicated on the meter. L6 is adjusted to resonance as shown by maximum increase in anode current of V7.

For alignment of the R.F. circuits following L6, it is recommended that an oscilloscope having

Back of panel view. The A.F. phase-shift network can be seen towards the front centre of the chassis.



horizontal time base deflection, and access to the vertical plates, is employed. In the unit being described an *Emiscope* 4/1 tube was used, one set of plates being connected to the time base, while the other pair (those terminated in the neck of the tube) were connected to a 14 Mc/s. tuned circuit, link coupled to the R.F. circuits of the exciter. This arrangement is shown in Fig. 3.

With the oscilloscope described above connected to the output link of the balanced modulators, oscillator and doubler stages tuned, and no audio input to the A.F. input jack, deliberately throw the balanced modulators off balance by rotating VR3 and VR4 away from a central position. Adjust the balanced modulator anode tuning condenser C37 until maximum unmodulated carrier is indicated on the tube. Disconnect the tube circuit, and re-connect the balanced modulator link to the input of the linear amplifier. Connect the tube to the output of the amplifier, and tune grid and anode circuits of the latter by adjusting the cores of L11 and L12 for maximum unmodulated carrier.

Now balance the modulators by adjusting VR3 and VR4 until the carrier disappears. It will be necessary to adjust these controls several times in turn before correct balance is obtained.

With one channel of the audio frequency phase-shift network disconnected, apply a tone (1000 c/s.

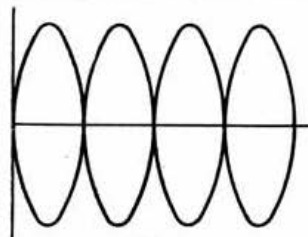


Fig. 4

Oscilloscope of double sideband modulation with carrier suppressed.

is convenient) to the A.F. input jack and increase the A.F. gain until a two-tone modulation pattern appears on the tube screen, as shown in Fig. 4. This indicates a double sideband suppressed carrier wave, and shows that the apparatus is working correctly up to this stage in the alignment.

Both channels of the A.F. phase-shift circuit are now connected, and with audio input applied, the output will appear as a modulated carrier, until the R.F. phase-shift circuit is adjusted. This is best done by trial and error, adjusting the dust core of L7, the pre-set condenser C30 and VR2 until the modulation disappears, and what appears to be an unmodulated carrier remains. With correct adjustment, this condition should be obtained with the sideband selector switch S1 in either position. In practice it will be found impossible to obtain a pure R.F. sine wave, but if only a slight modulation ripple remains with S1 in either position alignment has been satisfactorily carried out. If this condition cannot be obtained, it may be necessary to adjust the number of turns on L7.

This unmodulated R.F. wave indicates a sideband, of a frequency plus or minus 1000 c/s. (in this case) from the original carrier frequency.

If too much audio input is applied, the system will be over-modulated, which will appear as ragged edges to the R.F. output pattern in the case of an S.S.B. signal, or rounding of the modulation peaks with the two-tone wave previously mentioned.

A small flashlamp bulb connected to L13 should

light to a fair brilliancy with 100 per cent. modulation.

No opportunity has yet arisen to test the exciter over the air. It is intended to follow the EF91 amplifier by two low power stages, working into a push-pull class B amplifier employing valves of the 807 class.

TABLE I

COIL	TURNS	S.W.G.	REMARKS
L2	29	26 D.S.C.	
L3	20	"	
L4	2	"	Spaced 3/32 in. from L3
L5	2	"	Spaced 3/32 in. from L6
L6	20.5	"	
L7	30	31 D.S.C.	See Text
L8	20 C.T.	26 D.S.C.	
L9	2	"	Wound over 3 layers of Sellotape on L8
L10	2	"	Spaced 3/32 in. from L11
L11	19	"	
L12	20	"	
L13	2	"	Spaced 3/32 in. from L12

All coils wound on  $\frac{1}{8}$  in. diameter formers slug-tuned.

#### REFERENCES:

- (1) Single Sideband Transmission applied to Amateur Telephony. Hyde N.G., R.S.G.B. Bulletin, Vol. 25, Nos. 6 and 7, December 1949 and January 1950.
- (2) Audio Phase-Shift Networks. Nibbe G.H. QST, January, 1950.

#### Festival of Britain

THE Council of the Society have been pleased to accept an invitation from the Festival of Britain authorities to co-operate in the operation of an Amateur Radio station in the Land Travel Exhibition.

An earlier invitation had to be declined, with regret, because it appeared that the authorities required the Society to guarantee, many months in advance, that the station would be manned for at least six hours a day. No such guarantee was associated with the present invitation.

In connection with this matter the Council have invited Messrs. I. D. Auchterlonie, G6OM (Manchester), C. A. Sharp, G6KU (Leeds), G. Brown, G5BJ (Birmingham), and J. J. Curnow, G6CW (Nottingham), to act as the Society's representative when the Exhibition visits their respective cities. These four members will also be responsible for naming operators and for superintending the installation and operation of the equipment.

It is understood that negotiations are proceeding with the Post Office to obtain a suitable call-sign for the station, whilst the equipment, which will include specially designed log books and QSL cards, will be provided by specialist concerns at the invitation of The Council of Industrial Design.

The members referred to above have been asked by the authorities to submit the names of persons who are qualified and willing to assist with the operation of the station.

The itinerary for the Exhibition is as follows:

May 4—May 27	...	Manchester
June 23—July 15	...	Leeds
August 4—August 26	...	Birmingham
September 15—October 7	...	Nottingham

#### Bruges

Still they come! W.B.A. "Worked Bruges Amateurs." A certificate offered by the Radio Amateurs of Bruges in Belgium is now available to anyone proving contact with 10 stations in that city. Applications to U.B.A., Bruges Section, P.O. Box 38, Bruges, Belgium.

# A GENERAL-PURPOSE OSCILLOSCOPE

THE cathode-ray oscilloscope is inclined at the best of times to be an expensive item of equipment and the amateur who contemplates the construction of such an instrument faces a particularly acute form of an old problem—that of compromising between maximum usefulness and minimum cost. In the design to be described, every effort has been made to produce a really useful general-purpose instrument capable of a wide range of applications; unnecessary complications having, as far as possible, been avoided.

ance chain R32, P4, R33), potentials are also developed across the resistance R31 to enable the shift controls to operate satisfactorily, and across P5 and R34 to provide the negative bias for control of "brilliance." Thus the output winding of the mains transformer has to provide a total of about 800V.

The design of the remainder of the section, which includes the C.R. tube controls, is quite normal.

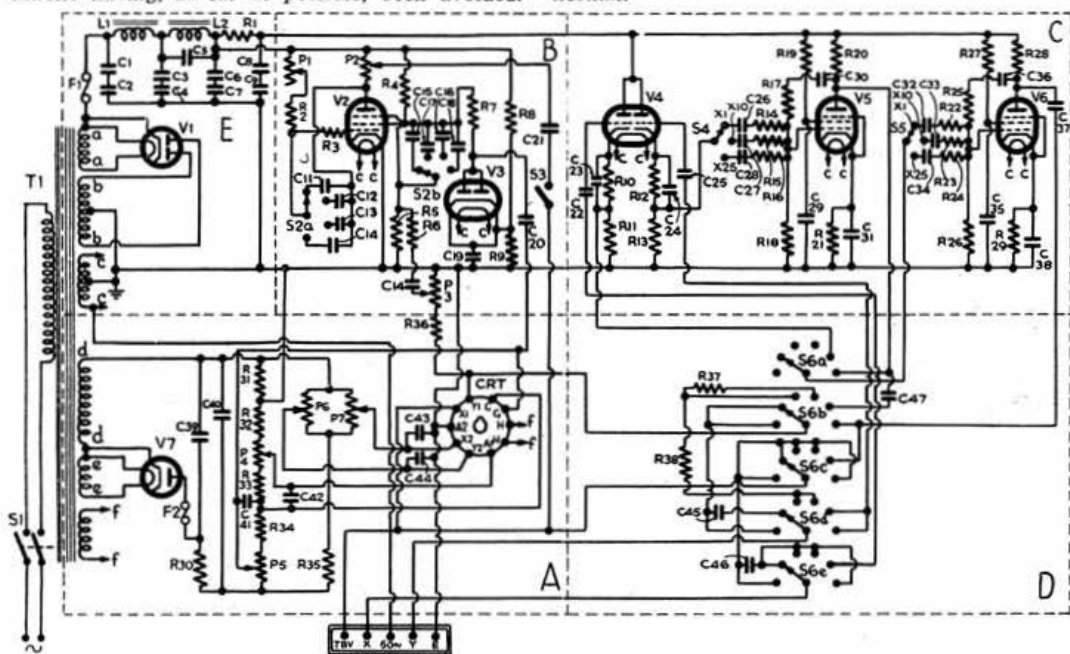


Fig. 1.  
The circuit diagram of the complete oscilloscope.

For convenience in description, the circuit diagram, Fig. 1, has been divided into sections or "boxes." These "boxes" have no relation to the screening used, which is of a simple nature and is shown in the illustrations.

## C.R. Tube and Associated Equipment (Box "A")

The VCR 139A tube used has a  $2\frac{1}{2}$  in. screen, functions well on fairly low operating potentials and can be obtained, brand new, comparatively cheaply as "government surplus." It is rated for operation with a maximum potential, at the final anode, of 1000V., but it is undesirable to employ such a high voltage for oscilloscope purposes. The tube works quite well at voltages around 550V., and at this lower potential not only is the design of the power supply simplified but the tube sensitivity is increased (i.e. a given potential applied to the deflector plates produces a greater movement of the light spot).

In addition to the 550V. (say) needed for H.T. supply to the tube (the voltage across the resist-

## Time Base (Box "B")

A Miller type of time base is used since, though this form of oscillator has its limitations, it is hard to beat for simplicity and cheapness. An EF50 (V2) produces the sweep voltage and an EB34 (V3) is used for fly-back suppression. (A single diode can be substituted for the latter purpose). The component values selected give time base speeds ranging from about 1 c/s. to approximately 250,000 c/s. The saw-tooth output, in addition to being applied to the X1 deflector plate, is also taken to the terminal board for use in conjunction with a frequency-modulated oscillator.

## Amplifier (Box "C")

It is very useful in oscilloscope work to have an amplifier circuit the gain of which is always known, since it then becomes possible to estimate, from the size of the trace appearing on the screen, the amplitude of the wave-form which is producing it. A special circuit is needed to achieve this result because with the more usual types of amplifier—apart from the difficulty of

\* 48 Eton Avenue, New Malden, Surrey.

calibrating the gain controls—the actual gain of the amplifier varies under the influence of unknown factors such as, for instance, changes in the level of supply voltages. Further, although the amplifier is usually required to feed the vertical deflector plates, it is sometimes useful to be able to apply a certain amount of amplification in both the horizontal and vertical directions simultaneously.

The amplifier section in the present instrument is designed to meet both these needs in addition to its main purpose of providing adequate amplification for most wave-forms likely to be met in practice. Two identical amplifier stages are used, each comprising an SP61 valve (V5, V6) in an anode-follower circuit. A full description of the anode-follower would be out of place in this article, but two of its features should be noted. First, the gain of an anode-follower stage is governed by the ratio of the feedback resistance (e.g. R17 in the case of V5) to the resistance in the grid arm of the circuit (R14, R15 or R16) and normally is largely independent of other factors. Secondly, owing to the low input impedance of the stage when set to the higher gain positions, a cathode-follower stage is normally interposed between it and the signal to be amplified. (The reader who is not familiar with the operation of the anode-follower and the Miller time base circuits will find two excellent articles on these subjects in the March 1947 and June 1947 issues of the *R.S.G.B. Bulletin* respectively).

In the present case each amplifier stage can, by means of a switch (S4 or S5), be set to give a gain of 1, 10, or 25 times. Further, two alternative methods of operating the amplifiers are available. In the first arrangement the two stages work quite independently, one amplifying a signal for application to the vertical deflector plates, and the other a different signal for the horizontal deflector plates. Each amplifier, of course, requires its own cathode-follower input stage, and the two halves of the 6SL7 twin-triode valve (V4) fill this role. In this way a gain of

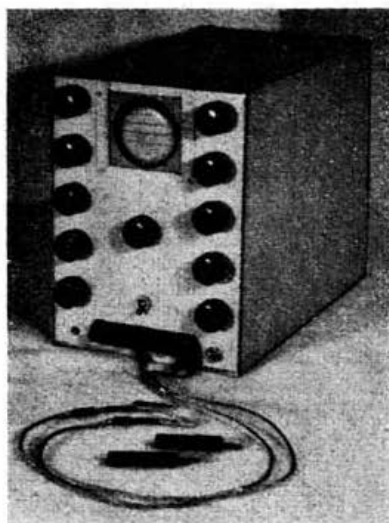


Fig. 2.  
Front view of the oscilloscope.

up to 25 times is provided simultaneously in both the horizontal and vertical deflections. In the second arrangement of the amplifiers, one of the cathode-followers lies idle whilst the other feeds the two anode-follower stages in cascade, the final output being applied to the vertical deflector plates. Thus a gain of 1, 10, 25, 100, 250 or 625 times is available, but in the vertical direction only, by appropriate settings of the two gain switches.

#### Master Switch (Box "D")

Between one oscilloscope test and the next it is frequently necessary to re-arrange the various connections between the input terminals, the amplifier (or attenuator), the time base and the deflector plates. When these changes have to be made by re-setting numerous switches and

### COMPONENTS LIST—GENERAL PURPOSE OSCILLOSCOPE

CONDENSERS		RESISTANCES		SWITCHES	
C1, 2, 3		R1	3,000 ohms., 3-watt	S1	Mains "On/Off" D.P.S.T.
4, 8, 9	16 $\mu$ F., 500 V.	R2, 5, 6	100,000 ohms., $\frac{1}{2}$ -watt	S2	Time Base "Coarse"—2-pole, 4-way Yaxley.
C5, 28		R3	100 ohms., $\frac{1}{2}$ -watt	S3	Time Base "On/Off"—S.P.S.T.
34	0.25 $\mu$ F., 250 V.	R4, 8	100,000 ohms., 2-watt	S4	Amplifier 1 gain—1-pole, 3-way Yaxley.
C6, 7	32 $\mu$ F., 500 V.	R7	250,000 ohms., $\frac{1}{2}$ -watt	S5	Amplifier 2 gain—1-pole, 3-way Yaxley.
C11	0.2 $\mu$ F., 350 V.	R9	20,000 ohms., $\frac{1}{2}$ -watt	S6	Master Switch—5-pole, 6-way Yaxley.
C12, 30		R10, 12	3,000 ohms., $\frac{1}{2}$ -watt		
36	0.01 $\mu$ F., 350 V.	R11, 13	100,000 ohms., $\frac{1}{2}$ -watt		
C13	500 $\mu$ F., 350 V.	R14, 17			
C14	25 $\mu$ F., 350 V.	22, 25	500,000 ohms., $\frac{1}{2}$ -watt		
C14 (Between P3 & R6)		R15, 23			
	0.5 $\mu$ F., 250 V.	30, 33	50,000 ohms., $\frac{1}{2}$ -watt		
C15	0.4 $\mu$ F., 250 V.	R16, 24	20,000 ohms., $\frac{1}{2}$ -watt		
C16	0.02 $\mu$ F., 250 V.	R18, 26	1 megohm, $\frac{1}{2}$ -watt		
C17	0.001 $\mu$ F., 250 V.	R19, 27	100,000 ohms., 1-watt		
C18	100 $\mu$ F., 250 V.	R20, 28	50,000 ohms., 3-watt		
C19, 27		R21, 29	350 ohms., $\frac{1}{2}$ -watt		
33	0.1 $\mu$ F., 250 V.	R31, 32	200,000 ohms., $\frac{1}{2}$ -watt		
C20	0.2 $\mu$ F., 250 V.	R34	1,000 ohms., $\frac{1}{2}$ -watt		
C21, 22,		R35	750,000 ohms., 1-watt		
25	1 $\mu$ F., 250 V.	R36	1 megohm, $\frac{1}{2}$ -watt		
C23, 24	25 $\mu$ F., 12 V.	R37	4 megohms, $\frac{1}{2}$ -watt		
C26, 32	0.01 $\mu$ F., 250 V.	R38	2 megohms, $\frac{1}{2}$ -watt		
C29	0.5 $\mu$ F., 350 V.				
C31, 38	50 $\mu$ F., 12 V.				
C35	0.05 $\mu$ F., 250 V.				
C37, 47	1 $\mu$ F., 500 V.				
C39, 40	0.5 $\mu$ F., 1,500 V.				
C41	25 $\mu$ F., 50 V.				
C42	0.25 $\mu$ F., 500 V.				
C43, 44	0.5 $\mu$ F., 500 V.				
C45, 46	1 $\mu$ F., 750 V.				
		VALVES		POTENTIOMETERS	
		V1	5X4	P1	(Time base "Fine"): 5 megohms.
		V2	EF50 (VR91)	P2	("Amplitude"): 50,000 ohms.
		V3	EB34 (VR54)	P3	("Sync"): 1 megohm.
		V4	6SL7	P4	("Focus"): 500,000 ohms.
		V5, 6	SP61 (VR65)	P5	("Brilliance"): 50,000 ohms.
		V7	U17	P6	("X Shift"): 1 megohm.
		CRT	VCR139A	P7	("Y Shift"): 1 megohm.
				MISCELLANEOUS	
				T1	Mains transformer:
					Input: 230 V., 750 mA.
					Outputs:
				aa	5 V., 3 A.
				bb	500-0-500 V., 60 mA.
				cc	6.3 V., 5 A.
				dd	800 V., 10 mA.
				ee	4 V., 1 A.
				ff	4 V., 1 A.
				L1	20H., 60mA.
				L2	10H., 60mA.
				F1, 2	60 mA., fuse.

juggling with the connections to a forest of terminals, oscilloscope work becomes tedious and aggravating. In the present case the various "functions" of the oscilloscope are controlled by one master switch (S6) in conjunction with only a few terminals (the connections to which frequently remain unchanged for long periods).

In the first position of the master switch, the X and Y input terminals are connected directly to their respective deflector plates for D.C. working. In the second position, both inputs are connected to the deflector plates via isolating condensers, enabling A.C. wave-forms to be studied free from the effects of any D.C. component which may be present. In the third and fourth positions, the X input terminal remains connected to its deflector plate via the isolating condenser, but the Y plate is fed through a resistance network (R38, R37, R36, P3) which gives an attenuation of one-half (in the third position) or one quarter (in the fourth position). This arrangement, which functions for A.C. or D.C. inputs, enables large deflecting voltages, which would normally drive the spot right off the screen, to be kept within bounds. The last two positions of the master switch bring in the amplifiers in the two circuit arrangements which have already been described; position five gives single-stage amplification for both X and Y plates and position six provides two-stage amplification for the Y plates only.

The operation of the master switch has, of course, been described on the assumption that separate external signals are to be applied to the X and Y plates (as would be the case if, for example, *Lissajous* figures were required) and in that case, the time base switch S3 would be open. When only one signal is to be applied to the oscilloscope—as, for example, in simple wave-form examination—it is fed to the Y plates, and the X plates usually derive their sweep voltage from the time base, S3 then being closed.

#### Time Base and Amplifier Power Pack (Box "E")

The power supply to the time base and amplifier circuits is quite normal and calls for little comment.

It is, of course, especially important that mains ripple in the H.T. supply to these circuits should be reduced to the minimum possible, and extensive smoothing is included for this purpose. In order to ensure adequate sweep voltage when the time base is operating on its highest frequency-range, an H.T. voltage of at least 500V. should be used, and at the rectifier cathode the voltage will, of course, be even higher. Hence, if ordinary 450V. or 500V. electrolytic condensers are used in the smoothing circuits, two of them should be connected in series at each point to avoid any possibility of a breakdown. If metal-cased electrolytic condensers are used care must be taken that there is adequate insulation between the chassis and the outer cases of those condensers whose negative leads are not to be earthed. The value of the condenser C5 is adjusted to resonate with choke L2 at a frequency of 100 c/s. Thus if L2 has an inductance of 10H, C5 should have a value of about 0.25  $\mu$ F. In practice it may be necessary to experiment to discover the value of C5 which reduces the mains ripple to a minimum.

A lead is taken from the end of one of the heater windings to a terminal on the front panel to provide a 50 c/s. source, which is useful in several oscilloscope tests.

#### Construction

There is, of course, plenty of room for individuality in the actual construction of the

instrument; the arrangement shown is merely put forward as one possible solution. A front view of the oscilloscope is seen in Fig. 2. The two "Shift" controls are to the left of the tube and the two controls to the right are "Brilliance" and "Focus." On the left of the instrument and below the "Shift" controls are, respectively, the master switch and the two gain switches; behind them are mounted the amplifier circuits. Below the "Focus" control on the right of the oscilloscope come the time base "Coarse" and "Fine" speed controls and the "Sync" control, and behind them is the time base itself. In the centre of the front panel are two more time base controls, the "Amplitude" control and the "On/Off" switch: behind them the centre section of the chassis houses the various large coupling and isolating condensers associated with the master switch, time base and amplifiers. The pilot lamp, terminal board and mains switch are at the bottom of the front panel.

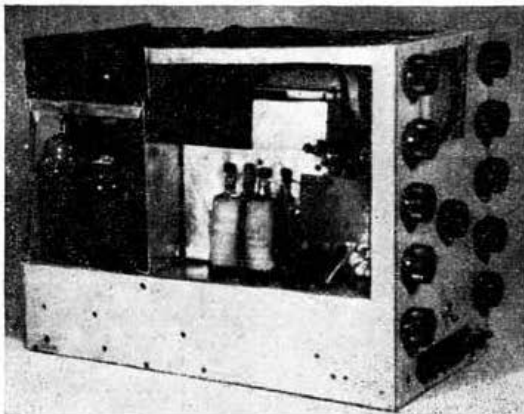


Fig. 3.

The oscilloscope with its case removed.

Fig. 3 shows a side view of the oscilloscope. The power pack is mounted to the rear of the vertical partition, as far as possible from the actual tube, which is also protected by a mumetal screen. The mains transformer, which is specially wound to supply the various outputs, and should have a screened primary winding, is mounted centrally and therefore exactly in line with the tube, in which position it is least likely to influence the light spot. It may be convenient to use two standard transformers, giving the correct outputs, in place of the specially-wound component, but if so the two transformers should be mounted close to one another (to avoid unduly spreading the magnetic field) and as nearly as possible in line with the axis of the tube.

The condensers associated with the tube are mounted on the upper platform. Forward of the vertical partition, the section nearest the camera contains the amplifier circuit and the corresponding section farthest from the camera (not visible in the photograph) houses the time base. Between these two, as already mentioned, is a central section in which are mounted the larger of the isolating and coupling condensers.

The whole oscilloscope is built into a government surplus case (8in. x 11½in. x 14½in.) which formerly housed a radar unit.

#### Accessories

A pair of screened connecting leads should be made up for use with the oscilloscope, the screen-

ing being connected to the earth terminal of the instrument. The free end of the leads should be fitted with alternative test prods of crocodile clip connections.

In some oscilloscope tests it is necessary, in order to avoid upsetting the normal operation of the test circuit, to insert a small condenser (about 5  $\mu$ F.) or a large resistance (1M $\Omega$  or more) in the tip of the connecting lead. For this purpose the resistance or condenser can be made up as a small unit which can be inserted between the connecting lead and the test prod or crocodile clip connector. A suitable condenser can be made by loosely twisting together two pieces of insulated wire two or three inches long.

### Testing

With the time base switched off and the "Shift" controls roughly central, the "Focus" and "Brilliance" controls are adjusted to give a small sharply-focused spot, after which the "Shift" controls can be tested to ensure that they give adequate control of the movement of the spot. The brilliance of the spot should, of course, always be kept low to avoid damage to the screen.

The time base "Coarse" and "Fine" speed controls are then set for lowest speed, "Amplitude" to maximum and "Sync" to zero. If the time base is now switched on, the slow sweep of the spot from left to right and the swift return should be clearly seen. Increasing the time base speed will produce a horizontal line of light, the length of which can be varied by the "Amplitude" control.

The time base is switched off and the master switch set to position 6. If the "50 c/s." and "Y" terminals are linked, a short vertical line should appear on the screen, representing the movement of the spot under the influence of the 50 c/s. input. The gain switches are set to give a trace of reasonable height. (In operating the gain switches, the necessary amplification should always be obtained as far as possible from the second stage, the first stage being called upon only when the gain from the second stage is insufficient). The time base "Coarse" control is set to position 2 and "Amplitude" to maximum, and the time base then switched on. A confused jumble of waves usually results, but adjustment of the "Fine" speed control should eventually produce a more or less stationary trace consisting of one or two complete sine waves. The setting of the "Sync" control is increased slightly and the "Fine" control again adjusted for a stationary pattern, this process being repeated, if necessary, until a point is reached at which the trace "locks" and no longer drifts across the screen. The effect of different settings of the gain switches should now be clearly visible on the screen and these controls can be checked for satisfactory operation. The operation of the master switch can also be checked in its various positions.

### Conclusion

Little difficulty should be met in operating the oscilloscope once familiarity with its controls has been gained. The scope of the instrument is, of course, very wide and no claim is made that it has been tested in every possible application; enough has, however, been done to establish its reliability and usefulness in all normal amateur radio activities.

### 50-Watt T.V.I.-Proof Transmitter

THE wide interest shown at the Exhibition in the original model of the 50-watt T.V.I.-proof transmitter described by Mr. Louis Varney, G5RV, in the July, 1950, issue of the BULLETIN, left no doubt as to the very large number of members now building similar apparatus. The following additional points should therefore be of value.

From inquiries it is clear that as a result of the unavoidable loss of detail incurred in the reproduction of the photographs, a number of constructors have not realised that the 807 P.A. valve is sunk below the main chassis to a depth of approximately 1½ in., being mounted on a small sub-assembly formed from a 5½ x 2 in. strip of 16 gauge aluminium. This strip is bent to form a 2 x 2 in. platform with two 2 x 1½ in. sides and two mounting flanges of 2 x ½ in. A 1½ in. hole is drilled in the platform to accommodate the 807 valveholder. A close examination of Fig. 4 of the original article will make the arrangement clear. This sub-assembly helps to provide additional isolation of the anode and grid circuits by preventing R.F. feedback to the internal leads in the base of the valve and should not be omitted.

A further point, which may result in a slight financial saving, is that the type N750 fixed condensers specified are of negative temperature co-efficient characteristics and could be replaced, without affecting results, by the slightly cheaper P120 series.

### TVI—Suppression Device

MR. IVAN B. HOWARD, G2DUS of Stotfold, Beds., reports that an extremely simple but effective filter for use where television-interference is caused by blocking, or by break-through of unwanted signals into the I.F. channels of the receiver, consists of a ¼λ (where λ=television wavelength) of co-axial cable. The cable, which is short circuited at the far end, is connected to the TV aerial feeder as close as possible to the aerial socket on the receiver, the inner conductor of the ¼λ stub being connected to the inner conductor of the aerial feeder, and the outer braidings being similarly joined. The correct length of the stub in the London area is 5ft. 4in., and in the Midlands about 4ft. The cable can be run inside the television receiver cabinet or left to trail at the back. The system will not, of course, reduce interference caused by harmonics radiated in the TV band or interference picked-up directly in the I.F. stages.

### Strange Advice

MORE than one amateur has commented adversely upon the reports, published in the national Press, of remarks made by a well-known professor in the course of a talk on "Noise and Sound" given at Birmingham last November. The professor advised an audience of about 350 persons that an effective cure for next-door neighbours who operate a noisy radio set is to run an electric fan "preferably an old one with a rough commutator" as near as possible to the offending set.

The professor did not add—or, at least, if he did so it was not reported—that such a device would almost certainly ruin short-wave and television reception over a wide area, quite apart from being contrary to the Wireless Telegraphy Act. It seems most unfortunate that a scientist of eminence should give advice which—if taken seriously—might wreck months of patient effort on the part of the many responsible bodies now campaigning for the suppression of radio interference.

# RENDEZVOUS AT THE ROYAL

FOR four days, from November 22 to November 25, the Royal Hotel in London again became the focal point for amateurs and short-wave enthusiasts not only from the Home Counties but from all parts of the British Isles. A number of overseas visitors will also return to their own countries with glowing stories of the Exhibition. This year, for the first time, the Exhibition was honoured by a visit from the Postmaster-General, the Rt. Hon. Ness Edwards, M.P., who closely examined the Amateur Radio and television equipment displayed. Attendance generally was well spread over the entire period, although once again a solid mass of hot but happy enthusiasts packed the halls on the Saturday afternoon.



Mr. Hugh Pocock opening the Exhibition.

[Photo: E. W. Yeomanson]

While the trade stands did, to some extent, reflect the "settling down" period of the Amateur Radio market—not all firms finding it possible to introduce new lines this year—there was plenty that was both fresh and original to occupy the attention of those who came to look at the exhibits (by no means all of those who flocked to the Royal—if the amount of "rag-chewing" which went on can be accepted as any criterion). Outstandingly successful were the absorbing G.P.O. exhibits, the amateur television demonstrations provided by G2DUS, G3CVO and other members of the British Amateur Television Club, and the comprehensive display of advanced amateur-built equipment dis-

played on the Society's stand. The opportunity to meet representatives of the G.P.O. licensing department and the technical press was also taken full advantage of. This year a cream and silver motif formed the attractive setting to the displays, and few of those who saw the final appearance of the stands realised that they were erected in little more than 24 hours.

## Luncheon

Immediately prior to the opening of the Exhibition on Wednesday, November 22, the President and Council entertained a number of distinguished guests and representatives of the Radio Industry and technical press to lunch in the Fountain Room of the Royal Hotel.

The guests included: Mr. Hugh Pocock, M.I.E.E. (Managing Editor, *Wireless World*), Col. Sir Ian Fraser, M.P. (Past President), Air Vice-Marshal E. B. Addison, C.B., C.B.E. (Assistant Chief of Air Staff [Signals]), Dr. R. L. Smith Rose (Director of Radio, D.S.I.R.), Captain C. F. Booth, O.B.E. (Chairman I.E.E., Radio Section), Mr. A. H. Faulkner (Deputy Engineer-in-Chief, G.P.O.), Mr. A. H. Mumford, O.B.E. (Radio Branch, G.P.O.), Mr. C. I. Orr-Ewing, M.P., Messrs. V. M. Desmond, E. L. Gardiner, A. D. Gay, S. K. Lewer, G. Marcuse, E. D. Ostermeyer (Past Presidents), and Messrs. M. Child and R. Klein (Vice-Presidents).

The President (Mr. W. A. Scarr, M.A.) welcomed the guests on behalf of the Council, expressing his belief that the prestige of the Exhibition grows in lustre from year to year. He particularly thanked those firms who, viewing the event as a "trade enterprise," provide exhibits which were regarded by the amateur with "wonder, love and awe." Mr. A. O. Milne also referred to the efforts of the trade to produce gear for amateur use. Although there was a close parallel between amateur and commercial requirements, he hoped that the industry would not overlook the special needs of the U.H.F. enthusiast. The potential market in the Empire and the United States should not be disregarded, nor should the rôle played by the British amateur in making such equipment widely known overseas be overlooked. He noted the progress of the industry towards producing television equipment less prone to amateur interference than formerly, but expressed the opinion that even more could be done in this direction.

Replying on behalf of the Radio Industry, Captain H. de A. Donisthorpe (G.E.C.) reminded those present that the industry has continually drawn upon the Amateur Radio movement for the recruitment of personnel. He recalled his own experiences in the early days with the call DKX, mentioning the difficulties which his family experienced when, on the outbreak of war in 1914, the G.P.O. officially "sealed" not only his station but the entire house. The industry, he thought, sometimes forgets how much it is indebted to the early amateurs who successfully petitioned the P.M.G. of the day to start broadcast transmissions in this country.

Mention of the early days was most opportune, since it enabled the President to announce that Mr. Rene Klein, a founder member, is to present to the Society a new trophy—to be known as "The Founders' Cup"—for annual award.



Mr. Hugh Pocock tries out the Reaction Time Tester, a popular feature on the G.P.O. stand. The President and General Secretary are in the group.

[Photo: F. G. S. Wise]

The health of the Distinguished Guests was proposed by Council Member W. N. Craig, B.Sc. The Exhibition, he said, was the shop-window of the amateur movement, combining echoes of past achievements with a forecast of glories to come. The continued interest of those who are able to discuss and present the amateur case, expertly and at a high level, was much appreciated.

In reply, Dr. Smith Rose, after conveying the personal thanks of Sir Ian Fraser for the Society's efforts on behalf of the blind, spoke of the attitude of the authorities to Amateur Radio. He recalled the advice of his former chief to "encourage rather than 'put up' with the amateur." The future of TV, he thought, lies inevitably in the micro-wave bands and the recent amateur concessions would enable members to carry out fundamental research—though not without danger to their own allocations should they prove too successful! The amateur movement also provided a marvellous opportunity for furthering international collaboration at all levels. Even today, he believed, radio opens doors between one country and another.

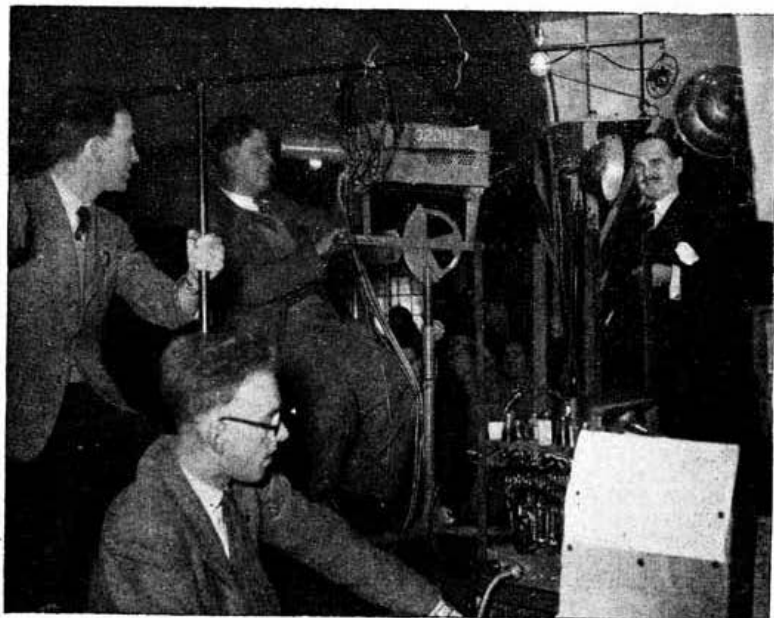
more willing to grant greater facilities if it was fully recognised on both sides that they could be rescinded without ill-feeling should the necessity arise. Such an attitude would be in the tradition of the earliest days of Amateur Radio in this country. The amateur movement might well adopt as its "Patron Saint" the late Lord Derby (formerly Lord Stanley), who, on August 10, 1904, when as P.M.G. he presented the second reading of the original Wireless Telegraphy Bill, said that he would always have the greatest sympathy for those who wished to experiment with wireless telegraphy, that all applications for licences would be treated as liberally as possible, and that no such request would be rejected unless it had been reviewed by himself.

#### Visit of the P.M.G.

The visit of the P.M.G., which took place during the afternoon of Thursday, November 23, was in fulfilment of a promise given a week earlier when the President and General Secretary called upon Mr. Ness Edwards at the House of Commons to

General view of the equipment used by the British Amateur Television Club. M. Barlow (G2CVO) is holding the microphone stand, I. Howard (G2DUS) is operating and H. Jones (G5ZT) facing the camera.

(Photo: E. W. Yeomanson)



#### Opening Ceremony

The exhibition halls were crowded when, at 2.30 p.m., the President introduced Mr. Hugh Pocock, who, he said, had been connected with Amateur Radio from its earliest days and had served on the Council of the Society during the vital period of the 1920s.

Mr. Pocock, after referring to his long association with the movement, spoke of the value of Amateur Radio to the manufacturers. Amateurs provided the stimulus which keeps the radio industry healthy; without them the trade would soon resemble a loaf without yeast. He wished that even more manufacturers could have been persuaded to be present in order to make the Exhibition fully representative of the British radio industry.

The G.P.O., he thought, has much to contend with in the constant demand for frequencies from all quarters, but should treat amateur requests in the most liberal manner possible. In turn the amateurs, he suggested, should help the authorities by recognising the experimental nature of their privileges. He felt sure that the G.P.O. would be

discuss Amateur Television. During that meeting the Society's representatives informed the P.M.G. that an opportunity would be provided at the Exhibition for members and others to witness a closed circuit demonstration of Amateur TV. Mr. Ness Edwards expressed interest in the project and promised to visit the Exhibition if his Parliamentary duties permitted.

The P.M.G. was received by the General Secretary (deputising for the President, who was unavoidably detained elsewhere) and by several members of the Council. Incidentally Mr. Ness Edwards showed during his visit that he possesses a lively appreciation of the Amateur Radio movement and a much wider technical knowledge than it is customary to expect from the political head of the Post Office.

The P.M.G. congratulated the Society on its enterprise in organising the Exhibition and spoke of the ingenuity and skill shown by members who had contributed items of technical interest for display on the Society's stand. He also referred to the part played by amateurs during the last war and of the efforts which Society members are

making to develop the very high frequencies.

The P.M.G. made it abundantly clear to the Society officials who were with him that he is anxious to provide amateurs with the maximum facilities possible in order to allow them to pursue their experiments.

#### Avo Presentation

A pleasant and informal ceremony on the Saturday evening marked the closing stages of the 1950 Exhibition. On behalf of the *Automatic Coil*

bers of Council and Headquarters Staff were assisted in manning the R.S.G.B. stand by a number of volunteers, many of them the same stalwarts who have given their services in previous years. They included: Mrs. M. Mills, G3ACC; Group Captain H. W. Evens (Retd.), G6CH; S/Ldrs. H. Bennett, G8PF; A. Evenett, G3AGZ; and S. F. Sharpe (Retd.), G3CKX; and Messrs. P. Bond, G3BEG; J. M. Davie, G2XG; T. Delvin, G2FLK; F. Ruth, G2BRH; and C. T. Wakeman, G4FN.



During his visit to the Amateur Radio Exhibition the P.M.G. and his staff took the opportunity of discussing matters of technical and topical interest with members of the Council. From left to right: A. J. H. Watson, G2YD (Hon. Treasurer), S. K. Lewer, G6LJ (Past President), J. T. Baldry (Principal Private Secretary), Richard Winterbottom, M.P. (Parliamentary Private Secretary), the Postmaster-General (Rt. Hon. Ness Edwards, M.P.), the General Secretary (John Clarricoats, G6CL), J. W. Mathews, G6LL (Hon. Secretary), W. N. Craig, G6JJ (member of Council). [Photo: F. G. S. Wise]

*Winder and Electrical Equipment Co., Ltd.*, Mr. Hills presented a specially engraved Avo Electronic Testmeter to the members of the British Amateur Television Club in recognition of their outstanding efforts in pioneering amateur high-definition television in this country. Mr. Ivan Howard, G2DUS, in accepting this generous gift on behalf of the Club, spoke of the technical difficulties which had had to be overcome in adjusting the camera equipment with only the simplest of test gear. The President and General Secretary also appeared before the television camera and paid tribute to the success of the TV demonstrations and of the Exhibition in general.

#### R.S.G.B. Stand

Throughout the period of the Exhibition, mem-

Overseas amateurs who visited the Exhibition included: HZ1HZ, OH5OB, PA0IV, 0XE, SM5GG, VE2RL, VS6BC, 7GR, W4PSC, Y12FDF, ZS1AX, and 6EK.

To Mr. H. Freeman (Exhibition Manager) must go much of the credit for the smooth running of the Exhibition, while grateful acknowledgment is also made to the Manager of the Royal Hotel (Mr. W. E. Mills) and his staff for their ready assistance. The construction of the stands was again in the capable hands of *Display and Exhibitions Ltd.*, with floral decorations arranged by the Royal Hotel Flower Shop. The public address equipment was generously loaned by Messrs. H. J. Leak & Co. Ltd.

## AROUND THE STANDS

AN inspection of the Fourth R.S.G.B. Amateur Radio Exhibition plainly revealed that Amateur Radio is entering a new phase. The immediate post-war impetus to the commercial manufacture of equipment designed exclusively for the amateur market has to some extent been halted. With certain notable exceptions, few entirely new amateur products have been introduced during the past twelve months. On the other hand, amateur technique has advanced considerably, creating, for specialised equipment, a growing demand which cannot be fulfilled by the use of war-time material. For example, the man who wishes to keep abreast of U.H.F. development is now faced with the quandary of deciding whether or not to adopt modern-type valves for which he must pay the full list price.

#### Amateur Television Demonstrations

From the Thursday onwards, visitors had an opportunity of viewing—for the first time in the London area—working demonstrations on a closed circuit of the 300-line (non-interlaced) 50-frame-per-second amateur television equipment built by I. Howard, G2DUS. Generally a highly favourable impression of the quality of the picture was formed, particularly in view of the "lash up"

nature of the equipment, much of which was built and adjusted with only the simplest of test gear. Definition, for the close-ups and captions, proved most satisfactory, whilst contrast and brilliancy were sufficient to permit the pictures to be viewed directly in the well-lit hall.

The camera unit, which uses an R.C.A. 5527 iconoscope tube, is mounted on a mobile "dolly" fashioned from a former floodlight stand, complete with "seat" for the operator. A 3-stage EF50 wide-band amplifier (flat response to about 2½ Mc/s.) with a cathode-follower output stage is coupled to the viewing monitors by means of co-axial feeder. A 3BPI C.R.T. is fitted to the camera unit as a viewfinder for the camera operator.

The pulse generator unit contains two EF50 transitron oscillators with 6N7 amplifiers: 6SN7 valves are used to shape the combined sync/blanking pulses. The monitors contain 9 in. and 15 in. C.R. tubes with their own time bases and power packs. During the demonstrations over 100 ft. of cable separated the 15 in. monitor from the "studio," hastily built on the platform in the first hall. Sound equipment was of conventional 6-watt type except perhaps for the microphone boom and counterweight (two bricks!). To supply

the 35 or so valves in use, a 300 V. 500 mA. regulated power pack plus an E.H.T. supply of some 2 kV. was used. The lighting, comprising four 500-watt photofloods and a 1 kW. bulb, left most "victims" perspiring, though it seemed to have little effect on mobile-featured M. Barlow, G3CVO, who conducted innumerable interviews during the three days with a style and ease worthy of his professional colleagues.

#### R.S.G.B. Stand

The display on the Society's stand, arranged by the Technical Committee, was undoubtedly the most comprehensive yet presented at any of the Exhibitions. The high standard of the amateur-built equipment shown, both technically and constructionally, was readily apparent. At the same time the display also reflected the BULLETIN policy of publishing constructional information on the latest amateur techniques: much of the equipment has either been, or will shortly be, fully described in print.

The attention of the U.H.F. worker was divided between the 420 Mc/s. equipment of D. N. Corfield, G5CD—a compact superhet receiver without plumbing and an exciter unit (see forthcoming BULLETIN articles); a 420 Mc/s. power tripler constructed by W. A. Scarr, G2WS, using the new QQVO6/40 double tetrode valve; 420 Mc/s. equipment of the South London Group (C. Newton, G2FKZ, H. F. Knott, G3CU, and G. Stone, 3FZL, etc.), including a concentric line P.A. popularly referred to as "The Trombone," an exciter with a final G.G.T. doubler giving an R.F. efficiency of 33% at 25 watts input, and a crystal-controlled receiver with a co-axial line R.F. stage and a tunable first I.F. at 35 Mc/s. For the benefit of those who are tempted to explore the micro-wave spectrum, L. Grimshaw, G3CBN, exhibited his latest re-entrant cavity oscillator and aerial assembly for 2,300 Mc/s., while the less remote regions of 144 Mc/s. were represented by a G.G.T. pre-amplifier using EC91's designed by W. H. Allen, G2UJ.

Single-sideband-suppressed-carrier equipment for 3.5 and 14 Mc/s. was shown by H. F. Knott, G3CU, and N. G. Hyde, G2AIH—full details of the latter's apparatus appears elsewhere in this issue. Standard amateur requirements were not overlooked. R. H. Hammans, G2IG, showed his

3.5/28 Mc/s. band-switched exciter unit (see forthcoming article) and a high stability V.F.O. in which, for greater convenience in operating, the tuned circuit of the Clapp-type oscillator is separate from the main unit. Also from the "shack" of G2IG came an I.F. amplifier with



The Postmaster-General examining a 420 Mc/s. transmitter constructed by the President (Mr. W. A. Scarr) during his visit to the Amateur Radio Exhibition. (Photo: F. G. S. Wise)

switched side-band selection: a full description of this advanced receiver device would probably require an issue of the BULLETIN to itself!

Wide interest was shown in the 50-watt T.V.I.-proof transmitter (described by R. L. Varney, G5RV, in the July BULLETIN) and it is apparent



A corner of the Society's stand before the Exhibition opened on the third day. In the picture are (left to right) the General Secretary; Miss Hazel Lightfoot; Miss May Gadsden; Pat Hawker (G3VA); Jack Wakeman (G4FN); H. W. Evans (G6CH).

(Photo: F. G. S. Wise)

that many members are at present engaged upon the construction of replica models. Portable and mobile equipment on the stand included a 1.8 Mc/s. transceiver with loaded whip aerial (see forthcoming article), by C. H. L. Edwards, G8TL; a mains operated 1.8-7 Mc/s. transmitter-receiver by A. O. Milne, G2MI; and a three-stage field-day transmitter using 12A6 valves by G. Wheatley, G8QB.

A link with the earliest days of wireless telegraphy was provided by an exhibit of apparatus from ECX of pre-1914 fame, loaned by Maurice Child. This included an original *Marconi* coherer receiver and an electrolytic detector of the 1905 period—the only one of its type in existence.

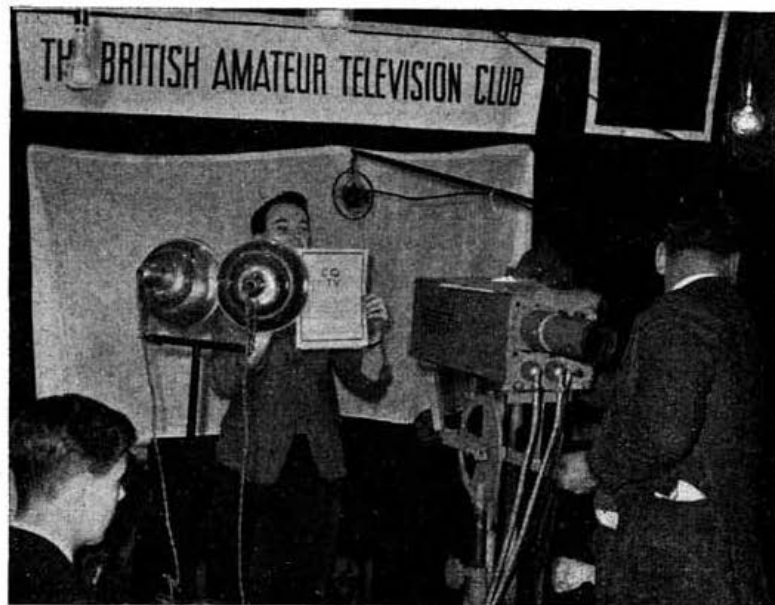
### New Receivers

New commercial receivers are always a subject of particular interest at the Exhibition. Visitors

employed. Eight of the miniature B8A-based valves are used. Particular feature of this low-priced (£29 10s.) communications receiver is the wide frequency coverage: from 484 kc/s. to 30.6 Mc/s., thus including both the medium-wave broadcast band and the 600 metre shipping band in addition to the usual amateur bands. A 640 model which for many months formed the main linkage between Heard Island (VK1VU, etc.) and the outside world was also displayed by *Webbs*. Both the table model and the slightly less expensive rack model of the BRT400 were featured on the *G.E.C.* stand.

### Measuring Equipment

Measuring and test equipment of all types formed a considerable proportion of the exhibits. The new Avo Model "8" high sensitivity meter made its debut at the Exhibition. This model,



M. Barlow (G2CVO), Hon. Secretary, British Amateur Television Club, displaying a copy of CQ-TV—journal of the Club—before the camera. I. Howard (G2DUS) is at the controls.

[Photo: E. W. Yeomanson]

this year had at least two new designs to examine: the "Q-Max" Q5/10x (developed from the Q5/10) and the *Eddystone* 740 shown on *Webb's Radio* stand. The Q5/10x is a ten-valve double conversion superhet intended exclusively for reception on the six amateur bands between 1.8 and 30 Mc/s. (including the not-yet-released 21 Mc/s. band). Concentration on the amateur bands enables the manufacturers to provide an unusually open dial with direct calibration on all bands. The high slope R.F. pentode amplifier with switched iron-cored inductances on polystyrene formers and a first I.F. of 5 Mc/s. are designed for high second channel rejection. The later I.F. stages at 455 kc/s. incorporate a crystal bridge circuit giving altogether six degrees of selectivity, including a 200 c/s. bandwidth at 3 db. down for C.W. operation in crowded bands. The clean appearance of the receiver with its heavy-gauge cadmium-plated steel chassis, black crackle cabinet and useful carrying handles was also the subject of favourable comment. The price is £52 10s.

The new *Eddystone* 740 has been designed as a successor to the popular 640, and in appearance is not dissimilar. A high reduction ratio-gearing mechanism and an auxiliary bandspread logging scale, however, replace the cord drive and electrical bandspread arrangements of the earlier model. A much lower I.F.—450 kc/s.—is also

which will be available early in 1951, is similar to the well-known Model "2" but has the benefit of alternating current ranges. It has fourteen D.C. ranges (2.5-2,500 V., 50  $\mu$ A.-10 A.), eleven A.C. ranges (2.5-2,500 V., 100 mA.-10 A.), plus several resistance ranges. Comprehensive displays of test equipment were also shown by *Salford Electrical Instruments Ltd.*; *Sangamo Weston Ltd.*, whose Model S.75 has 53 ranges; and *Taylor Electrical Instruments Ltd.*, who have a number of new instruments of interest to the amateur and service engineer.

The specialised test equipment produced by the Amateur Division of *E.M.I. Sales and Services Ltd.* is now expected to be marketed early in the New Year. Production models of the absorption wavemeter, grid dip oscillators and frequency markers—as reviewed last year—were shown. The *E.M.I.* stand also featured a historic collection of valves (from the 2V-P.I.F. developed by Capt. Round in 1913 to the latest B7G miniatures) and other early equipment included a S.W. receiver of the 1929 period. A grid dip oscillator covering 1.5 to 300 Mc/s. was shown by *Q-Max*, while the same firm also exhibited a simple modulation meter (M.I.A.) designed to give visible indication of 80% and 100% modulation peaks, a valuable device for any amateur using telephony.

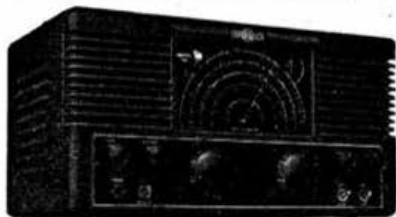
### Chassis

The metalwork in amateur stations has become of increasing importance as a result of T.V.I. Several interesting items in this category made their appearance this year. The *Widney Dorlec Cabinet* system, exhibited by C. H. Davis, consists of a series of prefabricated diecast corners, sections and brackets to enable a complete cabinet or rack of any size to be erected with a minimum of tools. Telescopic mountings shown by this firm were also of interest to those troubled by heavy power pack servicing problems. Another unusual item was the locking handle giving complete safeguard against unauthorised interference with equipment.

Recent additions in the E. J. Philpotts range include 2, 3 and 4-tier totally enclosed table rack assemblies, and a sectional (add-on) assembly designed to facilitate the enclosure of individual units as they are built, thus eliminating the need to plan the entire station in advance. Also of use where space is cramped are the new receiver stands allowing log-books, paper, etc., to be kept under the receiver. The policy of "made to measure" adopted by this firm has proved popular amongst amateurs—no two of whom ever seem to require exactly the same sizes of metalwork. To complete the trio of metalwork exhibits, the high-quality caseworks, racks and assemblies shown by *Alfred Imhof Ltd.* aroused considerable interest.

### Miscellaneous

Although only a limited selection of their designs could be accommodated, there is every indication



The new Eddystone 740 Receiver exhibited by Webb's Radio

that the G.S.V. beam arrays for frequencies of 28 Mc/s. and above are very popular with amateurs and commercial V.H.F. users. The *Telecraft* stand featured TV aerials and accessories, but this firm is actively interested in meeting the requirements of amateurs and, for this reason, welcomed the many inquiries on elements, waterproof aerial matching units, clamps and fixing devices.

Transformers, chokes, rectifiers, crystals and many other components were shown by *Woden, Oliver Pell Control (Varley), Salford Electrical Instruments, Westinghouse* and *Webb's Radio*. Several interesting pieces of apparatus for the amateur were shown also by the publishers of *Short Wave News, Radio Constructor* and *Wireless World*, including a modern I-V-1 receiver designed by G5JU (S.W.N.) and converters for 1.8 and 28 Mc/s. *Short Wave Magazine* showed a 300 Mc/s. model of the "ZL special" aerial described recently by G2BCX, and *Easibind* a wide range of binders for technical and other publications.

That the amateur fraternity includes many high-fidelity enthusiasts was made evident by the interest taken in the *Decca* equipment, much of which has been specially designed in connection with the new long-playing gramophone records. A receiver chassis from the *Decca Navigator* equipment, containing over 75 valves, also provided an example of commercial practice.

### G.P.O. Stand

Once again the multitudinous radio activities of



The Q-Max Q5/10X Receiver

the G.P.O. were made manifest on the Department's large stand. Of particular interest was the convincing demonstration—by means of a spectrometer—of the value of a simple key click filter in cutting drastically the bandwidth occupied by an A1 signal; the excessive spread on unshaped keying pulses having to be seen to be believed! Similarly the manner in which telephony bandwidth increases when over-modulation occurs were shown and it is much to be hoped that this exhibit has brought home to countless amateurs their responsibilities in keeping their signals as narrow as possible. The "response timer" was kept busy throughout the Exhibition; it combined popular appeal with a demonstration of the technique now used in the accurate measurement of short periods of time. Essen ring crystals, suspended by silk thread, and with extremely high-Q characteristics—as used for the standard frequency transmissions from Rugby—also attracted much attention. Among the many other exhibits on this stand were W28 crystal drive units and a standing-wave indicator for use with 4,000 Mc/s. TV relay equipment. Full facilities were also provided for advice on licensing and other amateur problems.

### The Future

While the Exhibition has once again demonstrated the ability and the desire of many British manufacturers to cater for the amateur enthusiast, it also emphasised—by conspicuous absences—the reluctance of certain important valve and component firms to concern themselves with the amateur market. Undoubtedly the sales of new valves and apparatus during the past few years have been affected by the ready availability of war surplus material. But it is also clear—as a visit to the R.S.G.B. stand alone showed—that amateurs in this country will not remain satisfied for long with anything less than the latest valve types and components. By showing, today, an interest in and willingness to cater for the experimenter whose pocket book—unlike his enthusiasm—is limited, far-sighted British concerns are sowing the seeds from which future dividends will be harvested.

## EXHIBITION PHOTOGRAPHS

Inquiries relating to official Exhibition photographs should be addressed to R.S.G.B. Headquarters. A selection of the photographs are available for inspection.

# In the Workshop

## WOODWORKING TOOLS

NUMEROUS suggestions have been received from readers that some general hints on the use of woodworking tools should be included in this feature. It appears that there is quite a large community in the amateur sphere who do, or would like to do, the various jobs of woodworking which arise from time to time. The scope appears to range from fairly elaborate pieces of radio "furniture," such as cabinets for television sets, test gear and receivers down to the humbler efforts of aerial arrays and similar structures: all of which frequently lend themselves to awful expressions of expediency in carpentry. The requirements for successful woodworking, however, are very similar to most other constructional work . . . a fairly sound "know-how," a reasonable selection of the right tools in good condition, and a strict control over natural impetuosity.

In general, most people find that it is much easier to make mistakes in woodworking than in metal-working, and much more difficult to disguise bad work. It is not to be supposed that every woodworking aspirant can become a skilled craftsman overnight, but sound and efficient construction with the minimum of technical skill is what the average amateur wants.

### Planes

The minimum requirements are a "roughing" plane for general preparation work, usually of the beechwood variety and a "class" tool of the all-metal type for finishes. The jack-plane, the "trying-plane" and special moulding planes are essential in professional carpentry, cabinet and pattern-making but are normally unnecessary in the type of work under review.

**Sharpening the Blade.**—Most planes, except small and special varieties, have two blades, a flat cutting blade and a deflecting blade secured to the cutting blade by a large screw passing through a slot. The function of this composite arrangement is discussed later. The angle of the cutting blade is formed in manufacture and it is only necessary to hone the edge to an angle about 15 degrees to the flat surface of the blade. Great care is necessary in honing in order to keep the cutting edge square to the sides of the blade, and quite even. It will be found that a "raw" edge forms which should be removed by drawing the blade across a piece of wood (usually the edge of the bench!).

Use a medium stone for the preliminary honing down and a fine stone with plenty of oil for finishing. Do not attempt any grinding or honing of the flat face of the blade which must always be kept free from rust, otherwise "pitting" will occur which will make it impossible to obtain a

perfectly true cutting edge and disfiguring streaks will be made in the process of planing.

A useful—and most effective—accessory is available for holding the blade at the correct angle during honing (see Fig. 1).

**Setting the Blade.**—When the cutting blade has been sharpened it is necessary to set the deflecting blade to its flat face in a particular way. The function of the deflecting plate is, as its name implies, to deflect the shavings away from the front of the cutting edge thereby conserving its keenness. A plane without this plate will require continual resharpening.

The actual distance of the edge of this blade from the cutting edge is dependent on the nature of the cut and the kind of wood being planed. In general the coarser the cut the wider should this distance be. For average work the dimensions shown in Fig. 2 should be followed.

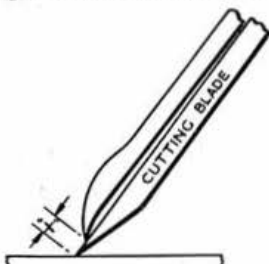


Fig. 2  
Setting plane irons.

Dimension "X":

- $\frac{1}{16}$ " for very fine cuts in hardwood.
- $\frac{1}{8}$ " for average cuts in hardwood.
- $\frac{1}{4}$ "— $\frac{3}{8}$ " for rough cuts in softwood.

**Setting the Plane.**—The following remarks apply only to the wooden plane with "wedge" setting, and not to the steel-carcase types which incorporate a form of micrometer screw setting.

First insert the blade assembly in the slot in the plane body so that the cutting edge is just *not* projecting. This is done by holding the body of the plane and the blade in the fingers, reversing it, and taking a "sight" along the working face. When this is done insert the wedge, still holding the blade, and gently tap in with light hammer blows. The cut can be adjusted by tapping the rear of the plane to reduce, or by tapping in the blade to increase, carefully "sighting" the cutting edge after each adjustment. Finally, tap in the wedge firmly and make a trial cut, adjusting as necessary. After only a little practice it is possible to set a plane accurately and quickly for a required cut.

### Planing

Before planing commences, it is most necessary to ensure that the work is held very firmly in a vice or rests on a flat bench against a stop (carpenters' benches are usually fitted with a stop adjustable for height). Good work is impossible if the work is able to slide about during each stroke of the plane.

Hold the plane in the right hand behind the blade, and place the left hand over the front palm downwards. Then, while maintaining a firm downward pressure with the left hand, commence

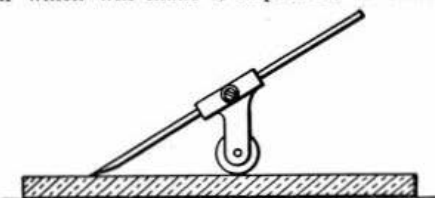


Fig. 1  
Useful accessory for honing plane irons, etc.

planing, along the grain of the wood, using long, sweeping strokes which run the full length of the work where possible. Avoid at all costs short "stabbing" strokes as these will have the immediate effect of clogging the blade which is not only annoying but which labels the amateur effort indelibly.

Check the work for dimensions, and for flatness continually with a straight edge—most people tend to plane "hollow." Use the carpenter's square frequently when planing adjacent surfaces so as to become practised.

When planing hardwood, always use the minimum of cut, and finish with a really fine cut, which with a plane in good condition will produce shavings of gossamer thickness and a finish which will require little treatment with glasspaper.

The frequent requirement of planing pieces of wood at the ends across the grain is more difficult and often results in spoilt or mutilated work by the splitting of the edges. To avoid this, chamfer off the front edge to about 45 degrees where the plane leaves the work (have due regard to the finished dimensions and do not use too heavy a cut). If the work is too wide for a single stroke, chamfer both the "entering" and "leaving" edges, and work from both sides, reversing the material periodically. When a steel plane is used for this type of work, it is helpful to spread a few spots of oil over the working face of the plane.

#### Maintenance of Planes

- (1) Wipe over the blades with oil when not in use, particularly the cutting edge.
- (2) With steel planes wipe a little grease over the working surface.
- (3) Give wooden planes an occasional wipe over with linseed oil.
- (4) Never store or rest the plane flat on the working face. Always rest it on its side, or place a piece of lath under its front end.
- (5) Never "clout" the plane unmercifully with a hammer when setting it—use a mallet whenever possible.

#### Chisels

For average work the following selection of chisels is ample:

*Flat or "firmer" chisels*— $\frac{1}{4}$  in.,  $\frac{1}{2}$  in., 1 in. and  $1\frac{1}{2}$  in. (the latter preferably of the "bevelled" type).

*Gouges*— $\frac{3}{8}$  in. and  $\frac{1}{2}$  in.

These chisels should be maintained with the same care as other cutting tools and not allowed to become rusty or the edges "nicked." (The XYL soon discovers that a chisel is an excellent "tack-lifter" or tin-opener, so beware!)

*Using Chisels.*—Chisels are really quite dangerous weapons if improperly used. Very serious cuts, even producing permanent disablement, are not so rare as they should be. The cause is nearly always incorrect usage coupled with an impetuous desire to hack a job into shape in the minimum of time. The first rule is to ensure that, when making "dangerous" downward cuts, the work is held firmly on a perfectly flat surface. The danger usually lies in the tilting of the work when considerable pressure is being applied to the chisel, which, in consequence, shoots away with disastrous results.

The correct method is to hold the work down firmly with the side of the left hand and to guide the chisel by hooking two fingers round the blade, keeping it as nearly vertical as possible when applying the pressure. Avoid heavy cuts until confidence comes and *don't blame the tools when things go wrong!*

When chiselling horizontally with the work in

the vice it is essential to hold the chisel firmly in the right hand and to steady and direct it by holding the blade in the left hand, *palm downwards*. With practice, a side to side motion helps the cut, but it must be carefully applied.

#### Centre Bits and Twist Bits

The humble centre bit is the most common tool for drilling in wood, but the more fortunate will possess the better class twist bit. Most centre bits are steel forgings generally indifferently hardened. They can therefore be sharpened and touched up with a fine file instead of by grinding. The most important point to observe is that the diameter of the hole produced is twice the dimension "X" in Fig. 3 and *not* the overall diameter of the drill (X + Y). The "marking-out" arm of the bit decides the size of the hole

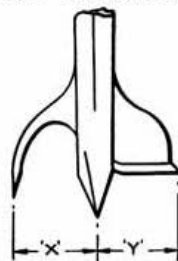


Fig. 3  
The Centre-Bit: Dimension "X" is the radius of the hole cut, and must never become less, by sharpening, than dimension "Y."

and the cutting edge removes the material.

It is essential with both centre and twist bits to drill from both sides of the work (when applicable); otherwise the bit will crash through and splinter the wood. As soon as the point of the bit appears, reverse the work.

The screwed tips of twist bits should be protected with small pieces of wood or corks when not in use.

#### Expanding Bits

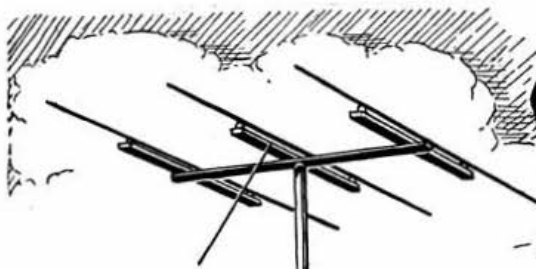
An expanding bit, though rather expensive, is a most useful addition to a workshop and allows holes from about  $\frac{1}{4}$  in. to  $1\frac{1}{2}$  in. to be drilled cleanly and effectively even in plywood. The setting of the adjustable cutter is quite easy as a scale of hole diameters is engraved on the tool but it is always advisable to make a trial cut in a piece of scrap wood to check the dimension.

Very great care is necessary in tightening up the locking screw of the adjustable cutter since, if the slot of the screw becomes mutilated, it will be impossible to tighten it sufficiently, or even perhaps to loosen it. Furthermore the bit must never be strained or it will be ruined beyond repair. No pressure need be applied to the brace when drilling as the bit will draw itself in automatically at the correct rate. As soon as the screwed tip of the bit pierces the work, complete the hole from the reverse side (as with centre-bits). The core will come out cleanly on the bit providing, incidentally, a useful protection when not in use.

#### Radio Amateurs' Handbook

The A.R.R.L. announce that due to ever-increasing costs of printing and paper, the overseas selling price of the 1951 edition of the *Radio Amateurs' Handbook* will be 3 dollars—equivalent to £1 2s. sterling.

Members who intend to order this edition—due to appear sometime in January—are asked to note the revised price.



## AROUND THE V.H.F.'s

By W. H. ALLEN, M.B.E. (G2UJ)\*

### V.H.F. Achievements

2 metres (144 Mc/s.)	W5VY-W8WXV	1,196 miles
	G2BMZ-DL4XS/3KE	520 miles
70 cm. (420 Mc/s.)	W6VIX/6-W6ZRN/6	261 miles
	{ W1PBB-W2QED }	
	G5BY-G6LK	161 miles
23 cm. (1,215 Mc/s.)	G8DD/P-G3QC/P	75 miles
13 cm. (2,300 Mc/s.)	W6IFE/6-W6ET/6	150 miles
3 cm. (10,000 Mc/s.)	G3APY/P-G3ENS/P	27 miles

### 70 cm. Activity Week

THROUGHOUT the country the popularity of the 70 cm. band has increased considerably as compared with even a year ago. However, the most sanguine could not say that, as yet, the band is other than thinly populated, and with the almost universal employment of beams with a narrow horizontal angle there is more often than not considerable difficulty in finding what other activity there may be.

Many workers or groups arrange skeds. and so manage to make contacts, but for the casual newcomer to the band it is all too often a wide open space with nothing happening in it, and under such circumstances one can hardly blame them if after a few sorties they lose heart and seek more populated frequencies.

It is with these thoughts in mind that a 70 cm. Activity "Week" has been arranged from Saturday, December 30, to Sunday, January 7, 1951.

This will not be, in any way, a competition, and no awards of any sort are offered. All that is asked is that throughout the period as many stations as possible will make an effort to be on the band at the times mentioned in the accompanying "box," and that information as regards stations heard and worked, together with other pertinent comments be sent to the writer, who will undertake to prepare a report on the event.

The following are a few suggestions to those who propose to take part:

Call "CQ 70" even if there is nothing to be heard—everybody listening does no one any good.

Make long calls of up to 10 minutes—it's a wide band.

When on 'phone please sign your call several times slowly on C.W. or M.C.W. for the benefit of those who have difficulty in reading you.

Don't leave the beam set in the direction in which you think other stations may lie: there are a number of new stations of which you may not have heard.

While the majority of signals are radiated on frequencies between 432 and 438 Mc/s., i.e. in harmonic relationship with the two metre band, some stations work outside these limits.

Even if you can only come on once, please come on.

Let us have your list of stations heard and worked and details of your gear.

\* 32 Earls Road, Tunbridge Wells, Kent.

### The Amateur Radio Exhibition

If further evidence of the increasing interest displayed in the V.H.F.'s was required, it was certainly forthcoming during the four days of the R.S.G.B. Amateur Radio Exhibition.

Although nearly all sides of amateur activity were reflected by the apparatus on view on the Society's stand, by far the greater number of questions concerned the examples of V.H.F. gear displayed. A complete receiver for the 70 cm. band, designed and constructed by D. N. Corfield, G5CD, comprising nine valves and including R.F., mixer, oscillator, 3 I.F.s, B.F.O. and audio stages on a chassis measuring only 8 in. by 6½ in. evoked considerable interest, particularly when it was realised that none other than standard types of valves were employed and that the complete absence of "plumbing" did not result in an inferior performance. After all, there are not many 14 and 28 Mc/s. communications receivers able to better its measured sensitivity of one microvolt absolute.

The beautifully constructed transmitter and receiver, also for the 70 cm. band, shown by the South London V.H.F. Group, came in for much favourable comment. These, together with several other exhibits, will be the subject of constructional articles in the next few months.

### The Aurora

Bearing in mind what was written last month regarding auroral reflections on the two metre band in the U.S.A., G3EHY (Banwell, Som.) noticed such an opening on ten metres between 20.10 and 21.00 G.M.T. on October 26. Unfortunately no signals whatever were audible on two metres at the time, although a number of calls were radiated in a northerly direction.

### Two Metres

The contest organised by the *Short Wave Magazine* on November 11/12 provided a good deal of activity on the band, and many contacts were effected all over the country. Conditions were good on the Saturday afternoon, with stations up to 200 miles audible in the South of England. Unfortunately such did not continue much after 6 o'clock in the evening, and for the remainder of the period ranges were no better than normal. At times of maximum activity much mutual interference was caused by stations operating in a narrow band around 145 Mc/s., while the frequencies between 144/144.5 and 145.25/146 Mc/s. were almost unoccupied.

(Continued on Page 225)

### 70 cm. ACTIVITY WEEK Suggested times of Operation

Saturday, Dec. 30 and Jan. 6 ...	15.00-16.00
	19.00-20.00
Sunday, Dec. 31 and Jan. 7 ...	10.00-12.00
	19.00-20.00
Monday, Jan. 1 to Friday, Jan. 5	19.00-20.00
All times G.M.T.	

# THE MONTH ON THE AIR

By A. O. MILNE (G2MI)\*

## GSWL

AN increasing number of QSL cards have been arriving at the R.S.G.B. Bureau, addressed merely to "G.S.W.L." With no name, address or distinctive number by which the addresses may be identified, it is impossible to deliver them. How this occurs is shown by a report we recently received from a listener; a nicely printed card bearing the letters G.S.W.L. in large type. An overseas amateur, when replying, would probably consider these letters as providing sufficient identification: hence the undeliverable cards. It is suggested that this practice should be discontinued and that all listeners should use some identification number, such as a B.R.S. or "A" number, or at least avoid the use of a misleading "call-sign."

## Thought for the Month

Our Happy Lid has T.V.I.  
But never any cures will try.  
Blusters, instead, at viewers who  
At his front door must form a queue.

\* \* \*  
Tells them that he has every right  
To transmit signals day and night,  
And as for filters, screens and traps  
He'll fit them when he likes, perhaps.

\* \* \*  
Our Happy Lid put "off the air"  
Of T.V. "rights" is now aware.  
Meanwhile in one more neighbourhood  
Ham Radio's misunderstood.

G3VA

## Notes and News

"Pim" Bradley, G5BS, has added 3A2AB and ZS7C to his DX list. He has also had an interesting QSO with IINMC (Portable Marine) TA on the motor ship "Maine" in Turkish waters; the operator is believed to be WINMC ("No more cash"). His bag on 28 Mc/s. this autumn included VK, VQ2, ZC4, ZS, ZC6, MD2, ZE, LU, SV, W, VS7, VE, VS9, TA, CX, FA, AR8 and PK4.

Like G5BS, BRS15846 of Camberley submits a long and comprehensive report which proves that 28 Mc/s. is not dead yet. During October he heard VP6, TI, VP2, ZS1, 5, 6, 7, KP4, ZE, HC, KS4, ZC4, VQ4, CT2, OQ5, VP8AI, CT3, VQ2 and XZ.

On 14 Mc/s. G6RH has heard FB8ZZ (14010) and has worked VK1PG (14015). G6XS recommends W7NPU and W7JHH to those members looking for Utah stations who QSL. Both are on 14 Mc/s. C.W. G2FAY was one of the lucky ones to raise VK1YG on Heard Island. BRS18017 copied SM8ALF/MM on 14060 kc/s. This station can often be heard calling CQ-SM. UA0KF, zone 19 (14025), and UA1AL, Archangel (14060), VP3VV (14030), were others noted. He says FW7WE is on Wallis Island and will be active in FG8 soon. G4FN has heard FG8AL on 14085 and says FG8AC is also active. G3CIZ gave ZD6JL his first G contact and says ZS8B is active on 14 Mc/s. 'phone.

Bob Pybus tells us that 3.5 Mc/s. has been moderately good during the past month, with

## Contests Diary

From	G.M.T.	To	G.M.T.	Contest
Jan. 20	0001	Jan. 21	2400	S.A.R.L. DX Contest (C.W.)
Jan. 20	2100	Jan. 21	0800	R.S.G.B. Top Band Contest
Jan. 27	0001	Jan. 28	2400	S.A.R.L. DX Contest ('phone)
Feb. 3	1700	Feb. 4	1700	B.E.R.U. Contest ('phone)
Feb. 10	0001	Feb. 11	2400	A.R.R.L. DX Contest (C.W.)
Feb. 17	0001	Feb. 18	2400	A.R.R.L. DX Contest ('phone)
Feb. 24	1700	Feb. 25	1700	B.E.R.U. Contest (C.W.)
Mar. 3	1700	Mar. 4	1700	B.E.R.U. Contest (C.W.)
Mar. 10	0001	Mar. 11	2400	A.R.R.L. DX Contest (C.W.)
Mar. 17	0001	Mar. 18	2400	A.R.R.L. DX Contest ('phone)

Rules for the TOP BAND CONTEST on January 20, 1951, will be similar to those published on Page 146 of the October, 1950, issue. (Logs to be posted on or before January 29, 1951.)

W1ATE and W4CPG as the outstanding signals. Associate member J. Robbins of Maidstone adds two new SP's to the list. SP5SQ on 3.5 Mc/s. 'phone and SP5LJ on 14 Mc/s. 'phone.

## Where They Are Now

ZB1CH is ex VP9E. He still has a few VP9 cards left for genuine applicants. Mentions how surprised he is to hear many people say "You are my first ZB1." G3AIS is now ZB1AIS, but reports that a pirate in the West Hartlepool area is using his G call.

It is now certain that Bob Ford, AC4RF, is in the hands of the Chinese invaders. This is official information which is confirmed by AC4YN, who is still in Lhasa. G3AAE was kind enough to pass it along to us.

SUIMR, says G3CIZ, was recently rushed to this country seriously ill and is now in the Royal Hospital, Sheffield, making progress. VS2CQ (G2NR) leaves Malaya in January. He made his final contact with G6GM on September 21. G3GAR (formerly DL2GZ) is now licensed as ZD6RD, and will shortly be active with 100 watts of C.W. and telephony on all bands from 3.5 to 28 Mc/s. His address is P.O. Box 72, Zomba, Nyasaland.

G8IG corrects our recently published QTH for VP8AJ. He says it is Port Locksoy, Grahamland, not Port Stanley.

## Pirates and Suspects

VT1DF claims to be in Kuwait and asks for QSL's c/o Cable and Wireless. No cards have ever been seen from this station and it is very improbable that he is genuine. VQ9AA is another suspect. This station claims to be using 500 watts at the Navy Office, Seychelles. It is therefore curious that almost all the cards received at the Bureau come from American stations. Despite the "QSL via R.S.G.B." instructions, no address has been received at the Bureau.

G3EFY has received a letter from CT3AA to the effect that CT3AF is a pirate. The call has not been issued. Official advice comes from VQ8AF, the Mauritius QSL manager that VQ8AU is not in the territory and that the call has never been issued. The only genuine VQ8's are VQ8AB/8CB, 8AD, 8AE, 8AF and 8AZ. 8AX

\* 29 Kechill Gardens, Hayes, Bromley, Kent.

was legitimate but has never QSL'd. He left the island some time ago. G3DDM tells us that the genuine G3FRS never was active and that the call has now been cancelled.

### Amateur Radio in Greece

BERS766 in Athens reports an interesting three-way contact between SV0WU, mobile along the sea-coast, SV0AM in Athens City and GW3FSP.

SV0AN (ex-VQ4RAW) says the first Greek amateur was Bill Tavanotis, SV1KE. Back in 1936 there were 1KE, 1RX, 1CA, 1MP, 1NK, 1SM and SV6SP in Crete (Colonel Zarifis, now SV1SP). All are still alive and well. In those days there were no licences, a situation which continued until 1940 when they were closed down. In 1947/49 there were SV1RX (now G3FNF), SV1WE, also now in this country, SV1EC (G2EC) and some XA stations operated by military personnel, both British and American. Then the British Mission issued a series of calls, SV0AA-SV0AZ.

The present set-up is that call-signs in the series SV0WA-WZ are being issued by the American Mission. The only legally operative Greek National is Colonel Zarifis, but it is hoped that Greek licences will soon be issued. There are two U.N. stations active, one in Salonica and the other—SV5UN—in Rhodes.

### Friend in Need

ZE3JJ (ex-G3CHP) was recently bogged down with a heavy lorry some 40 miles from town. The driver of the first car to come along offered to help, and turned out to be ZE2KB.

We are reminded of an incident during the war of G2IG driving along a desolate part of the Kentish countryside in the early hours of the morning. He offered a lift to a lonely R.A.F. man trudging wearily along, to find after they had been chatting for a while, that he was a VE2.

### AROUND THE V.H.F.'s (Continued from P. 223)

G3EHY (Banwell, Som.) found conditions very mixed during the period October 20 to November 20, although the earlier part was greatly superior to the last week or so. On October 18 he succeeded in working G2FO (Stockton-on-Tees) at 242 miles and heard ON4PZ at S7 on 'phone on October 24.

### The 70 cm. Band

G2QY (Pinner, Middlesex) has had several contacts with G5TP (Stoke Row, Oxon) at 27 miles, and on October 19 heard G2XC (Portsmouth, Hants), 60 miles, at strengths up to S4. Other contacts included G2CIW (Romford), 24 miles, G8SM and G5CD (Hendon, Middlesex), who is now active and using the equipment shown at the Exhibition.

We regret that in the October notes we did not make it clear that G2QY's contact with G8QY, portable near Coventry, was made while '2QY himself was operating portable at Princes Risborough. The distance was 61 miles.

### 2450 Mc/s.

Anyone in the vicinity of G2QY who is interested in operation on this band is requested to get in touch with him at 16 Latimer Gardens, Pinner, Middlesex. 'QY hopes to have his portable apparatus ready by Christmas.

*Reports by December 22 please.*

The writer would like to take this opportunity of wishing all members the compliments of the season and good luck and prosperity in the coming year.

### Falkland Islands Dependencies

IN the February, 1950, issue of the BULLETIN Mr. A. O. Milne, G2MI, stated in his "The Month on the Air" article that the A.R.R.L. had agreed not to recognise the activities of LU1ZA—a foreign pirate which had operated on British territory in the Falkland Islands Dependencies. Mr. Milne commented "That we have tolerated his impudence for so long is bad enough; to have recognised his activities for any kind of operating award would be the last straw of insult piled upon injury."

The publication of this statement caused considerable comment in Argentina and gave rise to adverse criticism of the R.S.G.B. in general and of Mr. Milne in particular.

Later it became known that other Argentina amateur stations had been set up in the Falkland Islands Dependencies.

It has been confirmed from official sources that the South Shetland Islands, the South Orkney Islands and the Palmer Archipelago form part of the Falkland Islands Dependencies over which His Majesty's Government have sovereignty. As none of the operators of these foreign stations has, as far as is known, applied to the Governor of the Falklands for permission to transmit from British territory, it can only be concluded that they are being operated illegally.

In view of these facts the Council has decided that the R.S.G.B. QSL Bureau shall not handle cards received from or addressed to these illegal stations.

The call-signs of the stations referred to are in the series LU1ZA, LU1ZB . . . LU2ZA, LU2ZB.

### FORTHCOMING EVENTS

(Continued from Page 203)

Watford.—January 2, 16, 7.30 p.m., Cookery Nook, The Parade.

Welwyn.—January 2, 8 p.m., Council Chambers.

Woolwich & Plumstead.—December 20, January 3, 17, 8 p.m., "Bull Tavern," Vincent Road, S.E.18.

#### REGION 8

Brighton.—Tuesdays, 7.30 p.m., "Eagle Inn," Gloucester Road.

Eastbourne.—January 5, 7.30 p.m., Friends' Meeting House, Wish Road.

Chatham (M.A.T.R.S.).—Mondays, 7.30 p.m., Co-operative Hall, Luton Road.

Gillingham (G.T.S.).—Alternate Tuesdays, 7.30 p.m., Medway Technical College.

Petersfield.—December 21, January 18, 7.30 p.m., Y.W.C.A. Hostel, High Street.

Portsmouth.—Tuesdays, 7.30 p.m., Royal Marines Signal Club, Eastney Barracks.

Reading (R.R.S.).—December 30, Main Society, 7 p.m., Abbey Gateway.

#### REGION 9

Bristol.—December 15, January 19, 7 p.m., Keen's Cafe, Park Row.

Exeter.—January 5, 7 p.m., Y.M.C.A., 41 St. David's Hill.

Gloucester.—Alternate Thursdays, 7.30 p.m., Spread Eagle Hotel, Market Parade.

North Devon.—January 5, 7.30 p.m., Rose of Torridge Cafe, The Quay, Bideford.

Plymouth.—December 15, January 19, 7 p.m., Tothill Community Centre, Tothill Park, Knighton Road, St. Jude's.

Torquay.—December 16, January 20, 7.30 p.m., Y.M.C.A., Castle Road.

Stroud.—Wednesdays, 7.30 p.m., Subscription Rooms.

Weston-super-Mare.—January 2, 7.30 p.m., Y.M.C.A.

West Cornwall (W.C.R.C.).—December 21, January 4, "Fifteen Balls," Penryn.

Yeovil.—Wednesdays, 7.30 p.m., Grove House, Preston Road.

#### REGION 14

Falkirk.—December 29, January 12, 7.30 p.m., Temperance Cafe, High Street.

### "TRANSMITTER INTERFERENCE"

Will solve your B.C.L. or T.V.I. worries

PRICE 1/3 (By post 1/6)

FROM R.S.G.B. HEADQUARTERS

# TOP BAND CONTEST RESULTS

FOR eleven hours on the night of November 18-19, operators all over the British Isles triumphantly piled up record scores in the second 1950 Top Band event—yet, when 8 a.m. arrived, less than 20 points separated the three leaders. No wonder that this contest has become recognised as a searching test of equipment, operating skill and that indefinable mixture of perseverance, zest and “flair” which time and again brings familiar call signs into the leading positions. Meanwhile the tempo grows ever faster: in 1939 the leading station (GW6AA) made 94 contacts in 12 hours; this November the corresponding figure is no less than 181 contacts in 11 hours—a striking illustration of the skill now required to challenge the leaders.

## Champion of the Year

Mr. H. J. M. Box, G6BQ, of Gravesend, Kent, again heads the table, thus becoming the first amateur to win both Top Band Contests in a single year. His score of 656 points shows an increase of no less than 97 points over that set up last February under similar scoring conditions but with less activity on the band. His transmitter is an E.C.O.—Treble—P.A. with three 6L6 valves, gang-tuning and automatic send/receive switching. A half-wave centre fed Zepp (254 ft. top, 60 ft. feeders) can be alternatively connected as a centre-fed “T” Marconi with direct earth; the second arrangement giving better low-angle radiation for distant stations and also a stronger ground-wave for working across London. Incoming signals are sorted out on a 14-valve home-built superhet with a BC453 “Q5-er.” G6BQ’s 181 contacts, which included 29 in the first hour and 100 in the first four hours, were made as a result of 23 calls.

Runner-up was Mr. W. T. Pickard, G8KP, of Wakefield, Yorkshire, a comparative stranger to Top Band events though a recognised contest enthusiast on the DX bands. He used a 6F6 V.F.O., 6L6 P.A., running 9 watts input and feeding a 140 ft. end on aerial. The receiver was an AR88. Only a few points behind was a regular contestant, Mr. J. C. Foster, G2JF, near Ashford, Kent, who used a four-stage transmitter, half-wave Zepp with quarter-wave feeders and an HRO receiver.

Mr. J. Hudec, OK1VW, submitted the best overseas log, his 135 contacts (131 with the U.K.) being made with a four-stage V.F.O. and grounded grid LS50 P.A. running 10 watts. His triple conversion superhet receiver is of his own construction. His log shows that HA5BK/1 was active on the band, although no British amateurs worked this station. DL2CH, incidentally, used a 3-watt C.C. rig powered by a 120-volt battery.

The entries show a welcome variety in equipment: home-built receivers being reasonably prominent (three in the first twenty places), while commercial and service models of almost every known type were represented. Aerials are of major importance at these frequencies and though the longer wire types are deservedly popular, excellent performances were also recorded with radiators less than 150 ft. long—at least half of the leading 20 stations being in this category. G6ZN, winner of the recent QRP contest, gained 12th place though restricted to 3 watts input from batteries. “Rock bound” stations were at a considerable disadvantage but despite this handicap both G5JL

Posn.	Call-sign	Reg.	Pts.	Posn.	Call-sign	Reg.	Pts.
1	G6BQ	07	656	51	G3DRY	01	347
2	G8KP	02	642	52	G3CO	07	345
3	G2JF	08	637	53	G6WH	03	344
4	G6NB	06	615	54	G16YW	15	343
5	G8NF	02	605	55	G3GDW	09	334
6	G8VR	07	595	56	G3CKX	07	332
7	G2YY	13	583	57	G4FB	08	329
8	G6UC	13	582	58	G3BIK	02	328
9	G5TO	02	576	59	G3CU	07	322
10	G4AU	07	556	60	G12FHN	15	321
11	G6HD	07	554	61	G3EPV	07	319
12	G6ZN	02	549	62	G3CDK	07	319
13	G5ZX	03	526	63	G1SSJ	15	309
14	G3AAQ	03	516	64	G3FEA	01	304
15	G2LC	05	500	65	G3ANK	07	285
16	G3AUT	03	498	66	G2HOX	07	280
17	G2BOI	02	493	67	G3ENY	07	276
18	G2DTD	06	490	68	G2AVC	07	275
19	G6GM	09	489	69	G2JB	07	271
20	G3DTG	03	486	70	G4KO	05	270
21	G3AKY	02	484	71	G2DZF	08	269
22	G6VC	07	480	72	G3DCQ	07	268
23	G8IP	07	479	73	G4CM	07	266
24	G5JL	07	479	74	G3DCC	07	262
25	G3SUB	01	478	75	G3CRY	05	261
26	G8JR	07	475	76	G3GGK	04	253
27	G3BTP	07	470	77	G6UT	05	252
28	G3YF	07	456	78	G3VM	05	248
29	G2MJ	01	455	79	G8BM	01	241
30	G5BP	04	445	80	G2CPL	05	240
31	GW2XZ	10	429	81	G3GBN	07	238
32	G3DDM	08	428	82	G2BOF	07	230
33	G3AKU	05	422	83	G2HBG	04	215
34	G5LP	04	419	84	GW3GWA	11	199
35	G2DVD	08	415	85	G2CVV	04	195
36	G3BKE	02	408	86	GW3CBY	10	183
37	GW3JI	11	406	87	G3BF	08	182
38	GM8FM	13	404	88	G2ZZ	07	161
39	G3ABG	03	404	89	G2XP	07	139
40	GW5BI	10	403	90	G5HS	06	136
41	G3CWW	07	400	91	G3GLV	01	133
42	GM3DZB	12	399	92	G8QZ	04	129
43	G2DAN	03	398	93	G3FVC	09	124
44	G5KT	09	398	94	G3NA	03	117
45	G2NJ	04	382	95	G2CXW	01	114
46	GM3EHI	14	381	96	G3FTY	05	105
47	G3DKO	02	369	97	G2CLD	08	95
48	G2YU	05	363	98	G2CIL	08	75
49	G5MR	08	363	99	GM3OM	14	71
50	G3ESY	03	361	100	G3GEN	09	44

and G8JR were placed in the top quarter of the table.

Notwithstanding many appeals, full use is still not being made of the high frequency end of the band: calls above about 1950 kc/s. brought few replies.

Some suggested modifications to the Rules have been considered but, for the present at least, the Contests Committee does not intend to make any major changes. It has been found that it takes several years to establish new rules and scoring systems. The advantages of novelty are usually more than outweighed by the difficulty experienced in making new Rules widely known. Even now the Regional number system is not always correctly operated. Similarly the suggestion that TV hours should be avoided altogether would seem to be a counsel of despair. In all but the most difficult of cases it is considered that it should be possible to construct a T.V.I. proof 10-watt 1.8 Mc/s. transmitter. A more serious comment, voiced by one non-entrant, is that, particularly in the first few hours, such Contests may lead to heavy interference on a shared band. Participants are therefore asked to avoid, as far as possible, the main commercial frequencies.

**Check Logs:** G2HW, 3ATU, 3BCM, 3E1W, 3ERO, 3ESP, 3GQV, 3GX, 3NT, 3SU, 4LX, 6JJ, GM3EGW, OK10BC, BR5250.

Overseas	Entries:		
1	OK1VW	539	points
2	DL2QM	535	points
3	DL2CH	379	points

**NEXT TOP BAND CONTEST STARTS 21.00 G.M.T., JANUARY 20th**

# RADIO AMATEURS' EXAMINATION

MAY, 1950

**F**ULL report of the results of the three-hour 1950 Radio Amateurs' Examination, held last May, has just been issued by the City and Guilds of London Institute. It shows that almost 80 per cent. of the 653 U.K. candidates were successful. The general standard of work, it is stated, both technically and the method of approach to the questions, was fairly high. Practically all questions were attempted by the entrants. The following analysis shows that while the number of candidates was slightly below the 1949 figure, the number of passes—653—rose appreciably.

Year.	No. of Candidates	Number of Passes	Number of Failures	Percentage of Passes
1950	Home, 823	653	170	79.4
	Over-seas 10	7	3	70
1949	Home, 885	628	257	71
	Over-seas, 13	8	5	61.7

## Paper and Comments

1. *With the aid of a diagram, describe the essential features of a crystal-controlled radio transmitter suitable for the 14 Mc/s. frequency band and indicate the method of keying.* (15 marks.)

**COMMENTS.**—Well done by most candidates. A small number of the candidates in their diagrams of single-ended power amplifier stages indicated incorrectly the method of neutralisation by showing the neutralising condenser connected directly between the anode end of the coil and the grid and the high tension supply connected to the end of the anode coil.

2. *Describe a superheterodyne receiver suitable for the reception of C.W. signals over the frequency range 1 to 20 Mc/s. Illustrate your answer with a block diagram.* (15 marks.)

**COMMENT.**—Very well done by practically all candidates.

## Aircraft and Shipping

**H**AVING, apparently, been approached by members of the Society belonging to the Bury (Lancashire) Group, Mr. Walter Fletcher (Cons., Bury and Radcliffe) asked the P.M.G. in the House of Commons on November 15:

"Why he declined the offer of the R.S.G.B. to assist in listening for aircraft or shipping in distress, in view of the assistance received from amateur radio operators during the search for the trawler 'Milford Viscount' and when this assistance would be at no cost to the public."

This action of the Bury members was taken without the knowledge of, and without reference to, the Council.

The P.M.G. (Mr. Ness Edwards) in his reply said:

"The standing arrangements for the reception in the United Kingdom of signals from ships and aircraft in distress at sea are generally found to be adequate. Where it is considered advisable, exceptionally, to augment these arrangements, the assistance of the public, including amateur radio operators belonging to the R.S.G.B., will be invited."

3. *State what requirements have to be met under the non-interference conditions of "The Postmaster-General's Licence To Establish An Amateur Wireless Station."* (15 marks.)

**COMMENT.**—Well done by most candidates.

4. *Describe a heterodyne frequency meter and explain how it is used to measure the frequency of a transmitter.* (15 marks.)

**COMMENT.**—Fairly well done by most candidates.

5. *What is understood by "radiation characteristics"? With the aid of diagrams, describe the radiation characteristics of a horizontal dipole with and without reflector.* (10 marks.)

**COMMENT.**—Well done by practically all candidates.

6. *Explain—*

either (a) *the meaning of class A, class B and class C amplification,*

or (b) *the method of neutralizing a power amplifier.* (10 marks.)

**COMMENTS.**—About 75 per cent. of the candidates chose the first alternative which practically all answered very satisfactorily. The remainder of the candidates who chose (b) satisfactorily described the procedure for neutralizing a power amplifier, but a fair number of the candidates showed incorrectly in their diagrams the position of the neutralizing condenser and the high tension lead. (See comment on Question 1.)

7. *Two inductors of 10 and 20 microhenrys are connected in series; two others of 30 and 40 microhenrys are also connected in series. What is the equivalent inductance if these series combinations are connected in parallel? Assume that there is no mutual induction.* (10 marks.)

**COMMENT.**—Well done by practically all candidates.

8. (a) *What is the relation between the frequency and the wavelength of a radio wave?*

(b) *What are the frequencies corresponding to wavelengths 30 km., 150 m., and 10 cm.?*

(c) *Why are wavelengths shorter than 5 metres generally unsuitable for long distance communication?* (10 marks.)

**COMMENT.**—Well done by practically all candidates.

Mr. Fletcher asked as a supplementary question:

"Does not the Minister think that at this time it would be a wise thing to get going a system which might be very useful later? In view of the signal service which is rendered by this Society would he give them more encouragement?"

Mr. Ness Edwards replied:

"This matter arose out of the loss of the 'Milford Viscount.' That is the subject of inquiry at present and I think I ought not to say anything about the use of amateurs until that inquiry has been completed. There is a lot of confusion and if these amateurs are to assist us it must be under very strict supervision."

It is singularly unfortunate that at a time when the Society is in touch with the Ministry of Transport and the Post Office on the general question of assistance by radio amateurs on occasions of emergency at sea, a small body of amateurs should take independent action and thus prejudice the outcome of negotiations which, based on much stronger evidence and with much wider support, could have produced far greater effect.

AS a result of the appeal in the September issue of the BULLETIN, about 300 offers of assistance have so far been received by the **Talking Book Department** of the National Institute for the Blind. A coverage map is now being prepared to trace areas from which further assistance would be desirable: details will be published later. Several blind users of this invaluable Library Service have already been aided by R.S.G.B. volunteers.

R.E.F. is one of the overseas societies concerned at the large number of individual packets of QSL cards from the U.K. on which surcharges have had to be paid since the rise in postal rates last October. Remember that letters to most foreign countries—United States (2½d.) is one exception—require a 4d. stamp plus an extra 2½d. for each ounce after the first. Current address, by the way, of the R.E.F. QSL Bureau is 72 Rue Marceau, Montreuil (Seine).

Did you know that the history of the London police radio network dates back to 1921 when tests were carried out between Scotland Yard—call sign GNSY—and 2LP then at Peckham? 2LP also held a public entertainment licence and on October 1, 1921, transmitted a programme which included "Greetings from the Pastor," a violin solo and a song to an audience at the Peckham Rye Tabernacle during a concert in aid of church funds, thus anticipating the B.B.C. by many months. Present station of Mr. A. W. Knight, G2LP (formerly XMA) is at Tolworth, Surrey.

Despite the popularity of many new DX certificates, the **British Empire Radio Transmission Award**, introduced in 1938, is still eagerly sought after by amateurs all over the world. Although 50, instead of the original 40, Empire cards are now required in order to claim the award, certificates are still being issued at a rate of over 100 a year. The 500th award will probably be claimed late this year or early in 1951.

Don Knock, VK2NO, in the W.I.A. journal, laments the tendency of the national Press to make sensational use of Amateur Radio. Some Australian newspapers, he says, rarely see real news value in Amateur Radio activities and are capable of distorting stories to fit their individual policies. A study of British news-clippings shows that, generally, the amateur in this country receives a fair Press, though the hard pressed "sub" or reporter does occasionally let his imagination run riot. A few words of advice: in an interview do not make exaggerated claims and steer clear of political comment on overseas stations.

When viewed in the mass, comparatively little originality was discernible in the QSL cards left at the Exhibition stand this year: costs presumably restrict printing to standardised designs. Three letter calls have given some scope: G3DOG shows an eager puppy chasing a cat labelled "Ur QSL" while G3EGG pictures a hen proudly surveying the results of her efforts. Also noted were the (very) young lady in cartoon fashion on G2YL's card, and the distinctive hand lettering block of G5LN. Generally voted one of the most effective designs is the card adopted by many members of the R.A.F. Amateur Radio Society showing, in the background, a jet fighter in air force blue. But at least one member of that Society keeps to his old design: G2LR pinned up a card filled in for a 1936 QSO. Still using the O—V—I Wally?

Activity in the recent **Top Band Contest** was at a high level with more than 100 logs received.

Lighter touch was supplied by one Northern station who found a "warble" creeping into his hurriedly assembled transmitter half way through the contest. In an attempt to bring about a cure, valves, condensers and resistors were replaced one by one between contacts. By 0800 G.M.T. the entire transmitter had been rebuilt . . . but the slight "warble" persisted! Obviously a case of Gremlins!

Aurora propagation has figured prominently in recent V.H.F. and DX notes, but this is nothing new. At a meeting of the Society on December 19, 1919, a Lt. Hall asked Dr. Erskine Murray (soon to become President) to explain "the extraordinary freak transmission in the presence of the northern lights. I have noticed most clear examples in Canada; coming down the River St. Lawrence on one occasion, stations with only half a kilowatt communicated with places as far distant as San Francisco. . . ."

An idea with possibilities as a means of improving Hamfest attendances is reported by EI2W in the *I.R.T.S. News*. At a meeting in Rochester, U.S.A., he was awarded a prize for being the amateur from "the most distant QTH." . . . Leading British stations in the Coupe du R.E.F. 1950 were (phone) G2WQ with 12771 points and (C.W.) G3EYN with 11610 points. . . . During 1949, S.A.R.L. accounts showed an excess of expenditure over income of almost £600. . . . Change in the A.R.R.L. countries list is the grouping of New Amsterdam (FB8) with the Kerguelen Islands (FB8). . . . The *British Amateur Television Club* estimates that a closed circuit system for the transmission of still images such as QSL cards or slides can be assembled for around £15. . . . A new B.B.C. studio has been opened at Nottingham. . . . First proofs of the report on the last QRP contest mentioned "flea - powder" enthusiasts. Presumably our printers thought this as good a way as any other of "de-bugging" the rig. But at least the error was spotted in time—unlike the recent newspaper report of amateur television transmissions on "2450 W/Cs."

## Ten Minute Quiz

This month's posers for the radio enthusiast.

1. What is the average efficiency of a power transformer in radio equipment?
2. What is an "infinite baffle"?
3. Why are gas and hot water pipes unsuitable for earth connections?
4. What are the most effective screening materials for: (a) radio frequencies; (b) audio frequencies?
5. Why is a resistor normally connected across the tuned circuits in an F.M. receiver?
6. What recent research investigation has added 11 miles per second to a well-known speed?
7. How is the power sensitivity of a valve amplifier normally measured?
8. What should a Post Office Inspector be carrying?
9. What frequency bands are available for model control?
10. What are the frequency limits of the 30 mn. band?

Now turn to page 231 and see whether you have beaten the Question Master.—H.E.B.

# AROUND THE REGIONS

## Barnet Amateur Radio Society

At a recent A.G.M. a year of progress and steadily increasing membership was reviewed. A social evening on December 16 will mark the amalgamation of the two local groups. Details of this and other events can be obtained from the Hon. Secretary, Mr. M. R. Jenkins, G3EIM, 1193a High Road, Whetstone, N.20.

## Coventry Amateur Radio Society

"Gadget Night" on November 6 produced an array of apparatus for demonstration, ranging from a complete portable station downwards. Amongst the more notable items were the G3FAB version of the "Select-o-Ject" and a four-band aerial coupling unit designed by G2LU. Four new call-signs are expected shortly.

## Forfar Amateur Radio Club

Club officers for the year, elected at the A.G.M. in October, include President Mr. R. McFarlane, GM3EAK; Vice-President Mr. J. Clark, GM2HIK, and Secretary/Treasurer Mr. A. F. Ferguson.

## Lowestoft and Beccles Amateur Radio Club

A new club, which will meet alternatively at Lowestoft and Beccles on the first Wednesday of each month, has just been formed. G2AJU, the R.S.G.B. County Representative, spoke at the inaugural meeting on November 29. A programme including Slow Morse classes and lectures is now being arranged. The next meeting will be at Beccles on January 3; full details from the Secretary, Mr. B. Bacey Fisher, Home Farm, Ditchingham, Nr. Bungay, Suffolk.

## Midland Amateur Radio Society

A lecture entitled "Modern Transmitter Design" was delivered at a recent meeting by old-timer George Brown, G5BJ. Meetings are held at 6.30 p.m. on the third Tuesday in each month at the Imperial Hotel, Birmingham.

## Slade Radio Society

The Annual Dinner of the Slade Radio Society was held on November 10 at the Crown Inn, Broad Street, with over fifty members and friends present, and with Mr. W. E. Chilvers in the chair. The opportunity was taken to present the trophies to the winners of the various direction-finding tests held during the past season. The Harcourt Trophy was won by Mr. C. N. Smart, who was also the winner of the first National Direction-Finding Contest held recently under the auspices of the R.S.G.B. It is interesting to note that Mr. Smart was a competitor in the Slade Radio Society's first D.F. Test, held in 1928. The runners-up in the Harcourt Trophy Competition were Mr. J. A. Walley and Mr. N. B. Simmonds; the Novice Cup was presented to Mr. E. Walcott, who had also won a Special Class Certificate in the Harcourt Trophy Contest.

## Sutton and Cheam Radio Society

A novel entertainment designed to make the work of the radio amateur more widely known in the district was staged recently by the Society. Before an audience of 250 Amateur Radio was explained—and demonstrated—in lay terms. The show opened with a talk and an explanation of such items as QSL cards, of which many were displayed on the back



The Dorset Hamfest at the Antelope Hotel, Dorchester, on November 5, was the first event of its kind to be held in Dorset. The 25 members present came from all parts of the county. The Regional Representative, Mr. H. Bartlett (G5QA), spoke on current Society activities, and after lunch a visit was made to Dorchester Beam Station set amid a forest of Franklin and rhombic aerials. In this group photograph are (front row, left to right): G3GYK Junior, BR513968 (C.R. Devon), G5QA (R.R.), G5UF (C.R. Dorset), G3EFY (T.R. Exeter) and G2TZ (T.R. Dorchester).

cloth. This was followed by a live transmission with G2AYC/A working cross band duplex telephony to G3FRV/A; G3CDK acted as commentator and was also responsible for the script. Next came a practical demonstration of a tape recorder built by a Society member, Mr. W. Webber. Finally there was exhibited what the Sutton and Cheam Society claims to be the "smallest television receiver in the world" (any challengers?) constructed by 17-year-old Lawrence White. The complete chassis measures 10 in. x 4 in. x 6½ in. high, giving a remarkably clear picture 1½ in. wide. This set was seen in operation alongside a 12-in. TV receiver made by Mr. C. Owen.

## South Shields Amateur Radio Club

The Club, which has recently been reorganised, now holds meetings every Friday evening (8 p.m.) at Trinity House, South Shields. In addition the club transmitter, G3DDI, is operated on most evenings, while lectures for junior members are given on Wednesdays by the Chairman, G4WG. Full details from: Mr. W. Dennell, G3ATA, 12 South Frederick Street, South Shields.

## Watford Radio Television Society

Features of the twice-monthly meetings of the Society include lectures on "Radio Fundamentals," "The Elements of Television," and Morse Classes. The A.G.M. will take place on February 6.

## Worthing Amateur Radio Club

A dinner at the Norfolk Hotel was held on November 23 to mark the departure from the district of G4JH of Lancing. Normal meetings are held on the second Monday in each month at the Adult Education Centre, Worthing.

## LONDON MEETINGS, 1950/51

All meetings are held at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2.

Friday, Dec. 29, 1950. ANNUAL GENERAL MEETING.

Friday, Jan. 26, 1951. D. N. Corfield, D.L.C. (Hons.), A.M.I.E.E. (G5CD).

"EQUIPMENT FOR THE 420 Mc/s. BAND."

Friday, Feb. 23, 1951. H. A. M. Clark, B.Sc. (Eng.), A.M.I.E.E. (G6OT).

"POST-WAR DEVELOPMENTS IN TELEVISION."

Friday, March 30, 1951. R. H. Hammons (G2IG).

"HIGH SELECTIVITY 'PHONE RECEPTION'."

Friday, April 27, 1951. A. O. Milne (G2MI).

"LOW POWER PORTABLE EQUIPMENT."

All Meetings commence at 6.30 p.m. Tea will be served from 5.30 p.m.

Readers are reminded that the meetings listed are open to all members of the Society.



[Photo: Courtesy, "Croydon Times."]

At the demonstration of Amateur Radio given by the Sutton and Cheam Society to an audience of 250. Left to right: The President (G2AYC); L. White holding his midjet TV receiver; G3CDK—the commentator—and (kneeling) C. Owen with his TV receiver.

# AFFILIATED SOCIETIES

THE FOLLOWING SOCIETIES AND CLUBS WERE AFFILIATED TO THE RADIO SOCIETY OF GREAT BRITAIN AS AT DECEMBER 1, 1950. ERRORS OR OMISSIONS SHOULD BE COMMUNICATED WITHOUT DELAY TO THE GENERAL SECRETARY, R.S.G.B., NEW RUSKIN HOUSE, LITTLE RUSSELL STREET, LONDON, W.C.1.

- ABERDEEN AMATEUR RADIO SOCIETY**, c/o Mr. G. M. Jamieson, 66 Elmfield Avenue, Aberdeen.
- ADMIRALTY ELECTRONICS SOCIETY**, c/o Mr. D. Houston, D.E.E. Dept., Admiralty, Bath, Somerset.
- AMATEUR RADIO CLUB**, c/o Hon. Secretary, H.M.S. Mercury, East, Meon, Petersfield, Hants.
- AMATEUR RADIO CLUB OF INDIA**, c/o Lieut. B. S. Paintal, Mhow, Central India.
- ASHTON-UNDER-LYNE AMATEUR RADIO SOCIETY**, c/o Mr. N. H. Brown, 13 Corporation Road, Audenshaw, Nr. Manchester, Lancs.
- A.S.T. AMATEUR RADIO SOCIETY**, c/o Mr. J. N. Tracey, Air Service Training Mess, Hamble, Southampton, Hants.
- AUSTIN RADIO & TELEVISION SOCIETY**, c/o Mr. R. D. Dixon, Longbridge Works, Birmingham 31.
- AYLESBURY & DISTRICT RADIO SOCIETY**, c/o Mr. J. G. Penrice, 31 Prebendal Avenue, Aylesbury, Bucks.
- BABCOCK & WILCOX STAFF ASSOCIATION RADIO SOCIETY**, c/o Mr. L. E. J. Manders, Babcock House, Farrington Street, London, E.C.4.
- BARNET & DISTRICT RADIO CLUB**, c/o Mr. C. J. Spencer, Hopedene, The Avenue, Barnet, Herts.
- BOURNEMOUTH RADIO & TELEVISION SOCIETY**, c/o Mr. F. G. Hamshire, 99 Elmes Road, Winton, Bournemouth, Hants.
- BRADFORD AMATEUR RADIO SOCIETY**, c/o Mr. V. W. Sower, Rushwood, Grange Park Drive, Bingley, Yorks.
- BRENTWOOD & DISTRICT AMATEUR RADIO SOCIETY**, c/o Mr. J. F. Moseley, 45 Geoffrey Avenue, Harold Park, Romford, Essex.
- BRIGHTON & DISTRICT RADIO CLUB**, c/o Mr. L. Hobden, 17 Hartington Road, Brighton, Sussex.
- B.T.H. (COVENTRY) SOCIAL & ATHLETIC CLUB (RADIO & TELEVISION SECTION)**, c/o Mr. R. G. Holl, 76 Humber Road, Stoke, Coventry.
- CATERICK AMATEUR RADIO CLUB**, c/o 22155806 L/Cpl. J. Phelps, Loos Lines, Caterick Camp, Yorks.
- CHELTHAM AMATEUR RADIO SOCIETY**, c/o Mr. F. W. Humphries, 136 Whaddon Road, Cheltenham, Glos.
- CHESTER & DISTRICT AMATEUR RADIO SOCIETY**, c/o Mr. W. G. Lloyd, 124 Tarvin Road, Chester.
- CITY & GUILDS RADIO SOCIETY**, c/o Mr. F. H. Steele, Radio Society, City and Guilds College, London, S.W.7.
- CITY OF BELFAST Y.M.C.A. RADIO CLUB**, c/o Mr. S. H. Foster, 29 Dunluce Avenue, Belfast, N. Ireland.
- COURTAULDS AMATEUR RADIO GROUP**, c/o Mr. W. P. Stevens, Courtaulds Ltd., Foleshill Road, Coventry.
- COVENTRY AMATEUR RADIO SOCIETY**, c/o Mr. K. Lines, 142 Shorncliffe Road, Coventry.
- DERBY & DISTRICT AMATEUR RADIO SOCIETY**, c/o Mr. F. C. Ward, 5 Uplands Avenue, Littleover, Derby.
- DORKING & DISTRICT RADIO SOCIETY**, c/o Mr. C. J. Greenwell, 7 Sondes Place Drive, Dorking, Surrey.
- DUNFERMLINE RADIO SOCIETY**, c/o Mr. D. Leah, 14 Hillwood Terrace, Rosyth.
- EAST SURREY RADIO CLUB**, c/o Mr. M. L. Knight, Radiohome, Madeira Walk, Reigate, Surrey.
- ECCLES & DISTRICT RADIO SOCIETY**, c/o Mr. E. Rayson, 11 Hartington Road, Winton, Eccles.
- EDGWARE & DISTRICT RADIO SOCIETY**, c/o Mr. R. H. Newland, 3 Albany Court, Montrose Avenue, Edgware, Middlesex.
- ELECTRONIC & AMATEUR RADIO SOCIETY**, c/o Mr. R. W. Scarr, Queen Mary College, Mile End Road, London, E.1.
- FORFAR & DISTRICT AMATEUR RADIO CLUB**, c/o Mr. A. Ferguson, 3 Osnaug Street, Forfar.
- GARATS HAY RADIO CLUB**, c/o Cpl. A. Hudson, Garats Hay, Woodhouse, Nr. Loughborough, Leics.
- GRAFTON RADIO SOCIETY**, c/o Mr. W. H. C. Jennings, Grafton L.C.C. School, Eburne Rd., Holloway, London, N.7.
- GRAVESEND AMATEUR RADIO SOCIETY**, c/o Mr. R. E. Appleton, 23 Laurel Avenue, Gravesend, Kent.
- GRAYS & DISTRICT AMATEUR RADIO CLUB**, c/o Mr. C. Mundy, 68 Chestnut Avenue, Grays, Essex.
- HARLOW & DISTRICT RADIO SOCIETY**, c/o Mr. H. J. Wright, 137 Dunmoe Road, Bishops Stortford, Herts.
- HARROGATE & DISTRICT SHORT WAVE RADIO SOCIETY**, c/o Mr. F. Walker, 99 East Parade, Harrogate, Yorks.
- HARROW RADIO SOCIETY**, c/o Mr. S. C. Phillips, 131 Belmont Road, Harrow Weald, Middlesex.
- HAYLE & DISTRICT AMATEUR RADIO CLUB**, c/o Mr. N. G. Sanders, Endsleigh House, Carbis Bay, St. Ives, Cornwall.
- H.M.S. "GANGES" AMATEUR RADIO CLUB**, c/o Inst./Lieut. K. Harper, Wardroom Mess, H.M.S. "Ganges," Shotley, Nr. Ipswich, Suffolk.
- HOUNSLOW & DISTRICT RADIO SOCIETY**, c/o Mr. A. H. Pottle, 11 Abinger Gardens, Isleworth, Middlesex.
- ILFORD & DISTRICT RADIO SOCIETY**, c/o Mr. C. E. Largent, 44 Trelawney Road, Barking, Ilford, Essex.
- ISLE OF MAN AMATEUR RADIO SOCIETY**, c/o Mr. H. Grist, Broadway House, Broadway, Douglas, Isle of Man.
- KINGSTON & DISTRICT AMATEUR RADIO SOCIETY**, c/o Mr. R. S. Babbs, 28 Grove Lane, Kingston, Surrey.
- KYNOCHE RADIO & TELEVISION SOCIETY**, c/o Mr. G. Nicholls, Work Study Dept., I.C.I. Ltd., Metals Division, Elliott Works, Selly Oak, Birmingham 29.
- LEICESTER HAM RADIO SOCIETY**, c/o Mr. S. D. Hoff, 51 Gwencole Crescent, Braunstone, Leicester.
- LUTON & DISTRICT RADIO SOCIETY**, c/o Mr. E. Radford, 37 Wilden Avenue, Luton, Beds.
- MALVERN & DISTRICT RADIO SOCIETY**, c/o Mr. G. V. Nash, Piers Plowman Club, Malvern, Worcs.
- MANCHESTER & DISTRICT RADIO SOCIETY**, c/o Mr. H. Marshall, 14 Greenway Close, Sale, Manchester.
- MANSFIELD DISTRICT RADIO SOCIETY**, c/o Mr. T. S. White, West View, Litton Avenue, Skegby, Nr. Mansfield.
- MERSEYSIDE WIRELESS TRANSMITTING AMATEUR SOCIETY**, c/o Mr. S. E. Orr, 2 Argyle Road, Anfield, Liverpool 4, Lancs.
- MIDLAND AMATEUR RADIO SOCIETY**, c/o Mr. H. B. Bligh, 52 Norman Road, Birmingham 31.
- MONTROSE RADIO CLUB**, c/o Miss J. Steers, 182 High Street, Montrose, Angus, Scotland.
- MURPHY RADIO SPORTS CLUB**, c/o Mr. A. L. Parsons, Murphy Radio Ltd., Broadwater Rd., Welwyn Garden City, Herts.
- NORTH EAST AMATEUR TRANSMITTING SOCIETY**, c/o Mr. A. Charrett, 56 Lovaine Place, Newcastle-on-Tyne 2.
- NORTHAMPTON SHORT WAVE RADIO CLUB**, c/o Mr. V. R. Hartopp, 22 Purser Road, Northampton.
- NORTH KENT RADIO SOCIETY**, c/o Mr. L. E. J. Clinch, 8 Windsor Road, Bexleyheath, Kent.
- OXFORD & DISTRICT AMATEUR RADIO SOCIETY**, c/o Mr. J. Hickling, 47 Banbury Road, Oxford.
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- PYE SHORT WAVE RADIO SOCIETY**, c/o Mr. J. Parish, Radio Works, St. Andrews Road, Cambridge.
- QUEENSBIDGE RADIO CLUB**, c/o Mr. R. H. Lamb, Queensbridge Secondary School, London, E.8.
- RADIO SOCIETY OF N. IRELAND**, c/o Mr. J. Milliken, Fortfield, Upper Dunmurry, Belfast.
- RADIO SOCIETY OF S.E. LONDON TECHNICAL COLLEGE**, c/o Mr. W. Taylor, Technical Institute, Lewisham High Road, London, S.E.4.
- R.A.E. & FARNBOROUGH RADIO SOCIETY**, c/o Mr. J. St. C. T. Ruddock, 80 Byworth Estate, Farnham, Surrey.
- READING RADIO SOCIETY**, c/o Mr. L. Hensford, 30 Boston Avenue, Reading, Berks.
- R.E.U. AMATEUR TRANSMITTING SOCIETY**, c/o 2430633 A.C. Robinson, P.J. Test Section, "T" Division, R.E.U., R.A.F., Henlow, Beds.
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- S.R.D.E. AMATEUR RADIO SOCIETY**, c/o Capt. J. Singleton, Ministry of Supply Signals Research & Development Establishment, Somerford, Christchurch, Hants.
- STOKE-ON-TRENT AMATEUR RADIO SOCIETY**, c/o Mr. J. Brindley, Elston, Albany Rd., Hartshill, Stoke-on-Trent, Staffs.
- STOURBRIDGE DISTRICT RADIO SOCIETY**, c/o Mr. W. Higgins, 28 Kingsley Rd., Kingswinford, Nr. Brierley Hill, Staffs.

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**SURREY RADIO CONTACT CLUB**, c/o Mr. S. A. Morley, 22 Old Farleigh Road, Selsdon, S. Croydon, Surrey.

**SUTTON & CHEAM RADIO SOCIETY**, c/o Mr. R. I. Clews, 1 Hurstcourt Road, Sutton, Surrey.

**THAMES VALLEY AMATEUR RADIO TRANSMITTERS' SOCIETY**, c/o Mr. K. A. Rogers, 21 Links Road, Epsom, Surrey.

**TORBAY AMATEUR RADIO SOCIETY**, c/o Mr. K. J. Grimes, 3 Clarendon Park, Tor Vale, Torquay.

**WALSALL & DISTRICT AMATEUR RADIO SOCIETY**, c/o Mr. L. G. Barlow, 15 Kinnerley St., Walsall, Staffs.

**WANSTEAD & WOODFORD RADIO SOCIETY**, c/o Mr. R. J. C. Broadbent, Wanstead House, The Green, Wanstead, London, E.11.

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**WEST SOMERSET RADIO SOCIETY**, c/o Mr. T. C. Bryant, 16 The Parks, Minehead, Somerset.

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**No. 32 MAINTENANCE UNIT'S AMATEUR RADIO SOCIETY**, c/o Mr. J. E. Smith, West Camp, R.A.F., St. Athan, Barry, Glam., S. Wales.

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**MALTA AMATEUR RADIO SOCIETY**, c/o Mr. F. Hague, Edelweiss, Ramel Buildings, Isouard Street, Sliema, Malta.

**MONTREAL AMATEUR RADIO CLUB**, c/o Mr. S. Chapman, 4711 Earncliffe Avenue, Montreal 28, Canada.

**NEWFOUNDLAND AMATEUR RADIO ASSOCIATION**, P.O. Box 660, St. Johns, Newfoundland.

**NEW ZEALAND ASSOCIATION OF RADIO TRANSMITTERS**, P.O. Box 489, Wellington.

**NORTHERN RHODESIA AMATEUR RADIO SOCIETY**, P.O. Box 95, Kitwe, N. Rhodesia.

**RADIO SOCIETY OF EAST AFRICA**, P.O. Box 1313, Nairobi, Kenya Colony.

**SOUTH AFRICAN RADIO LEAGUE**, P.O. Box 3911, Cape Town, South Africa.

**WIRELESS INSTITUTE OF AUSTRALIA**, P.O. Box 2666 W., G.P.O., Melbourne.

## Ten Minute Quiz

Answers to the questions set on page 228.

- 70 per cent.
- A box enclosing the back of a loud-speaker and lined with a sound absorbing material. It prevents distortion caused by the reflection of soundwaves back to the speaker.
- Because an insulating material is often used to pack the joints.
- (a) A good conductor such as copper; (b) a magnetic material.
- To broaden their frequency response.
- The National Physical Laboratory has now established that radio waves travel at 186,282 m.p.s. and not 186,271 m.p.s. as formerly believed.
- By dividing the watts output by the square of the signal voltage applied to the grid-cathode circuit.
- His card of identity which should be produced on request.
- 26.96-27.28 Mc/s. and 464-465 Mc/s.
- 10,000 Mc/s. and 10,500 Mc/s.

## Slow Morse Transmissions

Regular slow Morse transmissions have proved of considerable benefit to many aspiring amateurs, but more volunteers are still required for districts not already covered and to allow a temporary respite to those who have given their services for several years.

Stations listed who find themselves unable to continue transmissions should immediately notify the organiser, Mr. C. H. Lamborn Edwards, A.M.I.E.E. (G8TL), 10 Chepstow Crescent, Newbury Park, Ilford, Essex.

G.M.T.	Call	kc/s.	Town
<b>Sundays</b>			
09.30	G6NA	1750	Guildford
10.00	G6MH	1990	Southend-on-Sea
10.00	G5XB	1950	Reading
10.00	G3AEZ	1847	Dorking
11.00	GM3AVA	1860	Falkirk
12.00	G3CWW	1730	Hendon, N.W.4
20.00	G3FPS	1870	East Molesey
21.00	G2FIX	1812	Nr. Salisbury
22.00	G2FXA	1900	Stockton-on-Tees
<b>Mondays</b>			
13.00	G3AXN	1870	Southend-on-Sea
19.00	G3NC	1825	Swindon
19.30	G3AIX	1760	Birmingham
19.30	G3ESP	1850	Wakefield, Yorks
19.30	G3GYW	1922	Westcliff-on-Sea
20.00	G2AJU	1900	Stutton, Ipswich
20.00	G3DSR	1750	Derby
20.00	G2CLD	1775	Tunbridge Wells
21.00	G3BLN	1900	Bournemouth
21.00	G3BHS	1820	Eastleigh, Hants
22.00	G8TL	1896	Ilford
22.00	GM4MF	1860	Falkirk
22.00	G3AEZ	1847	Dorking
<b>Tuesdays</b>			
13.00	G3AXN	1870	Southend-on-Sea
19.00	G5XB	1905	Reading
19.30	G2AVK	1850	Osssett, Yorks
19.30	G2CPL	1900	Lowestoft
20.00	G2HLT	1900	Belfast
21.00	G3EFA	1855	Southport
22.00	G3ELG	1772	Rotherham
22.00	G2FXA	1900	Stockton-on-Tees
22.30	G6JB	1820	Salcombe, Devon
<b>Wednesdays</b>			
18.45	G3CQL	1990	Leigh-on-Sea
20.00	G2NY	1850	Preston
20.00	G3AFD	1783	Southampton
22.00	G6NA	1840	Guildford
22.00	G3DLC	1800	Grays, Essex
22.00	GM4JQ	1860	Falkirk
<b>Thursdays</b>			
18.00	G3AXN	1870	Southend-on-Sea
19.00	G3NC	1825	Swindon
19.30	G2AQN	1850	Osssett, Yorks
19.30	G3BUJ	1990	Southend-on-Sea
20.00	G3NT	1805	Northallerton
21.30	G6DL	1760	Birmingham
22.00	G2FXA	1900	Stockton-on-Tees
22.00	G3ARU	1990	Wanstead, E.12
22.00	G3AEZ	1847	Dorking
22.30	G3OB	1803	Manchester
<b>Fridays</b>			
13.00	G3AXN	1870	Southend-on-Sea
19.00	G3BLN	1900	Bournemouth
19.30	G3DMP	1850	Wakefield, Yorks
19.30	G2CPL	1900	Lowestoft
20.00	G2AJU	1900	Stutton, Ipswich
20.00	G2AMV	1870	Wirral
21.00	G3BHS	1820	Eastleigh, Hants
22.30	G6JB	1820	Salcombe, Devon
<b>Saturdays</b>			
22.00	GM3OM	1860	Falkirk
23.00	G2FXA	1900	Stockton-on-Tees

## OTHER AMATEURS ARE ASKED TO AVOID CAUSING INTERFERENCE TO THESE TRANSMISSIONS

### In the Family

John Bazley, G2BOZ, has had to take a back seat recently, for his two sons are now G3HCT and G3HDA. One of them already has 57 countries to the credit of his 18 watts. John wants to know how does one operate three transmitters simultaneously on the same band with the same aerial?



## -if yours is a (rare) VALVE PROBLEM

take for instance EF9... we always have a few of most critical types. But send us all your requirements and—order C.O.D.

Lists are **FREE**—**OBsolete**: DK1, DAC1, DF1, DL2, can now be replaced with equivalent valves and ready-to-plug-in adaptors.

**HOW TO REPLACE DIFFICULT VALVE TYPES**: 6B3, 6F5, 6N6, 6P8, 6U5/6C5, 12A7, 12F5, 12Z3, 15D1, 25A7, 32L7, 36, 39/44, 41, 45, 47, 50L6, 70L7, 84/624, etc. We can help you here, too. H1VAC, XSC, XW, XH, XD, XL, XLO, XP, XY and holders. Please inquire for any valve. We are fully stocked and well assorted. Lists sent.

**"DEMObBED VALVES"**: Service valves and their commercial equivalents, 2/8, post free. **BOOKS** on every aspect of Radio in stock. We shall be pleased to send special list. Valve equivalent charts with quick reference. Index, 2/8, post free.

**EX-W.D. CHASSIS** with brand new valves 1R5, 1S4, 1S5, 1T4 and circuit diagram, showing how this can be converted to a very **32/6** excellent personal portable. Post 1/-.

**SERVICE SHEETS**: The one you require on **FREE** loan if you buy one dozen **10/6** assorted at.

**EASY TERMS** up to 10 months—and very near Cash Price on all TAYLOR meters. Catalogue **FREE**.

Taylor 240A Pattern Gen.  
30A Oscilloscope  
47 AS Valve Tester  
55A Wobulator  
65C W.R. Sig. Gen.  
70A Multi-Range Meter  
70B Multi-Range Meter  
75A Multi-Range Meter  
85AP Multi-range Meter  
110B Bridge  
170A Electronic Test  
Meter and the complete Range.

## THE Q-MAX CHASSIS PUNCH

3" 3" 7"	1" 1 1/2" 1 1/2"	1 1/2" 2 1/2" 1" Sq.
9/6 ea. 10/6	12/6 ea.	15/- 25/- 19/6
Key 9d.	Key 1/-	Key 1/-



**Smallest (and Best)  
CRYSTAL Radio Set**  
Only **17/9**  
"Crystal Set Construction"  
for 9 models. Only 1/3

## AMERICAN LOW-PRICED

### Electric PAINT SPRAYER

Just Plug In and Spray  
Complete unit, no extras to buy. Works off any 200-250 V. (A.C. only) light socket or plug point. Easier than a brush and 3 times as quick. **75/-**  
Extra nozzle discs supplied free.

### PIFICO ALL-IN-ONE RADIOMETER

A.C. and D.C.  
Plus 1/- postage **25/-**  
Kindly mark envelope (Ra So)



**RADIO BULLS VALVES**  
246 HIGH ST. HARLES DEN NW10

**PARMEKO SMOOTHING CHOKES**: 10 H. 650 mA. Brand new in original wooden case. £1 carriage paid per goods. 22/6 per passenger rail.

**V.H.F. CRYSTALS**: 20 Mc/s.-27.4 Mc/s. in 100 kc/s. steps, cur choice 4 for 10/-, post paid. 100 kc/s. **CRYSTAL**, complete with holder, 10/- carr. paid.

**MICROAMMETERS**: Centre zero 500-0-500  $\mu$ A. 3 1/2" scale. 4 1/2" overall, flush mounting resistance 100 ohms. Easily modified to read 0-1 mA. 12/6, post paid.

**TEST SET TYPE 105/ACR19** for SCR522 transmitter complete with 0-1 mA. meter, leads and instructions for use. Brand new. 15/-, post paid.

**POWER UNITS TYPE 247**: Input 230 V. 50 c/s. Output 500 V. 250 mA., fully smoothed with choke and two 4  $\mu$ F. condensers, also 6.3 V. 3 A. Brand new in original packing case. 57/6, carriage paid.

**TRANSFORMER-RECTIFIER** to supply 24 V. 1 A., 19/6 post paid.

**THERMO-COUPLE AMMETERS**: 0-5 A. 2" square flush mounting. New and boxed. 2/6 each, post paid. 6 for 12/6, post paid.

**FILAMENT TRANSFORMERS**: 230 V. 50 c/s. input. Output 6.3 V. 3 A. 3,000 V. test. 12/6, post paid.

**FILAMENT TRANSFORMERS**: Input 190-210-230-250 V. 50 c/s. Outputs: 5-0-5 V. 3.25 A. and 5-0-5 V. 3.25 A. Fully shrouded with terminal panel. 13/6, post paid.

**TUNING UNITS**: Range 6020-9050 kc/s. Less outer case, 10/-, carriage paid.

**PARMEKO MAINS TRANSFORMER**: 230 V. 50 c/s. input. Output 620-550-375-0-375-550-620 V. 5 V. 3 A. and 5 V. 3 A. The 375 V. winding is for 250 mA., and the 550 or 620 V. winding for 200 mA. The 375 V. winding and 550 or 620 V. winding may be used simultaneously. If the 375 V. winding is used alone it is capable of delivering 450 mA. Brand new, 39/6, carriage paid.

**PARMEKO MAINS TRANSFORMER**: Input 115-230 V. 50 c/s., 80 V. 2000 c/s. or 180 V. 500 c/s. Output 350-0-350 V. 100 mA., 5 A. and 6.3 V. 6 A. New in original wooden packing case, 27/6, carriage paid.

## A. FANTHORPE

6/8 HEPWORTH'S ARCADE, HULL. Telephone 35694

## A.C.S. RADIO

### COMPONENTS & ACCESSORIES

**RIBBON Feeder**, 300 ohm ..... 9d. yard

**TWIN Feeder**, 80 ohm ..... 8d. yard

**SCREENED Twin Feeder**, 80 ohm ..... 1/3 yard

**CO-AXIAL Feeder**, 80 ohm ..... 1/3 yard

**7/22 Copper**, 100ft. 7/9; 50ft., .. 4/-

**PAXOLIN Coil Former Tubing**, 3/4" & 1" diam. .... 1/- per ft.

**MAGNETIC Recording Tape**, Emitape 65, Reels 1,200 ft. .... 25/-

**MICROPHONES**, D104 with handle .. £6

**ECHOPHONE AC/DC Communications Receiver**, 10-550 metres, Bandspread, B.F.O., noise limiter, good condition ..... £9 10s. 0d.

**EXTENSION SPEAKERS**, Stentorian Bude X, with volume control ..... 35/6

**LABCEAR Viewing Units** at half-price, 3" tube, power supply, in attractive black crackle case ..... £8 10s. 0d.

**H.R.O.—MX receiver**, 9 coils, A.C. power pack, speaker in matching cabinet, new condition ..... £45 10s. 0d.

Please add postage on orders under 20/-.

## A.C.S. RADIO

### 44 WIDMORE RD BROMLEY, KENT

'Phone RAVensbourne 0156

# SURPLUS BARGAINS!

**POWER UNIT, 5441B.**—With separate individually controlled H.T. and filament transformers, these provide 300 V. at 200 mA. D.C., 12 V. at 3 A. A.C. and 5 V. D.C. for bias purposes. In attractive grey crackle cases, measuring 14" x 7" x 7½", they are fully fused, and complete with red and green indicator lights. NEW AND BOXED. **65/-**  
Soiled, **50/-**.

**PHOTO-CELL MULTIPLIERS.**—Containing a 931A photo-cell, which provides a stage gain of 1,000,000 and is equivalent to 27M1 (Mazda), these are complete with bleeder network and a 3-valve amplifier (two 6AC7s, one 6AG7), and will find a variety of uses for facsimile, photo-electric measurements, burglar alarms, and for the now permitted Amateur TV! Supplied with full cell data. **30/-**

**RECEIVER, TYPE P40.**—These units, which cover from 85-95 Mc/s., with an I.F. of 2.9 Mc/s., utilise a crystal controlled oscillator (with subsequent frequency multiplication), and may be easily converted for "2." Complete with four EF54s, one EC52, two EF39s, one BE34, one 6J5 and one 6V6. Very rigidly constructed, they are housed in a ventilated case, measuring 11½" x 5½" x 4½". In Sealed MAKER'S CARTONS. Only **65/-**  
Slightly store soiled, **39/6**

**ADMIRALTY A.P.W. 8345 STRIP.**—A 60 Mc/s. I.F. strip which may be used for Sutton Coldfield TV, containing six EF50s & three EA50s. **49/6**

**RECEIVER 25.**—With six mains operated valves, this is one of the best known units for conversion into a receiver. Complete with circuit. **19/6**

**INDICATOR UNIT 198.**—With 3" VCR 138A Tube and eight useful valves, this may be converted into an oscilloscope, modulation indicator, etc., and is one of the greatest bargains ever offered. In sealed MAKER'S CARTONS **40/-**

**VIBRATOR PACK 21.**—Providing approx. 150 V. at 40 mA., from 6 V. input, these are designed to supply the Trans./Rec. 21. The case measures 10" x 8½" x 2½". **15/6**

**RECEIVER 21.**—Covering 4.2-7.5 and 18-31 Mc/s., and complete with nine battery operated valves, BFO, noise Limiter, etc., these may have slightly damaged switch spindles (NOT wafers), but are supplied complete with a Vibrator Pack 21. **37/6**  
ONLY

**AMPLIFIER 1135A.**—A twin input unit complete with EBC33, EK32, and EL32, which is suitable for modifying into a small Modulator. Our circuit with 10-min. conversion data, 1/3. **15/-**

**CONTROL BOX 214.**—In sealed maker's cartons, and complete with three EF50s, two EB34s, one D1, 39 resistors, 17 condensers, 8 pots, Yaxley switch, toggle switches, etc. **19/6**

**TRANSMITTER 21.**—Complete with front panel of the set, and the control box, these are the remainder of the Trans./Rec. 21, requiring only the receiver and vibrator pack. The PA coils and change-over relays have, however, been removed by the Ministry of Supply. Replacement of these should present no difficulties. COMPLETE WITH VALVES **25/-**  
AND CIRCUIT. In first-class condition.

**RADIO EXCHANGE CO.,**  
**14 ST. MARY'S STREET, BEDFORD**

Phone 5568



## GARDNERS RADIO Ltd

will be pleased to send you a complimentary copy of their NEW 28-PAGE BROCHURE.

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### "SOMERFORD" MAINS TRANSFORMERS

including the new types  
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## BRAND NEW EX-GOVT. VALVES!

The following valves are Brand New and in the Original Cartons:  
6J5GT, 3/9; 2C26, 2X2, 6C5, 6N7GT, 4/9; 6J5, 6SK7, 6SK7GT, 5/3; 6AC7, 5/6; 6K7, 6K7G, 6K7GT, 5/9; 6B8, 6/-; 5Z4, 807, 6/3; 5U4G, 6/6; 6Q7GT, 6C4, 6P6G, 6/9; 25L6GT, 7/3; 6J6, 10/-.

The following are new, but in plain cartons or unboxed:  
EB34, 2/-; 12SH7, 3/6; 2C26, 2X2, 6C5, 4/3; 6SK7, 6SK7GT, 4/9; 6AC7, 6B8, 6SL7GT, 12SJ7, RL18 (EC53), 5/-; 5R4GY, 3/4; 5/9; 6J7, 6/-; 6C4, 6V6G, 6V6G, 6P6G, 6/3; 7V7, 6V6, 6TW61, 6/6; 6J6, 7/9; 6NO110, 8/-.  
100 well-sorted RESISTORS for 10/-, 6, 8 & 12-way JONES PLUGS, 6d. a pair.

**SMOOTHING CHOKES.** 15 H. 60 mA. 320 ohms "Potted" type, 4/6 plus 9d. postage. 20 H. 80 mA. 250 ohms, 6/6 each plus 9d. postage.

2,000-Volt Test 6 μF CONDENSERS, 3/6 each.

## REED & FORD

278 PORTLAND STREET, SOUTHPORT

## — ROCK RADIO (G3LN) —

**PROP. PITCH MOTORS.**—New, U.S.A. type, will turn any mast or beam 6-30 V. 3-6 A., reversible, 10,000 to 1 reduction gearing. A.C., £2 2s. 6d.; D.C., £1 17s. 6d., carriage 5/-.

**VALVES.**—807, 6/-; 6X5, 5/3; 6J5, 3/3; EA50, 2/-.  
**DURAL TUBE.**—1" x 16 S.W.G., 8d. ft.; ¾" x 16, 7d.; ½" x 20, 4d.; ¼" x 18, 3d. Small stocks, please state alternatives, carriage extra.

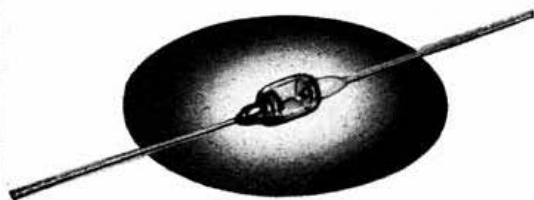
**AR88D.**—As new, with manual, callers only. £45.  
**BC312.**—As new, with crystal gate, £17. Another, as new, no crystal gate, £16 (both callers only).

**CHOKES.**—Midget 5H., 2/-; swinging 3.6/4.2H. 150 mA., 5/-.  
P.O. standard jack plugs, 4d.; large type 4-way plugs and sockets, 6d. pair.

**CERAMIC SWITCHES** for 150 watts, 3-bank 2-way, 5/-, or 3 for 12/6; 2-bank, 3/6, or 3 for 9/-.  
**COPPER WIRE.** 12 to 44 S.W.G., enam., D.S.C., Lewmex and Litz, see previous advertisements.

**1154 TRANSMITTER.**—3-band, new in crate, £4 10s. 0d.

We stock EDDYSTONE—DENCO Components.  
**1801 PERSHORE ROAD, BIRMINGHAM, 30.** (Kin. 2797.)

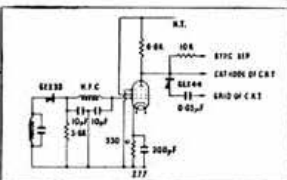
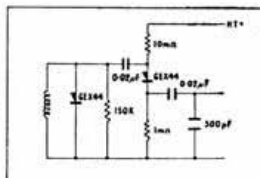


# G.E.C.

## Germanium diodes

have many advantages — electrical and physical, which make a substantial appeal to the professional radio engineer and the serious experimenter. Being so small they can be soldered directly into the part of the circuit where they are wanted and without any consideration of mounting methods or special holders. They require no heater power and therefore the danger of introducing hum does not exist, neither has screening to be considered. A minimum life of 10,000 hours means that they need not be

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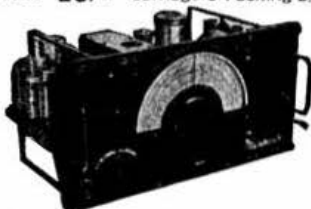
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