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Devoted to the Science and Advancement of Amateur Radio

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EDITOR: JOHN CLARRICOATS, O.B.E., J.P., G6CL
ASSISTANT EDITOR: JOHN A. ROUSE, G2AHL
EDITORIAL OFFICE: RADIO SOCIETY OF GREAT BRITAIN
28 LITTLE RUSSELL STREET, LONDON, W.C.1
Telephone: HOLborn 7373

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Current Comment

Technical Progress

IT has been said by no less an authority than David Sarnoff, Chairman of the Radio Corporation of America, that the dominant physical fact in the next quarter-century will be unprecedented technological progress. In voicing that opinion Mr. Sarnoff suggested that " the last hundred years have been no more than a split second in human history yet they have compassed more technological achievement than all the millenia that preceded."

The pages of this journal have on numerous occasions over the past 30 years, recorded the high-lights of technical progress in those fields of science in which we, as radio men, have a special interest. That is the reason—if a reason is necessary—why we devote a fair amount of space each year to such exhibitions as the one held last April at Grosvenor House, London. Sometimes that exhibition—now known as The Components Show—is called the Show of Frustration because for the radio amateur many of the latest developments are not immediately available to him. We would, however, remind those who feel a sense of frustration that even if the latest valves and components are for the moment denied us, the techniques which lead up to their development will eventually help us to obtain greater pleasure and enjoyment from our hobby.

The display of home-constructed equipment at the annual R.S.G.B. Exhibition in London provides an outstanding example of the way in which members have been able to apply new techniques to their specific problems. Equipment designed for single sideband and frequency modulation operation show how amateurs have been able to benefit from new techniques in the broader field of radio communication.

Within the pages of our last issue Frank Hicks-Arnold and Louis Varney, both Members of the Technical Committee and of the Governing Body passed on to the membership as a whole the benefits of their wide experience in the field of Amateur Radio. Mr. Hicks-Arnold's Antennamatch will enable those who use it properly to obtain superior results from their aerial systems. Its inclusion in a transmitter should go a long way to reduce interference to television. Mr. Varney's Speech Amplifier Clipper Filter Unit when used with The Elizabethan transmitter is aimed at helping the average amateur to operate his station on 'phone at any time of the day or night without interfering with television reception.

With the coming of commercial television a whole host of new technical problems may face the Amateur Radio movement in the United Kingdom but so long as we have such men as Hicks-Arnold and Varney available to give practical advice those problems will eventually be overcome.

On May 14 last the London U.H.F. Group—under the enthusiastic leadership of Mr. Phil Thorogood (G4KD)—held a most successful Convention, Exhibition and Dinner in London. A report of the day's events appeared in our last issue but no written account could hope to capture the spirit of friendship that prevailed. The high standard of workmanship shown by those who loaned equipment aroused much favourable comment. The presence at the dinner of Dr. R. L. Smith-Rose, C.B.E., Director of Radio Research, D.S.I.R. and an Honorary Member of the R.S.G.B. set the seal of official recognition on the activities of this go-ahead group of enthusiasts.

The enterprise of the group in publishing its *Proceedings* in booklet form is deserving of very high praise. The fact that so many of the leading u.h.f. exponents of the country have contributed material to the first issue augurs well for the future.

The enthusiasm of the London U.H.F. Group is matched by that of many R.A.E.N. groups up and down the country. At the Staffordshire County Meeting held in Lichfield a few weeks ago we were privileged to see examples of the equipment made by members of local R.A.E.N. groups. The appearance and workmanship were first class.

In the few short months that have passed since R.A.E.N. was inaugurated and the first Amateur Sound (Mobile) Licence was issued we have seen many important advances in the development of low-power portable equipment. The ingenuity shown by those concerned in the design and construction of low power transmitters and receivers for emergency or mobile work is on a par with that shown by many of those keen v.h.f. and u.h.f. exponents whose activities are recorded faithfully each month in this Journal.—J.C.

Intruders

THE continued presence in " exclusive " amateur bands of commercial and broadcast stations gives rise to grave misgivings in the minds of those who are responsible for protecting the interests of radio amateurs. We can but hope that the high level talks between Heads of States which are shortly to take place will eventually lead to a lessening of

(continued on page 32)

Crystal Controlled 27 Mc/s Transmitter for Model Control

By G. T. PECK (B.R.S.15402)*

In this article, the author describes what might well be called the radio man's approach to some of the problems involved in the radio control of models, one of the newest and most fascinating branches of the amateur use of electronics. Particular attention is drawn to the fact that a G.P.O. licence is required before radio control experiments may be carried out. The fee is £1 for five years.

LICENCES for the transmission of signals for the control of models permit operation in two bands—26.96 to 27.28 Mc/s and 464 to 465 Mc/s. The method of specifying the power to be employed allows a maximum effective radiated power (e.r.p.) of 1.5 watts in the h.f. band and 0.5 watt in the u.h.f. band, the e.r.p. being defined as the mean radio frequency power output multiplied by the gain of the aerial in a horizontal plane.

Of the two bands, the lower is used by the majority of model control enthusiasts because easily obtainable valves and components can be employed. Practical information on apparatus for these frequencies is readily available and many transmitters—almost all based on some form of self-excited oscillator—have been used for model control and several commercial equipments of a similar nature are obtainable. With careful adjustment and frequent checking with a calibrated wavemeter, some excellent results have been achieved, but in the absence of skilled knowledge and accurate measuring equipment a more positive method of frequency control seems desirable. The use of crystal control meets the stability requirements and offers additional advantages in the reduction and simplification of adjustments. When used in conjunction with a crystal controlled receiver, virtually all tuning controls can be eliminated.

The design of crystal controlled 28 Mc/s transmitters is well established and almost any circuit suitable for low power transmission on that frequency can be satisfactorily used in the 27 Mc/s model control band. For this particular purpose, however, it is necessary to rely on battery power to permit operation in a suitable stretch of clear water or (if an aeroplane model) in an open space of sufficient size.

Because of these considerations, it is very desirable to reduce the size and weight of the transmitter to a minimum but the battery should be of sufficient capacity to permit continuous operation for at least one hour. Economy in this direction is most important. To maintain an input of 5 watts to the p.a.—the input necessary if the maximum effective radiated power permitted is to be used—the total anode supply requirements for the p.a., oscillator and modulator, will approach 15 watts which, while far greater than can be economically obtained from dry batteries, can be readily supplied from a vibrator pack operated from a small accumulator which also enables valves with indirectly heated cathodes to be employed to great advantage.

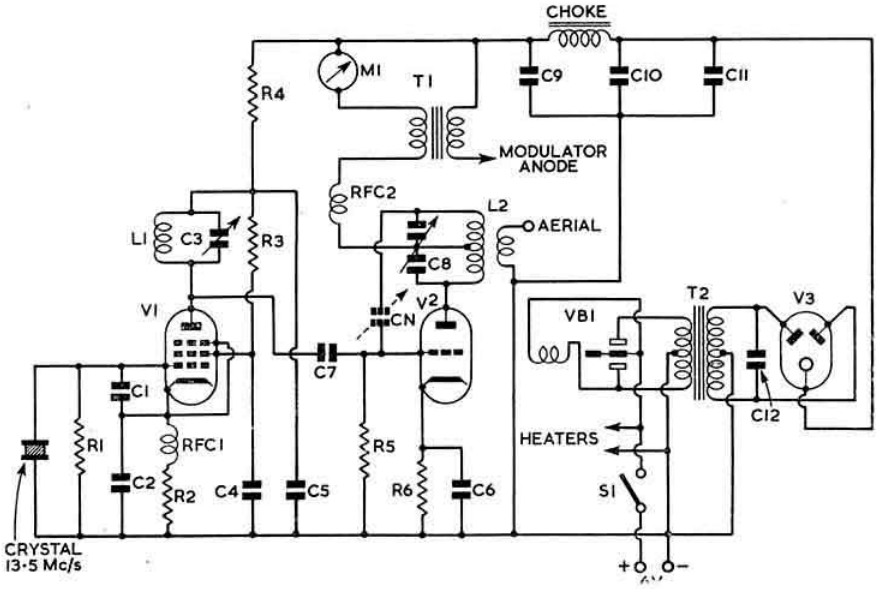


Fig. 1. Circuit diagram of the 27 Mc/s crystal controlled transmitter and its associated vibrator power supply. C1, 10 $\mu\mu$F; C2, 15 $\mu\mu$F; C3, 7, 50 $\mu\mu$F; C4, 5, 6, 0.1 μF; C7, 100 $\mu\mu$F; C8, 30+30 $\mu\mu$F split stator; C9, 10, 16 μF; C11, 0.001 μF mica; C12, 0.01 μF 1000 V wkg.; Choke, 3—10 H; CN, see text; L1, 6 turns; L2, 16 turns centre-tapped (both coils are 18 s.w.g. tinned copper, 1 in. diam., spaced diam. of wire); M1, 0-20 mA meter; R1, 3, 100,000 ohms; R2, 1,000 ohms; R4, 2,000 ohms; R5, 270,000 ohms; R6, 150 ohms; RFC1, 2, 1.5 mH; T1, modulation transformer (see text); T2, 6 V vibrator transformer; V1, 6V6; V2, 6C4; V3, OZ4; VB1, type NS6 vibrator.

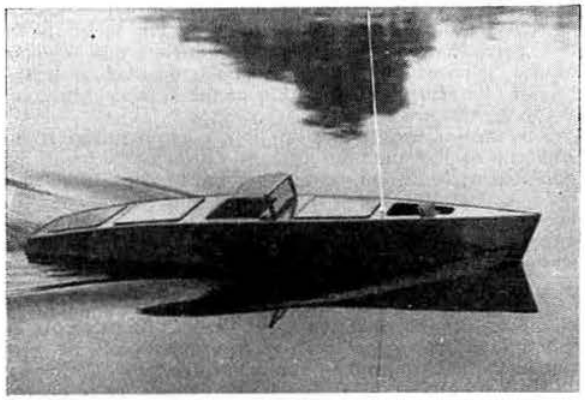
The Transmitter

In the equipment to be described a standard lead-acid 6 volt motorcycle battery is housed with the power pack and transmitter in a small wooden box which also provides a rigid base for the vertical quarter-wave aerial. The modulator obtains its power from the same source but is contained in a separate case and connected to the transmitter by a flexible cable so that each unit

*c/o Ernest Turner Electrical Instruments, Ltd., Chiltern Works, Totteridge Avenue, High Wycombe, Bucks.

may be positioned to the best advantage. In addition, as widely varying methods are attempted, corresponding alterations may be made in the modulator without affecting the r.f. and power supply circuits which usually remain almost unaltered.

In view of the importance of low battery consumption many possible combinations of crystal oscillator and p.a. arrangements were tried and compared on the basis of r.f. output for total battery drain. It was found that valves with low consumption heaters gave less output than was expected. More recent types with high mutual conductance and higher heater requirements did not show up to advantage until the limits of available h.t. voltage and current had been exceeded. The circuit eventually selected makes use of a 6C4 as a neutralised p.a. driven by a 6V6 as crystal oscillator doubling the crystal frequency of 13.5 Mc/s to a final frequency of 27 Mc/s. Miniature versions of the 6V6 such as the 6AQ5 and 6BW6 could be employed and would give similar performance. With the 230 volts h.t. available from the vibrator pack, the p.a. stage can be loaded to draw an anode current of 18 mA—an input of 4.14 watts. With carefully adjusted screen and grid voltages the crystal oscillator provides sufficient drive with a total anode



One of the model boats used with the equipment described in this article.

and screen current of only 12 mA. The modulator stages require 20 mA, giving a total of 50 mA. The total heater current is 1.05 A, making a total battery drain of 4 amps. With the addition of intermittent current requirements for the operation of relays associated with the control circuits, this permits continuous operation for just under two hours.

The circuit is shown in Fig. 1 and is quite straightforward. Only two items call for any comment. The modulation transformer used by the writer is a Wharfedale type GP8 multi-ratio output transformer which has four separate windings, two low and two high impedance. The latter are used in this application, the modulator being connected to terminals 1 and 3 and the p.a. to 4 and 6. Any other suitable small transformer could of course be used. The neutralizing condenser CN is an 8 $\mu\mu$F Philips concentric trimmer from which most of the adjustable element has been turned off to give a maximum capacity of about 4 $\mu\mu$F.

An extending quarter wave aerial is employed in conjunction with a metal plate on the underside of the wooden case to provide a capacity to earth. The length of the aerial is not critical and can be readily adjusted to load the 6C4. Optimum radiation is obtained with the aerial adjusted to a total length of 7ft 6in. Fairly loose coupling to the p.a. coil is satisfactory.

Modulation

It is not intended to make more than a passing reference in the present article to the many different methods of modulation which can be used to transmit orders to the controlled model, as a comprehensive survey of current techniques has already been published in the BULLETIN[1]. In general, apart from the interrupted carrier used by the most elementary systems, almost all control methods depend either on some form of interruption of the modulation or upon the simultaneous use of any or all of a number of different modulation frequencies. From time to time the writer has constructed modulators for various methods of control and although the possible combinations are too numerous to describe in detail some common features are perhaps worthy of mention.

The modulation frequencies are generated by low consumption filament-type valves in the resistance capacity oscillator circuit shown in Fig. 2, which will give an output of 20-30 volts of sine wave form with the modest h.t. consumption of 1 mA. The filaments were at first operated in series with suitable resistances from the 6 volt accumulator but as it was found impossible to remove completely the vibrator hash the filaments of the 1T4 audio frequency oscillators are arranged to be supplied from a separate dry cell brought into circuit by a 6 volt relay.

Different control methods may require either one or several different modulation frequencies simultaneously. A number of audio oscillators may therefore be used with different R/C constants to give the required audio frequencies. In each case a 1T4 buffer stage is used between the audio oscillator and the modulator to simplify tone switching and mixing and to avoid change of modulation frequency with changing loads. For the same reason, the h.t. supply to the audio oscillators should be stabilised.

Performance

With both the transmitting aerial and an 18 in. vertical receiving aerial at ground level it has been found possible to maintain positive control overland at a distance of $\frac{1}{4}$ mile. Increasing the length of the receiving aerial, and the height of either, very greatly increases the signal strength and the range.

For these tests, a miniaturized superhet receiver with a crystal controlled local oscillator (6AM6) was used, the crystal frequency being trebled and applied to the oscillator grid of a 6BE6. Only pre-set tuning adjust-

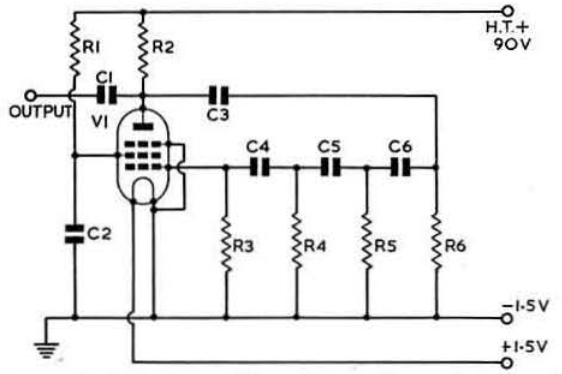


Fig. 2. Audio frequency R/C oscillator. The anode current is approximately 1 mA and the sine-wave output 45 volts. With the following component values, the frequency is 1,000 c/s. C1, 2, 0.1 μF; C3, 4, 5, 6, 200 $\mu\mu$F; R1, 3, 4, 5, 6, 1 Megohm; R2, 220,000 ohms; V1, 1T4.

ments are provided but the circuit is otherwise conventional. A.V.C. is applied to both frequency changer and i.f. stages. To obtain the necessary bandwidth to permit the use of higher modulation frequencies and to reduce oscillator pulling, an intermediate frequency of 1.6 Mc/s is employed. B7G valves with indirectly heated cathodes are used in most stages, as even with only 90 volts of h.t. the performance is very much better than can be obtained from filament-type valves; other difficulties arising from microphony and from ripple or pulses caused by operation from the common accumulator of propulsion motors and relays associated with the control are also reduced. A simple pentode limiter consisting of a 3S4 valve with very low screen voltage is included and materially reduces interference from switching surges. Another 3S4 is used as an output stage to permit monitoring headphones to be introduced without affecting the control circuits.

Considerable screening and generous decoupling of the oscillator and frequency changer was essential in order to avoid spurious responses and consequent loss of control resulting from swamping of the receiver when in close proximity to the transmitting aerial.

Results

In the design of this equipment emphasis was placed on consistency of performance with complete reliability. The increased complexity and weight has more than justified itself in these respects. For example, a 46 in. electrically propelled model launch can be controlled with complete certainty and without adjustment over distances from a few feet up to the visual limit for an object of this size. The biggest difficulty has proved to be fouling of the propellor and rudder by weeds or floating debris which cannot be distinguished at such distances.

Reference

"The Radio Control of Models." R.S.G.B. BULLETIN, May and June, 1950.

Society News

National Radio Show

NEXT month the Society will again be represented at the Earls Court National Radio Show. The Show will open on Wednesday, August 24, and will close on Saturday, September 3 (Sunday, August 28 excluded).

The Society's stand (No. 310) will be located in the gallery at a point directly above the Warwick Road entrance, reached easily by escalator from that entrance.

The stand will, it is hoped, feature closed circuit demonstrations of Amateur Television, using equipment loaned by Messrs. Ralph and Jeremy Royle, G2WJ. National Field Day and mobile equipment will also be displayed together with many other items of amateur built equipment.

The General Secretary will be glad to hear from members who are willing to undertake stand duty during the period of the Exhibition. Members who offer their services are asked to state the date (or dates) and period of the day (or days) they will be available. Because of the long duration of the Exhibition—a period of 11 days (including Pre-View day)—a great many volunteers are required.

Region 5 Representative

THE Council has accepted with regret the resignation of Mr. W. J. Ridley (G2AJF) of Chelmsford, Essex, from the office of Region 5 Representative. Mr. Ridley has gone to Canada on business and is expected to be out of the country for some time.

The Council wishes to place on record its thanks to Mr. Ridley for his valued services to the Society for, in addition to fulfilling the office of Regional Representative, he has been Chairman of the R.A.E.N. Committee almost from its inception.

Nominations for his successor in the office of Regional Representative should be made in writing and in prescribed form to reach the General Secretary by not later than August 31, 1955. Mr. Ridley's successor will hold office until the end of the current year.

Yugoslav Convention

COPIES of a brochure giving full details of the Yugoslav Amateur Radio Convention to be held in Zagreb from August 4 to 7, 1955, may be obtained by sending a 2½d stamp to Headquarters.

Amateur Radio Station at the Science Museum

AS a result of discussions which have taken place between representatives of the Society and officials of the Science Museum, it has been decided to establish an Amateur Radio Station at the Science Museum, South Kensington.

The station will be set up in a demonstration room adjacent to the Communications Galleries and will be operated each day by members of the Museum staff who hold Amateur Licences. It is hoped that the station will become a focal point for visiting amateurs and that in appropriate cases they will be permitted to operate the station.

The task of designing the station and the associated aerial systems will be undertaken by a small panel of members of the Society's Technical Committee. It is anticipated that some of the equipment will be presented to the Museum by manufacturers.

Mr. Gerald Garratt (G5CS), Deputy Keeper in charge of the Communications Department, who has been prominent in the initial negotiations, will be responsible for the station but the operation will largely be in the hands of Mr. G. Voller (G3JUL, ex-YI2AM) who joined the staff of the Museum some months ago and is now the Assistant in the Communications Department.

It is intended that the station will be a model of first-class design and operation and that, local QRM permitting, it will establish a world-wide reputation for efficient operation. The main purpose of the station will be to demonstrate the technique and practical operation of a radio communication station and by showing some of the interest and fascination of DX working to a wider public, especially to schoolboys and students, to encourage some to consider the attractions of a career in some branch of the radio industry.

Slow Morse Practice Transmissions

IN future, the complete Slow Morse Schedule will appear in alternate issues of the BULLETIN. Corrections will, however, be published each month.

Interference Suppression Stickers

MEMBERS are reminded that stickers bearing the words "This car has been fitted with a suppressor to prevent interference to television reception" are available from Headquarters on receipt of a stamped addressed envelope.

Stabilized Power Supplies

By P. G. DAY (G6PD)*

One of the most useful pieces of equipment in an Amateur Radio station is a stabilized power unit. In addition to the more obvious advantages which such a unit confers it often happens that when a v.f.o. is fed from a stabilized h.t. supply, what was previously a T8C note becomes T9X. A class B modulator will also benefit from a really stable h.t. supply.

WHILST making adjustments and changes to experimental apparatus it is very convenient to have a source of h.t. voltage which it is known will remain constant, irrespective of variations in the load. If the actual voltage available may also be set readily to the particular value needed, the utility of the unit will be considerably enhanced.

Most of the components for such a supply can often be found in the spare parts cupboard—there is considerable latitude in the types and values—and the time spent in construction will be amply repaid.

A Simple Stabilizer

A simple form of voltage stabilizer is a neon tube, for once struck, the voltage across the tube remains more or less constant irrespective of the current flowing through it. A wide variety of stabilizer valves (using neon or other inert gases) are available from valve manufacturers, each type stabilizing at some specified voltage between 75 and 150 volts. Although the stabilized supply is usually limited to 20-30 mA at 75-150 volts with a stabilizer valve alone, even so, it is a very useful device for running a v.f.o. or receiver local oscillator whenever there is a tendency for the frequency to shift due to variations of supply voltage. One feature of a gas stabilizer is that the "striking" or "ignition" voltage is considerably higher than the running voltage. In view of that fact care must always be taken to ensure that sufficient voltage is available when switching on to bring the valve into operation.

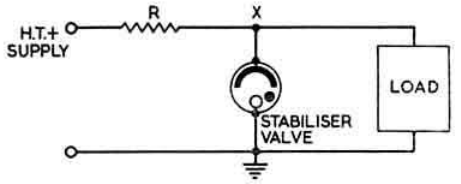


Fig. 1. Simple form of stabilizing circuit using a gaseous stabilizer valve.

Fig. 1 shows a typical circuit using a gas-filled stabilizer tube. The value of R must be chosen so that (a) with the stabilizer valve out of action, the voltage at X is greater than the striking voltage of the stabilizer tube in use, (b) under running conditions the current flowing through the stabilizer is within the limits specified by the makers.

In the case of the VR150/30 stabilizer valve the minimum striking voltage is 185 volts, the operating voltage 150 volts, and the maximum and minimum operating currents, respectively, 40 mA and 5 mA.

*Three Ways, Old Lane, Knebworth, Herts

In the example of Fig. 1, assume that the value of load resistance is 10,000 ohms, so that with the stabilizer struck (150 volts at X), the current through the load is 15 mA. Suppose now that the supply voltage is nominally 265 volts and that 20 mA is allowed to flow through the stabilizer valve under these conditions. The voltage to be dropped across the resistance R is 115 volts (265V—150V) and, since a current of 35 mA flows through it, the value of R would be 3,300 ohms. In this example the maximum permitted variation of supply voltage to maintain stabilization at X would be from 240 volts to 330 volts: if less than 240 volts were applied, the stabilizer would not strike when switching on since the initial voltage at X would not exceed 180 volts. If more than 330 volts were applied the current through the stabilizer would exceed the maximum rating of 40 mA. In the case of, say, a v.f.o. running from a power unit also supplying keyed transmitter stages, use of this circuit would eliminate the effect of h.t. variations on the oscillator.

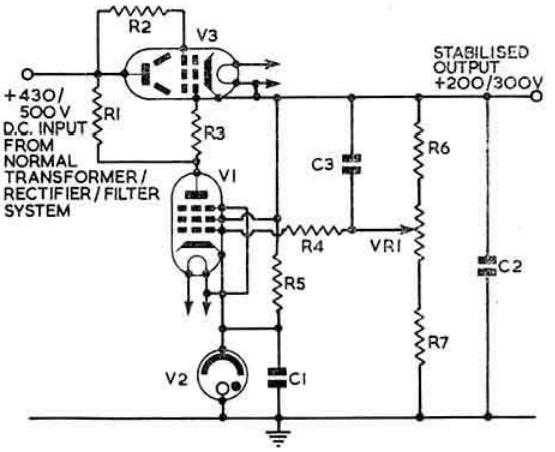


Fig. 2. Electronic stabilizing circuit. C1, 4 μF, 250 V wkg.; C2, 8 μF, 350 V wkg.; C3, 0.25 μF, 350 V wkg.; R1, 270,000 ohms ½ watt, 20 per cent tol., carbon; R2, 100 ohms ½ watt, 20 per cent tol., carbon; R3, 4, 1000 ohms ½ watt, 20 per cent tol., carbon; R5, 12,000 ohms 2 watt, 20 per cent tol., carbon; R6, 7, 68,000 ohms 6 watt, 10 per cent tol., wirewound; V1, EF91 or EF50; V2, VR150/30 or similar; V3, 6L6, 6L6G or 807; VR1, 25,000 ohms wirewound potentiometer.

An Electronic Stabilizer

The main purpose of this article is to describe an electronic stabilizer which uses a stabilizer valve merely to provide a reference voltage. The unit gives almost complete stabilization at output voltages and currents far in excess of those obtainable from the simple arrangement shown in Fig. 1. In fact, the power supply of Fig. 2 is capable of giving a stabilized output at any desired voltage between 200 and 300 volts at any load current between 5 and 80 mA: within these current limits the voltage variation for a given voltage control setting will not exceed one or, perhaps two, volts. The output voltage is quite independent of even violent mains voltage variations and as the circuit is effective at ripple frequencies, the residual hum level on the h.t. output line is very low indeed. Provided that the mains transformer, chokes and rectifier valves are suit-

ably chosen, the maximum load current may be increased to 160 or 240 mA merely by adding one or two extra 6L6 valves in parallel with V3. When two or more valves are used in parallel it may be found that the load current is not shared equally between them but this condition may be corrected by adding 180 ohm negative feedback resistors (½ watt 20 per cent tolerance) in the cathode leads as shown in Fig. 3.

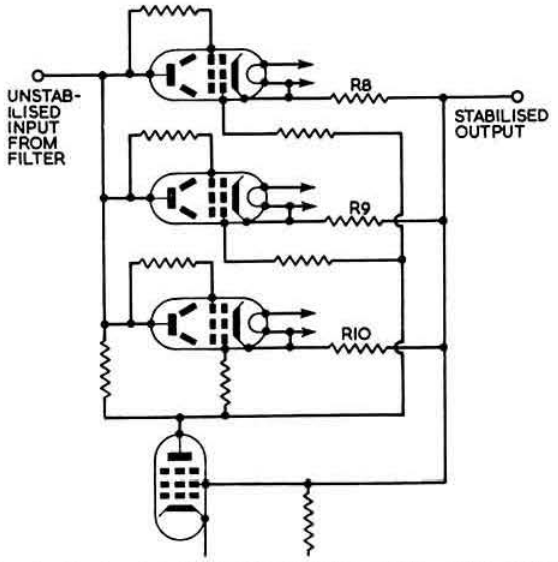


Fig. 3. To increase the current handling capacity, series voltage regulator valves may be used in parallel. R8, 9 and 10 are 180 ohms ½ watt carbon resistors. Other component values are the same as in Fig. 2.

The Principle of Operation

In the circuit, Fig. 2, V2 is a voltage stabilizer, V1 an amplifier and V3 a series regulator valve. V1 and V2 are connected in series across the h.t. supply so that the cathode voltage of V1 is held at a constant value irrespective of the actual h.t. voltage and the current flowing through V1. The bleeder resistance R5 ensures that the current through V2 is maintained within its rated limits even when V1 is biassed to cut-off. The grid of V1 is taken *via* R4 to the slider of the potentiometer chain R6, VR1 and R7 wired across the stabilized supply. The values of these components are chosen so that V1 can operate with normal grid bias (relative to cathode) even though its cathode is held at 150 volts positive by the action of V2. The position of the slider of VR1 sets the grid bias of V1 and therefore its anode current and hence also its anode potential. The anode of V1 is directly coupled to the grid of the series valve V3 and thus the grid bias condition of V3 depends on the anode potential of V1 relative to the cathode potential of V3. It will be realised that variation of bias on V3 varies its effective series resistance and hence the output voltage of the unit which is taken from the cathode of V3. Adjustment of the position of the slider of VR1 alters the bias on V1 and therefore its anode potential; this in turn alters the bias on V3 which varies the output voltage of the unit. VR1 is thus the output voltage control.

Suppose the unit is feeding h.t. to a piece of equipment which passes a varying current (*e.g.* a keyed transmitter). When the current drain increases there will be a tendency for the output voltage of the power unit to fall; this will cause a fall in the potential at the slider of VR1 and thus an increase in the grid bias on V1. The current through V1 decreases and its anode potential rises. The grid bias on V3 is thus reduced and the effective series resistance of V3 becomes less, so increasing the value of the output voltage. In practice the stabilizing action just described almost exactly cancels the variation of output voltage which would have occurred (the higher the loop gain of the system the better is the stabilization) and, of course, the same chain of events occurs in reverse when less load current is drawn.

The effect of a.c. mains variations on the output voltage of the unit is nullified almost completely; if the mains voltage falls the tendency is for the d.c. output voltage to fall, but the stabilizing action just described operates and prevents the output voltage from changing.

The purpose of C3 is to feed any a.c. ripple present on the output of the unit directly to the grid of V1. V1 and V3 then react at ripple frequency exactly as they did to d.c. changes and the output ripple is thus reduced to a very low level.

Practical Details

For correct operation of V3, it is necessary to allow for at least 130 volts drop across the valve under full load conditions. If, for example, a 300 volt stabilized supply is required, the normal transformer, rectifier and choke/condenser filter arrangement must be capable of delivering at least 430 volts d.c. at full current load to the input of the stabilizer circuit. The upper limit of voltage which may be supplied to the stabilizer is set by the maximum permitted anode dissipation of V3.

It will be seen from the circuit diagram that the cathode of V3 is at the output potential. In order that the maximum rated heater/cathode potential difference for V3 is not exceeded it is necessary to run it from its own filament winding on the mains transformer and to connect one side of heater to cathode as shown in the circuit diagram. Depending on the type of gas stabilizer valve used for V2, the cathode of V1 may or may not require a separate filament winding if the maximum permitted heater/cathode potential difference of the valve is not to be exceeded. If a separate filament winding is used for V1 one side should be connected to cathode as shown in Fig. 2.

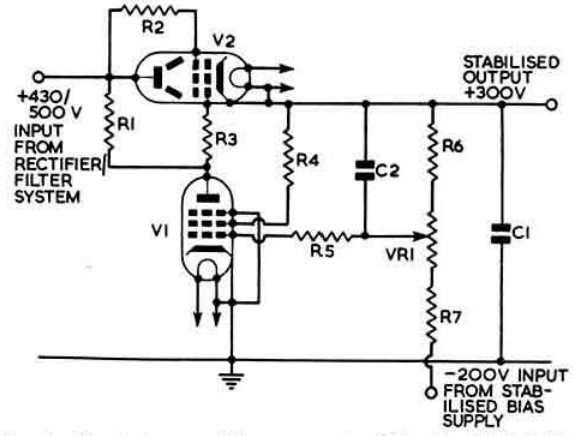


Fig. 4. Circuit for use with an external −200 volt stabilized bias supply as reference. C1, 8 μF, 350 V wkg.; C2, 0.25 μF, 350 V wkg.; R1, 270,000 ohms ½ watt, 20 per cent tol., carbon; R2, 100 ohms ½ watt; R3, 5, 1000 ohms, ½ watt, 20 per cent tol., carbon; R4, 15,000 ohms 4.5 watt, 10 per cent tol., wirewound; R6, 82,000 ohms 6 watt, 10 per cent tol., wirewound; R7, 47,000 ohms 6 watt, 10 per cent tol.,wirewound; V1, EF91; V2, 6L6G; VR1, 25,000 ohms wirewound potentiometer.

The resistors R2, R3 and R4 are anti-parasitic resistors and they should always be used. They must be wired directly to the valveholders and their leads should not exceed about ½in. in length; R2 may be soldered directly across the valveholder from the anode to screen pins. Wire wound resistors are specified for the potentiometer chain to ensure good long term stability.

The general mechanical layout of components and wiring is not very important but great care should be taken to ensure that there is no possibility of electrostatic pick-up on the lead which runs from the slider of VR1 to the grid of V1. This lead should be kept well away from any wiring associated with the rectifier, the mains transformer and the first smoothing choke (especially if a choke input filter is in use). Any mains frequency pick-up on V1 grid will be amplified through the system and will appear as excessive ripple on the output.

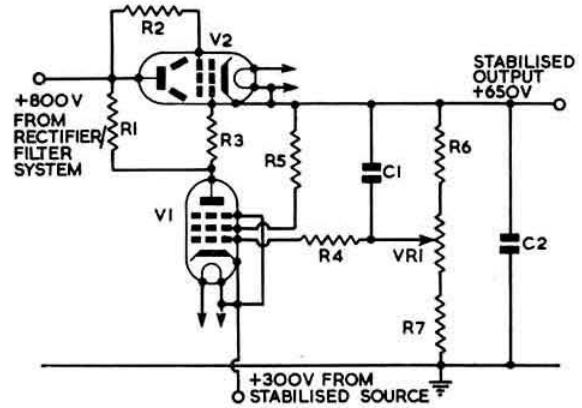


Fig. 5. Circuit for use with an external 300 volts stabilized supply as reference. C1, 0.25 μF, 350 V wkg.; C2, 8 μF, 750 V wkg.; R1, 270,000 ohms ½ watt, 20 per cent tol., carbon; R2, 100 ohms ½ watt, 20 per cent tol., carbon; R3, 4, 1000 ohms ½ watt, 20 per cent tol., carbon; R5, 47,000 ohms 6 watt, 10 per cent tol., wirewound; R6, 82,000 ohms 6 watt, 10 per cent tol., wirewound; R7, 68,000 ohms 6 watt, 10 per cent tol., wirewound; V1, EF91; V2, 6L6G; VR1, 25,000 ohms wirewound potentiometer.

Variations of Design

The power unit shown in Fig. 2 may be arranged to give a stabilized negative supply merely by transferring the earth connection from the position shown to the h.t. positive output line. In this case, the cathode of V3 is at earth potential and a separate filament winding is not needed for this valve.

It is quite possible to supply the steady reference potential for a given stabilized power unit from another stabilized power unit, thus obviating the necessity for more than one stabilizer valve. Fig. 4 indicates how a +300 volts supply may be stabilized from a stabilized —200 volts bias supply. In this case the filament supply for V1 may be taken from a general filament winding since it is at earth potential.

Fig. 5 gives the circuit of a unit which takes its reference voltage from a stable +300 volts source and delivers a stabilized output of about 75 mA at 650 volts (the current may be increased by adding valves in parallel with the series regulator valve). In a case of this type it is important to ensure that the maximum voltage ratings of the amplifier valve are not exceeded.

From the above examples and notes, it should be possible for the reader to design a unit to suit his own requirements and, by suitable modifications to the circuit values, to use components which are already available.

Amateur Radio at Gilwell Scout Park

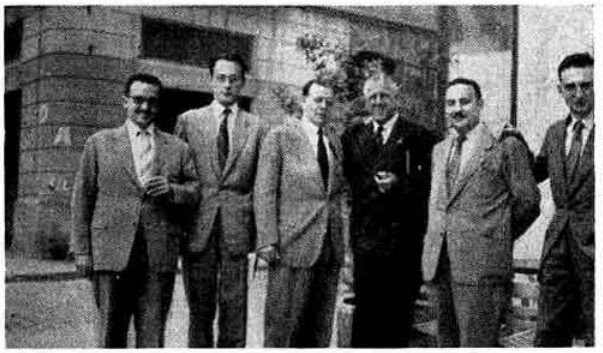
AN Amateur Radio station using the special call-sign GB3GP will operate from the International Patrol Camp at Gilwell Park from July 27 to August 6. The station will work on 1.8, 3.5 and 14 Mc/s and possibly on 21 and 28 Mc/s as well and will be operated by members of the Chingford and District R.S.G.B. Group with guest operators from other Groups. A 20 m beam is being loaned by Panda Radio and the receivers by J. A. Steele (B.R.S. 20181). F. Ingleby (G3EHD) is loaning his transmitter and a Hamobile transmitter will probably be used for 144 Mc/s operation. There will also be an exhibit of amateur gear and a Band III television receiver will be demonstrated.

Barcelona Amateurs entertain the President

ON Sunday, June 12, while on holiday on the Costa Brava, our President (Mr. H. A. Bartlett, G5QA) was entertained in Barcelona by a number of Spanish radio amateurs who were meeting there on the occasion of a National Engineering Exhibition.

Whilst at the Exhibition, Mr. Bartlett visited the Amateur Radio station organized by the local group of amateurs and recorded a message which was broadcast later that night on National and amateur frequencies.

EA3CL, '3BB, '3KI, '3IT, '3KB and '3KJ were chiefly responsible for making Mr. Bartlett's visit so enjoyable.



Mr. H. A. Bartlett, G5QA, President of the R.S.G.B. (fourth from left) with Barcelona amateurs.

London Members' Luncheon Club

JACK Montagne (F9CQ), Tom Shanks (ZS9QV) and Bill Clegg, G8RP (ex-MP4BBS), were among the 20 members and visitors present at the June meeting of the London Members' Luncheon Club. In the Chair—after an unavoidable absence from recent meetings—was Stan Vanstone (G2AYC), who had the support of Arthur Milne (G2MI).

Radio amateurs visting London are assured of a warm welcome at London Members' Luncheon Club gatherings which are held monthly at the Bedford Corner Hotel, Bayley Street (off Tottenham Court Road, London, W.C.1). The Club is due to meet on Friday, July 15, and again on Friday, August 19 (12.30 p.m. for 1 p.m.). Seats can be reserved by 'phone (Ruislip 2763 or Holborn 7373) or by postcard to R.S.G.B. Headquarters. Latest time for reservations 12 noon on the day preceding a Luncheon.

C.U. ON STAND 310 AT EARLS COURT

An Introduction to Amateur Transmitting

Part 6—The Aerial

By LORIN KNIGHT, A.M.I.E.E. (G2DXK)*

WHENEVER the intensity of the electric current passing through a wire changes, a very small amount of energy is radiated into space. When a radio-frequency current passes through the wire several million times a second the amplitude of the current may be alternating between its maximum positive value and its maximum negative value. The amount of energy radiated may then be quite considerable.

The radiated energy is said to consist of radio waves. It is not necessary to be able to visualize these waves but it is useful to remember that they travel outwards from the wire at 300,000,000 metres per second. Thus, with a radio signal whose frequency is 30,000,000 cycles per second (30 Mc/s) the distance occupied by one complete wave (i.e. from one positive peak to the next) is 10 metres. We therefore say that a 30 Mc/s signal has a wavelength (often abbreviated to λ) of 10 metres.

To radiate a strong signal we must persuade a large r.f. current to flow into the aerial wire, and in order to obtain some idea of how this may be done let us first consider the horizontal aerial shown in Fig. 24.

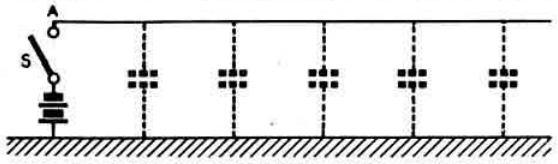


Fig. 24. A Horizontal Aerial.

If the switch S is suddenly closed, current will flow into the aerial to charge up the capacitance formed by the wire and the ground. Now it is normally assumed that the electric current flow through a wire is instantaneous but in reality it has a finite speed which is approximately equal to that of radio waves in space. Thus the current will not flow immediately into all the capacitance. If we consider the aerial to be made up of a series of small elements we can think of each element as starting to charge up in sequence. There will in effect be a "front" of current speeding along the wire at 300,000,000 metres per second. Behind this front, current will be flowing, while ahead of it there will be no current. With an infinitely long wire this current front would be continually moving on and at any instant in time the current from the battery would be charging up some new section of the wire. At point A there would consequently be a steady flow of current and, as far as the battery was concerned, it would be feeding into a resistance.

The wire would still behave as a resistance if the battery was replaced by a source of r.f. energy. Peaks and troughs of r.f. current would then pass along the wire in the same way as did the current front. As the current passed along the wire some energy would be lost due to the resistance of the wire but, with a reasonably thick wire, this energy would be far less than that radiated as radio waves, and we would have an efficient transmitting aerial.

The Half-Wave Aerial

A practical aerial cannot be infinitely long and its behaviour is not so simple. When the current reaches the end of the practical aerial it is reflected back.

A particularly important effect occurs when the aerial is exactly half a wavelength long as in Fig. 25 (a). Suppose that a positive peak of current is moving from A to C. When it reaches C it will be reflected back again.

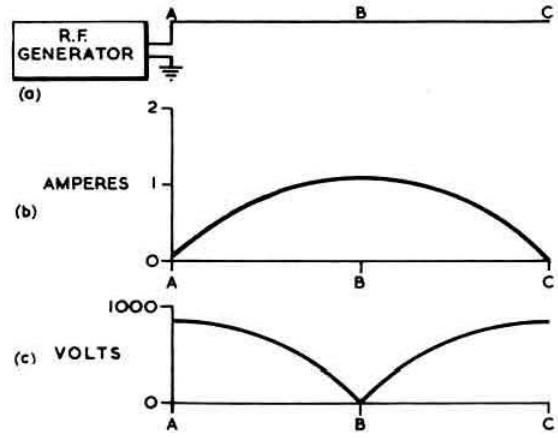


Fig. 25. (a) Horizontal Half-wave Aerial. (b) Typical R.F. Current Distribution (100 watts r.f.). (c) Typical R.F. Voltage Distribution (100 watts r.f.).

The reflected current will have the same amplitude and the opposite polarity and thus at C itself the net amplitude of the current will be zero. From B to C and back again is exactly half a wavelength. Thus by the time the reflected current peak, now negative, reaches B, it will meet the following negative peak which is on its outward journey from A to C. The two current peaks will therefore add together producing a very high peak of current at B.

When the reflected current peak reaches A it will be reflected back once more, this time as a positive peak. It will then have travelled exactly one wavelength since first leaving A and will therefore be reinforced by the next positive peak leaving the generator.

The same sort of thing also happens to the negative peaks. If we used an ammeter to measure the force of the alternating current at various points along the wire we would find it to be as shown in Fig. 25 (b). At B each peak of current would be reinforced by a reflection from C and the amplitude of the alternating current there would be high. At C the incident current at any instant is always cancelled by its reflection and the net value of the current here is always zero. The net current at A would also be zero if the r.f. source were not connected at this point; in practice the ammeter would measure the current being supplied by the generator.

If we were to measure the r.f. voltages on the aerial we should find that each end of the aerial had a high voltage to earth and that the voltage fell as we approached the centre, at which point it would be zero. The voltages at the two ends would be equal in magnitude but opposite in phase.

*28a Glebe Road, Letchworth, Herts.

The fact that the magnitudes of the r.f. currents and voltages vary along the length of the wire is often described by saying that there are standing waves present. We have the interesting condition that the ratio of voltage to current, that is to say the impedance of the aerial, is high at either end but low in the centre. This is in contrast to the infinitely long aerial where the amplitudes of the current and voltage were always in proportion, gradually diminishing along the length of the wire as energy became lost.

We have assumed so far that the capacitance to earth is essential for the operation of the aerial. There is, however, always capacitance between the individual points on the aerial and, although the operation is then not quite so easy to understand, the electrical characteristics of a half-wave aerial are in fact very similar with the wire perpendicular to the ground, or even without the earth being present at all.

If a half-wave aerial terminated at the transmitter, it could be connected in the manner shown in Fig. 26. At

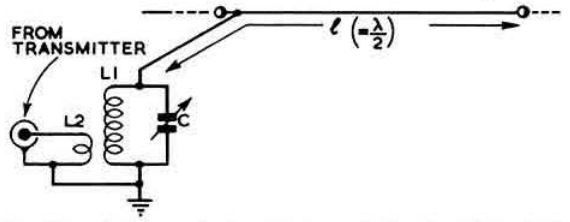


Fig. 26. Half-wave Aerial connected direct to Aerial Tuner. $L \simeq 470/f$ ft, where f is the frequency in Megacycles.

resonance the aerial would appear as though it were a resistance of a few thousand ohms to earth. Assuming that the transmitter has been designed to give its greatest power output when feeding into about 72 ohms† it would be necessary to interpose the r.f. transformer L1, L2, C. Then, although the aerial may be taking, for example, 0.1 ampere at 720 V, the input to L2 can be 1 ampere at 72 V so that the transmitter "thinks" it has a load of 72 ohms.

Now if the aerial is not exactly half a wavelength long the reflected current at A will not be exactly in phase with the applied voltage. This will give the effect of the aerial having some inductance or capacitance and will modify the tuning of L1C. But as long as C is used to tune the whole system to resonance the load applied to the transmitter will appear to be a pure resistance.

It must always be borne in mind that for maximum power output the transmitter must feed into a resistive load. Various combinations of reactance (either inductive or capacitive) and resistance can give an impedance of 72 ohms and any of these combinations will take 1 ampere at 72 V. The power taken, however, will only be 72 W if the voltage and current are exactly in phase, i.e., if the load is a pure resistance.

An aerial of the type shown might have its length chosen so that its natural resonance lay in the centre of an amateur band. The r.f. transformer, more commonly called an aerial tuner or aerial coupler, could then be used to tune the aerial to any frequency in the band, at the same time ensuring that the transmitter "saw" a resistance of about 72 ohms at each frequency.

Directivity

A half-wave aerial, or dipole as it is often called, which is well clear of the ground radiates quite well in all directions except those making an angle of less than about 30° to the wire. Thus a horizontal dipole lying north-south will radiate eastwards and westwards at all angles of elevation from horizontal to vertical. But northwards and southwards there will be little radiation at angles less than about 30° to the horizontal.

When the aerial is close to the ground, as must be the case in practice, the waves reflected by the earth interact with those radiated directly from the wire and modify the radiation pattern. This effect is most pronounced when the height of the aerial is $\lambda/4$ or lower and under these conditions all radiation at low angles to the earth tends to be suppressed and the high angle radiation is accentuated.

For almost all high frequency communication we use those waves which are reflected back to earth by the ionized layers in the atmosphere. When transmitting over a very long distance it is the low angle radiation which is used and consequently an aerial height of $\lambda/2$ or more is to be preferred. On the other hand, for communication over distances of only a few hundred miles we normally use the high angle radiation and a lower aerial usually gives better results.

If the dipole is mounted vertically there will be low angle radiation in all compass directions but little high angle radiation. Such an aerial has potential advantages for long distance communication but is not very often used because of the practical difficulties involved in constructing a vertical radiator half a wavelength long and clear of the ground.

If we are to obtain the best results from an aerial some care must be exercised in siting it, not only to ensure that it radiates in the required directions but also to ensure that it is as clear as possible from buildings and trees which might absorb some of the radiated energy. Consequently some method must often be devised whereby energy may be fed to an aerial which is remote from the transmitter. To understand how this can be done we must first give a little thought to the theory of transmission lines.

Transmission Lines

A typical r.f. transmission line or feeder is shown in Fig. 27. If an infinite length of this feeder were coupled to an r.f. generator it would behave in a similar manner to the infinitely long aerial. With the dimensions given the feeder would appear to have a resistance of about 600 ohms and this value would be said to be its characteristic impedance. The current in the two wires at any instant would be equal in amplitude and opposite in polarity. Thus, because the feeder is symmetrical and the wires are close together, the net radiation from the feeder will be quite small.

Now suppose that we take a finite length of the feeder and connect a 600 ohm resistor across the far end. As far as the r.f. generator and the feeder are concerned it is just the same as if an infinite length of

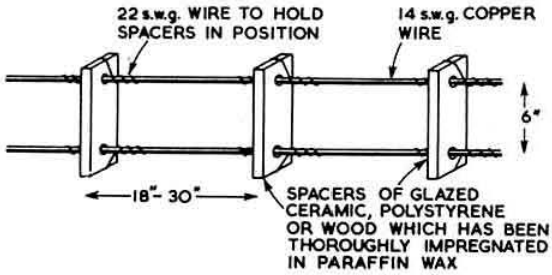


Fig. 27. Typical amateur-built Transmission Line.

†*Feeder cables generally have characteristic impedances between 50 and 100 ohms, 72 ohms being a popular value.*

feeder had been joined on the end. This means that any length of the feeder, when terminated by a load having a resistance of 600 ohms, will present a resistance of that value to the generator. Moreover, nearly all the r.f. energy will be guided by the feeder to the load and not radiated en route.

If the feeder is not terminated by its characteristic impedance, reflections will take place at the end and standing waves will occur. An extreme case is that of a quarter-wave line terminated by a short circuit as in Fig. 28 (a). We can think of this as rather like a half-

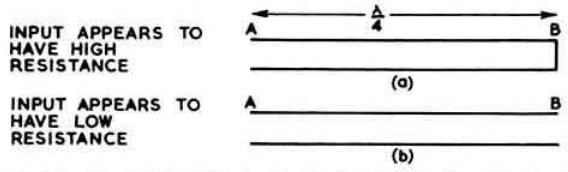


Fig. 28. Quarter-wave Line. (a) Short-circuited end. (b) Open-circuited end.

wave aerial doubled back on itself. Thus although the load resistance is very low the resistance at A will appear to be high. A converse effect occurs if the end B is open circuit as in Fig. 28 (b). The apparent resistance at A is then very low.

The nearer the load resistance becomes to the characteristic impedance the nearer the input resistance becomes to it also. Mathematically the relationship is expressed $Zi/Zc=Zc/Z_L$, where Zi is the impedance "seen" at the input to the feeder, Zc the characteristic impedance and Z_L the load impedance. Thus with a 600 ohm feeder and a resistive load of 300 ohms the feeder input will appear to be a resistance of 1,200 ohms; with a 1,200 ohm load the input would appear to be 300 ohms. If any reactance is present in the load the input impedance will also contain some reactance.

The quarter-wave line acts in effect like a transformer. If the line is half a wavelength long we can think of it as being two of these transformers connected back to back. The net effect will consequently be as if there were no transformer at all and the input impedance will equal the load impedance. This condition will in fact hold for any even number of quarter-waves. With an odd number of quarter-waves the net effect is the same as if there were only one.

Commercial feeders are obtainable with characteristic impedances of about 70 to 300 ohms. There are also co-axial cables available which behave similarly and which usually have impedances around 50 to 100 ohms. The coaxial cables have one conductor completely surrounding the other; the outer one is usually earthed so that it forms a screen. The commercial products are perfectly satisfactory provided that the feeder is operated "flat," that is to say, provided that the ratio of maximum and minimum r.f. currents along the wires (the standing-wave ratio) is less than about 3:1. With higher standing-wave ratios there are liable to be appreciable losses at the high current points due to the resistance of the conductors and at the high voltage points due to leakage in the insulating material. In such cases the use of a home-made feeder such as shown in Fig. 27 is to be preferred.

* * *

Next month it is proposed to consider the various ways in which transmission lines can be used to feed an aerial and to look at some of the practical considerations necessary for an efficient aerial system.

Radio Amateurs' Examination

COURSES of instruction have been arranged at the colleges and evening institutes listed below for the benefit of those who wish to study for the Radio Amateurs' Examination.

Bradford Technical College. Full details of classes to be held at this college may be obtained from Mr. F. J. Davies (Hon. Secretary, Bradford Amateur Radio Society), 39 Pullan Avenue, Eccleshill, Bradford 2.

Constantine Technical College, Middlesbrough. Enrolment at this college will take place during the week commencing September 5. Classes will be on Tuesday evenings from 7-9.15 p.m., commencing September 20.

Allen Glen's School, Montrose Street, Glasgow, C.4. Enrolment for classes in both Theory and Morse will take place in the evenings from September 5 to 8. Theory instruction will be given by Mr. A. M. Fraser (GM3AXX) and Morse by Mr. James Sey (GM8MJ). The classes will be on Tuesdays from 7-9.30 p.m. (Theory) and on Thursdays from 7-9.30 p.m. (Morse), commencing September 12. The fee is 10/-.

Ilford Literary Institute (High School for Girls), Cranbrook Road, Ilford. (Adjacent to Gants Hill station, Central Line.) *Radio Amateurs' Examination Course.* An eight months' course for those intending to take the examination. Wednesdays, 7.30 to 9.30 p.m. *Morse and Codes of Practice.* A six-months' course for those who wish to learn Morse up to G.P.O. requirements for an amateur licence. Arrangements have been made for those who, in the opinion of the instructors, have reached the required speed, to be tested at the Institute by a representative of the Post Office. For students living in the Essex County Council area the fee for either course is 10s. or 17s. 6d. for both. Students from other areas will be admitted provided the Local Authority is informed. Details of the arrangements for enrolment will appear in the August issue of the BULLETIN.

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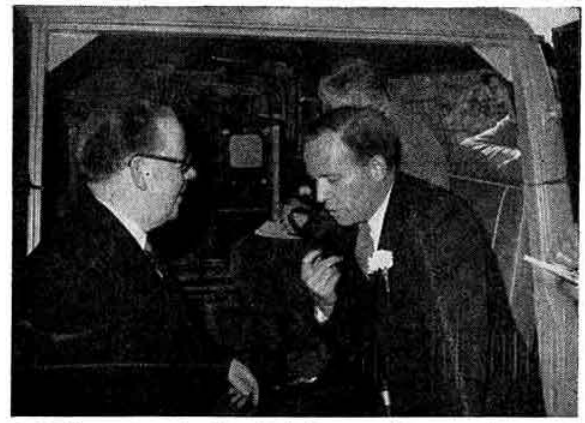
Organizers of classes at other centres throughout the United Kingdom are invited to send particulars for publication.



R.A.E.N. members in East Yorkshire recently arranged a special mobile demonstration for civic leaders. In this picture the Hon. Richard Wood, M.P. for Bridlington is seen operating one of the mobile stations. Lt.-Col. A. C. Dunn, G2ACD, County Controller is on the left.

(Hull Daily Mail photograph)

Lightweight to Brunei

By R. M. HERBERT, A.M.I.E.E. (VS5KU, G2KU)*

Malay houses at Kuala Belait.

OPERATION of amateur stations from remote locations where activity is spasmodic, or entirely absent, is always of keen interest to the DX fraternity. Whereas some of these trips are made solely for the purpose of Amateur Radio, the majority of people have to rely upon a business visit for such opportunities. These journeys are invariably made by air, the consequent limitations on baggage providing a major obstacle to those contemplating standard equipment. It is hoped that this short account of the writer's experiences will provide encouragement to others when visiting rare DX spots, indicating as it does, that very worth-while results can be obtained with the simplest equipment.

Preliminary Considerations

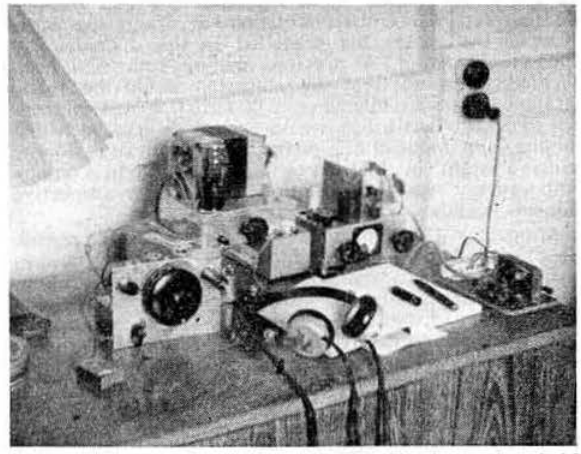
The would-be DX operator seeking guidance from accounts of previous trips is struck by the fact that, in the majority of cases, standard transmitters and receivers have been used, the total weight often being in excess of 100 lb. Quite apart from the inconvenience of bulky baggage, the cost is very considerable so far as air travel is concerned. With a free baggage allowance of 66 lb available for this form of travel, a figure of 6 lb for the complete station was aimed at (excluding the power supply). It was felt that the modest power requirements for such a small rig could always be located on site, even if a broadcast set had to fulfil this function.

Although the writer had considerable success with a miniature station in Monaco under the call 3A2AL, it was expected that conditions in Borneo would be entirely different. If a rare DX station is working adjacent to an area of considerable amateur activity, then there is a large QSO potential within a radius of 500 miles. In the case of a very sparsely populated country like Borneo, there were probably only a half-dozen active stations within a radius of 1,000 miles, thus even "local" contacts would be subject to the vagaries of conditions.

Equipment

The transmitter itself provided no problem. The final arrangement incorporated an EL91 as a tritet oscillator, the p.a. being an S.T. & C. 5B/254M, thus providing an input of 25 W with a 350 V supply. The transmitter was constructed on a chassis measuring 6 in. x 4 in. and weighed 2 lb.

The design of a suitable receiver, as can be expected, provided the biggest headache. It had to be small, light, reliable, sensitive and selective. There was no time to build a prototype, nor to experiment with different line-ups. It was decided at the outset to work solely on 14 Mc/s, thus avoiding the necessity for plug-in coils or switches. In point of fact it was found possible to wind coils which would cover 21 Mc/s also by varying the slug tuning and shunt capacities. The most difficult decision was that relating to the choice of i.f. For selectivity 465 kc/s was obviously the most desirable but on the other hand it was thought there would be little point in having a sensitive receiver if the required station could be wiped out by commercial second channel interference. It was decided, therefore, to employ an i.f. of 1.6 Mc/s, accepting the poor selectivity. The final line-up became 6AK5 r.f., 6BE6 mixer-oscillator, 6AK5 i.f. amplifier, 12AT7 combined triode detector and b.f.o. All this was accommodated on a chassis measuring 5 in. x 4 in., the total weight being 2 lb. It performed exceedingly well and any signal detectable on the home station HRO could also be resolved on the miniature receiver providing there was no adjacent interference. Another reason for choosing an i.f. of 1.6 Mc/s was that if the poor selectivity became a real obstacle it could be altered to about 1.5 Mc/s, a broadcast set being used as a separate and more selective i.f.



A view of the operating position at VS5KU. The tiny receiver (left) and transmitter (right) together weigh only just over 4 lb.

*17 Selcroft Road, Purley, Surrey.

channel. However, although this facility was available, the miniature receiver itself was used throughout, very few contacts being lost due to QRM.

Local Conditions

Brunei, up to the time of the writer's visit, had never been represented by a resident amateur since the war, activity being confined to very short appearances by W0ELA and G2RO. The writer's station was located in the British Malayan Petroleum Co.'s rest house at Seria within a few feet of the South China Sea. Licensing formalities had commenced before leaving the United Kingdom but even so a slight administrative hitch prevented immediate operation upon arrival.

As there are no roads or telephones linking Seria with the licensing authorities in Brunei town, negotiations were a little protracted. When a visit to the authorities eventually became desirable, it was necessary to wait for the low water spring tides and drive for some 60 miles along the beach, crossing an intervening river on a raft. This must be one of the few countries where motorists carry tide tables in preference to maps.

Due to the lack of a suitable support for the aerials, the first few transmissions took place using an indoor dipole draped round the walls, the extremities being bent down and terminating a few inches above floor level. The first QSO was with a VK4, who gave a report of RST569. Subsequently, some twenty QSOs in seven countries were made with this crude arrangement. Later a mast was obtained and the aerials raised to a height of about 30 ft.

Conditions throughout the period (November-December) were very poor and it is now believed that the end of last year represented the lowest level of the current sunspot cycle. The 14 Mc/s band was open from 6 a.m. local time until about 11 p.m., when the VK1s would appear at surprising strength. The standard of operating was very good, there being very few instances of calling during QSOs and other nuisances generally expected in such circumstances. The more powerful VKs and ZLs in particular were most considerate, frequently providing details of weaker stations who had been calling and using their own transmissions as markers. Afterwards they would stand-by throughout a QSO in case either side ran into difficulties. It was a pleasure to have such good neighbours.

One of the highlights of the trip was undoubtedly a contact with VR2RO operating from the Fiji Islands. He had left the United Kingdom at about the same time as the writer but travelled in the diametrically opposite direction. A previous calling code had been decided upon so that identification could be made through the severe interference expected. It was interesting to reflect that a few weeks earlier we had been discussing our forthcoming visits on a typically gloomy winter's night in London and were now in contact, both using "suitcase" stations, from our respective tropical islands.

Altogether 350 contacts were made with 40 countries, all continents being represented. The successful accomplishment of these visits is dependent upon the assistance of others, as always, willingly given. W. A. Roberts (G2RO) provided useful information on site conditions and D. Alimundo (VS4HK) went to considerable trouble to locate the writer's plane in Sarawak in order to hand over licence documents. It was through the kindness of the Pengiran Kirma Indra, State wireless engineer at Brunei, that the licence difficulties were overcome promptly. To all these gentlemen, as well as others, un-named, go the writer's sincere thanks.

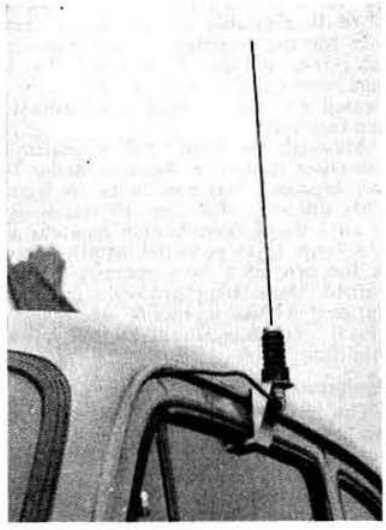
Mobile Column

By JOHN A. ROUSE (G2AHL)*

RECOGNITION of other mobiles on the road and the difficulties of making contact with them are problems raised by **G3JKV** who suggests a sign at the base of the bumper-mounted aerial is one answer; his own reads "G3JKV/M 160 metres" and is readable at about 50 yards. If such signs were made with the "Scotchlite" tape now being offered by the Minnesota Mining & Manufacturing Company, Ltd., they would be even more easily noticed. It would probably be a good idea, too, to have one at each end of the car. Only one doubt remains: are there sufficient mobiles on any one band to affect significantly the number of mobile-to-mobile QSOs if the idea is adopted? In any event, how many are equipped for operation on the mobile calling frequencies suggested in this feature many months ago? And how many habitually call or listen on those frequencies?

What surely must be the longest mobile-to-mobile QSO took place on May 14 when **G2ATK/M** and **G3ABA/M** were in contact on 2 m for three hours during their journey to London for the International V.H.F. Convention. The distance between the cars varied from a few yards up to five miles or so. G3ABA does not know London well but G2ATK was able to guide him without difficulty through the dense traffic.

The equipment used by G3ABA, built by G2ATK, uses a transmitter in which the line-up is a 12AT7 using one-half as an overtone oscillator in the "Robert Dollar" circuit with an 8 Mc/s crystal, the second half tripling to 72 Mc/s, followed by a Z77 doubler to 144 Mc/s driving a Z77 p.a. running only 10 mA at 250 V (2.5 watts input). Modulation is provided by a carbon microphone feeding a 6BW6 direct. The receiver uses a 6AK5 pentode connected r.f. stage, 6J6 mixer-oscillator, two 4.5 Mc/s i.f. stages using EF92s followed by a DH77 as second detector, a.v.c. rectifier and first audio, with an EL91 output stage. Two sub-miniature diodes are used in the noise limiter. The loudspeaker, i.f. gain



G2ATK'S method of mounting a 19 in. whip for 2m mobile operation above the near-side front window of the car. The bracket holding the aerial base is firmly held at the bottom by the window and is clipped over the rain scuttle above the door.

*Assistant Editor, R.S.G.B. BULLETIN.

control, and switches are mounted in a separate control box. The transmitter and receiver are constructed on similar 3in. x 4in. chassis and mounted in a case 4½in. x 4½in. x 7in. long.

Push-to-talk control is provided by a relay in the control box and an aerial change-over relay adjacent to the p.a. coil in the transmitter. The small relays used were made from those found in Command transmitters. The original coils were replaced by one of the coils from the aerial relay in the same equipment. When modified in this way the relays work satisfactorily from 6-12 volts. The aerial is a 19in. whip mounted above one of the front windows of the car in the manner shown in the accompanying photograph. H.t. is obtained from a Hoover rotary transformer rated at 11.5 V input and 250 V 125 mA output.

G3ABA is getting excellent results from this equipment, one notable contact being with G3EPW (Bury) while in Birkenhead. Other 2 m mobiles in the Midlands are G2AK, G2CVD, G5ML and G6YU. Several more are expected to be active shortly.

What is probably the first contact between two waterborne British mobiles took place on May 18 when **G3FYZ/M** (of Blackpool) worked **G2DHV/M** (of London) on 7 Mc/s. At the time both were on the River Waveney near St. Olaves, Suffolk.

Out and About with the ZC1s

On June 5, **GM3HY** and **GM4BK** met **G3ZO** and using GM4BK's ZC1 and a 12ft whip aerial worked EI5Q, GM3ITC, GM3JCY, G3IGW, GM3DZG, G3IOL, GW3JKB and a GI station, all whilst in and around Carlisle. A contact with GM2DBX lasted for about 80 minutes.

The best contact so far made by **G5CP**, who has installed an 807 in the p.a. stage of his ZC1, was on Top Band with G3KEJ (Buckingham), a distance of 80 miles. During a recent "round table" QSO with G3FGY, G3FUA/A, G3JWQ/M and G3IBL, G5CP arrived at a cross-roads where a car and a motorcycle had collided, fortunately without serious injury to anyone. G5CP called G3FUA/A and asked him to ring Ripley (Derbys.) Police. Immediately after doing so, a call was received from G3JWQ/M asking for a repeat of the message as he was stationary with the Ripley Police sergeant standing beside the car. Subsequently, G3JWQ took the police to the scene of the accident. G3FGY and G3FUA are worked almost daily on Top Band at 13.30 and 19.00.

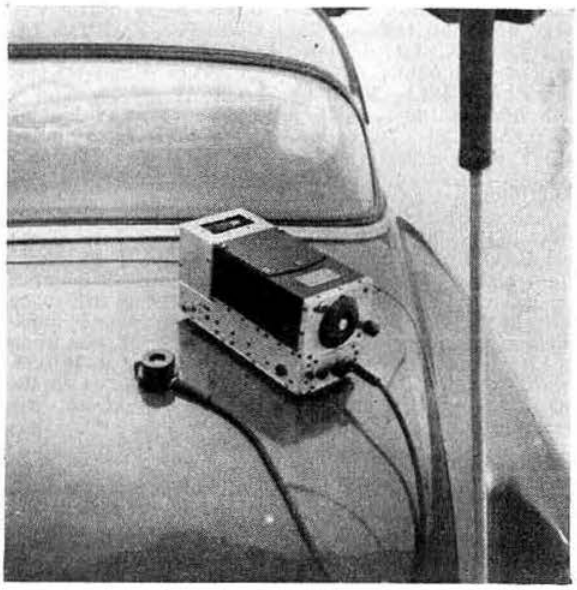
G3FZW, reporting on activity in the Lichfield area, says that G2YV, G2FDT and himself are already mobile with ZC1s while G2HKS is getting his own ready. G3FZW remarks that he finds mobile operation a great help in getting minor club, R.S.G.B. and R.A.E.N. work done. He finds it convenient when in a net to do a round of visits, carrying on the QSO meanwhile! Best DX so far (while parked at Caldry, Wirral) was a c.w. contact with GI2ARS. Lunch time operation from the centre of Birmingham suffers from a very high noise level, the best contact being with G4MK (Leicester) on c.w. at a distance of about 40 miles.

News from Scotland

GM3HLQ reports that the three mobile stations in Strathaven—GMs 3HY, 3HLQ and 4BK—were invited to visit the Prestwick group during May to demonstrate their gear. All three maintained contact with GM2BUD (Mauchline) and GM4PW (Prestwick) throughout the trip. Road conditions at the time were appalling, rain, snow, sleet and hail conspiring to make the journey a nightmare. Nevertheless, it was a great success. The Strathaven group hopes to arrange a rally-cum-picnic with a fixed portable station to guide stations wishing to join in. GM3HLQ recently visited Northern Ireland where he met **GI2DZG** personally after having worked him from Scotland for one of his best mobile DX contacts. GI2DZG mentioned having heard GM4BK/M on 3.5 Mc/s.

Mobile in Canada

The first report for this feature on mobile operation in North America comes from **VE7TX** (ex-G3GFF), whose neat single package transmitter-receiver is shown in the photograph below. The transmitter, comprising a 6J6 Pierce crystal oscillator and 6BQ6 p.a. running 5-6 watts and modulated by a 6J6 and 6AQ5, is mounted on the rear of the chassis of the BC454 receiver in the space originally occupied by the dynamotor. The b.f.o. circuit in the BC454 has been removed to provide additional space and the triode section of the valve rewired to provide a first audio stage. H.t. is obtained from a 200 V 100 mA dynamotor. The 12ft whip aerial is mounted, rather surprisingly, on a rigid base (a large porcelain feed-through insulator) which has been found much more satisfactory than the usual flexible mount. Swaying and consequent de-tuning is, of course, greatly reduced. The insulator has withstood many miles of very rough roads without breaking.



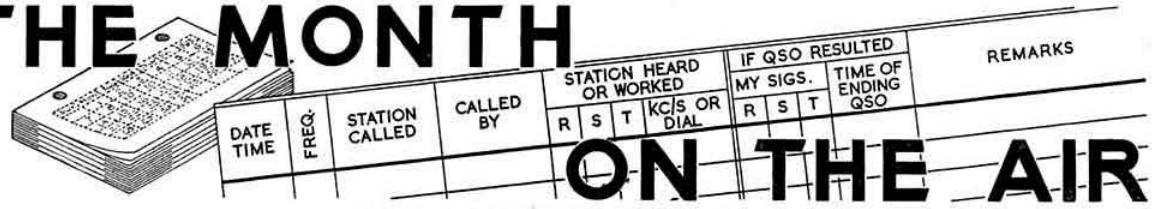
The neat appearance of VE7TX's 3.5 Mc/s transmitter-receiver. The transmitter section is at the rear of the BC454 chassis.

With the equipment described VE7TX has worked many stations up to 200 miles away from Vancouver and whilst travelling in the interior of British Columbia.

* * *

The *Mobile Column* will next appear in the September issue of the BULLETIN and comments and reports on all phases of mobile operation will be much appreciated. Owing to the holiday season, it would be a great help if letters could be sent to arrive not later than August 15. To those whose reports are quoted this month, many thanks.

THE MONTH ON THE AIR



By S. A. HERBERT (G3ATU)*

THE improvement in conditions seems to be continuing slowly and steadily with all three h.f. bands contributing something to the picture. There is comment on doings from Top Band down to 10 m which takes pride of place this month.

Ten Metres

Ten has seen frequent openings—mostly to Europe—but with real DX workable from time to time. The very fact that there *is* DX at this time of year seems quite significant. Even **GM3JDR,** way up in Wick, worked LU9EV, but then had to fall back on G3IDG and a spate of DL/DJs! **G3ATU** put a few watts on the band and worked DI1AK (Heidelberg) and some Fs, while **A.1290** logged 'phone DX from VQ2AT (15.30), VQ2NS, OQ5RU, LU3MZ (21.00), LU3AAT and ten European countries. **B.R.S. 20135** heard VQs 2NS, 4AQ and 4EU, CR6AO, CN8, 3V8, ZD3BFC, LU and ZB1JRK. **A.1291** pulled in W2ZGE/MM (25 miles east of New York), CX4CS, 5CV, VQ2, 4 and OK1FC (on s.s.b.). **B.R.S. 20106** noted CR6AI on c.w. and is still hearing LU and ZL on 7 M/cs, recently logging ZLs 1AH, 2PV, 2KN, 3GQ and 4GJ. He even heard a W5, K4BUR and VE1ZZ on 3.5 Mc/s.

Top Band

National Field Day happenings bring forth comment from **B.R.S. 20410** (Wigan), always a keen user of the band. On June 4, using a tiny receiver (1.4 W consumption) and a 115ft sloping aerial, he heard 33 counties in 2½ hours. Despite the long days, G-DX is still to be worked, '20410 heard G2FOL's ¼ watt 'phone transmission at a distance of 40 miles when '2FOL was using a kite aerial. He is a bit doubtful about GM3ESS, heard recently, but he has no doubts at all as to the status of VK1HI and a W5 heard in contact one evening!

Fifteen Metres

At last the days of "week-end only" activity seem to have departed because more and more stations are using the band regularly. Although Spring and Summer can usually be regarded as off-seasons on these relatively high frequencies, long distance openings have occurred recently, mostly in the evenings and to the West and South. Numerous outbursts of sporadic-E have produced strong signals from all over the U.K., often with the DX coming through at the same time and apparently easier to work than on 20 in similar conditions. Another interesting fact to emerge is the preponderance of 'phone on the band—G3AAE puts the proportion as high as fifty 'phone stations to every one on c.w.!—things, in fact, are just as they were on 10 m a few years ago.

G8DR (London, N.W.2) replies effectively to our recent comment that nobody would own up to working anything on 21 Mc/s. His 'phone tally includes such DX as FF8AK, BK, KP4YL, VQ4s FB, FO, RF, EU, OQ5, OQ0, M1B, HP3FL, VQ5EK, TI2GC, CE3, VP5SC, VP6, VP9BO, LU, YV5, OA5G, TG9AZ, ZP, KZ5, KV4, CX, CR6BX, FQ8AR, ZE3JL, FA and W1, 2, 3, 4, 5, 6 and 8! **G3AAE** (Barnet) took time off from constructional activities to work VP5, VP6, VP9, HC1ER, CE2CI, TG9, CX, VQ2PL, ZE2JK, ZS4FP, FF8 and OQ5 on 'phone and YN1AA, 9S4AX and JA3AH on c.w. Six months on 'phone have netted him 82 countries. Although **B.R.S. 20135** (Newport, I.o.W.) found things quiet during the month, with deep and troublesome fading, he logged 'phone signals from VQ5EK, SU1CN, ZD1SW, ZS3AB, ZC4BA, VS2DQ, PZ1RM, FY7YE and some Ws. **A.1291** (Ashtead) has heard 87 countries on 'phone this year with ZD4BL, CR9AH (RS56, 13.00), CP5EK, VS2DQ, YI3WW, LX1DC, VQ5FS and ZD9AC to his recent credit. **B.R.S. 20106** (Petts Wood) lists his best on 'phone as FM7WQ, HH2W, UQ2AN (Riga, 21.15), YI3 and VP4LL, with EA6, MP4 and much else heard. Norman's best on the key were VP8AQ, ZD6RM, ZS3E, CE6AB, VS6CL, WN3ZKH and LB8XC (who could be interesting). **R. J. R. Crocker** (Plymouth) notes an all-round improvement, although little was heard from the East. Specializing in 'phone, he dug out ZD3BFC, SP, VP4LL, PZ1RM, CR9AH (13.00), TI2BA, TI2RC, OA4AQ, VP6JK, 6WR, 6FR, KG4AV, PJ2AO, FY7YE, KP4ACI/KP4, FM7WQ, ZP9AY, KZ5MB, HC1EP, HK3PC, ZD1SW and almost everything logged by others! Maritime mobiles heard include W5AXI (02°S:03°W), W3MCJ (45°N:30°W), W8QOH (03°S:08°W), K2KGW (03°N:47°W), W7CZU (off Peru), W1OSF (07°N:82°W), K2BJB (600 miles west of Ireland), W5YMX (off Venezuela) and W2ZXM (*s.s. Flying Enterprise II* in the Mediterranean). **G3ATU** is using a push-push 807 doubler arrangement until something more efficient can be persuaded on to the band. However, ZD2DCP was worked on c.w. and a VP6 on 'phone, using an oddly-shaped wire as a radiator. Apparently the proverbial "piece of wet string" is all that is required when things are right. **A.1290** (Blackheath) found G.C.E. studies left little time for listening but did hear CT3AD (21.30), HB9QQ/MM, KV4BD, VQ4, VE3EN (21.20), W, ZD4, ZS and ZD1SW. ZB1JRK was heard to say that U.K. TV stations are often audible at good strength in Malta. '1290 has a QSL from ZL1ABL, confirming reception on 27/9/55. Someone must be using a crystal-ball front end!

Twenty Metres

At the beginning of the month things were lively but tailed off somewhat later. (An outsize sun-spot had something to do with this—S. A. H.) Some of the rarer Pacific calls continue to be heard in the early mornings—much to the delight of chasers after W.A.P.—and things are still humming until well after midnight on occasions. **B.R.S. 20317** (Bromley) lists on c.w. JA2, 5, 6 and 7, KL7BHK (16.45), VS1GL, VS6CL, CG, CT and DD (heard 16.45-19.30 for five days running), YI2AM, ZD6BX, UA9, UG, UN and UP. Stations were calling ZK1BG (16.50), YA6GAL and YA4BBR (more of these

*Roker House, St. George's Terrace, Roker, Sunderland.

two anon). On 'phone he heard CE2, FF8 and KR6KS. He now has 146C in 37 zones. **G3KBH** (Gravesend), who studies at Bristol University, has confined his home operating to vacations, mostly on 14 Mc/s using either a crystal-controlled rig or an Elizabethan and a N/S dipole; 39 countries have been worked, among them VK, ZL, VS1 and 2. VS2EM was a solid S6 while running only *two* watts into a Windom! Incidentally, VS2EM is looking for GW3IYI on the band. **G3KBN** (Stockport) is still doing well with his single crystal 14 W rig. New countries worked include VS1BJ, ST2AC, VE6VK, VE8AW, LU8FBH and VK4YP (23.00). W6EYJ/VK4 (Townsville) is active and W4GBS/AM was heard while flying over Brazil. **GM3JDR** (Wick) sends news of DX doings in Northern Scotland. He has been on the band "seriously" for three months during which time 112 countries (70 confirmed), 43 States and 35 Zones have been worked with the aid of a ground-plane and a 270ft wire for 10 and 15. On c.w. he worked XE2OK (07.00—the XE's first GM), VQ3FN, W0QAZ (Colo.), W7TQO (Wyo.), VE4TJ, 7AEC, KL7, KH6, VS6, EL2P, 4S7GE, VP5DC (Turks), ZR6RM, 3A2AW, KG1AA, 1JB, FQ8AG, VE8MA, ZD4BM, VP9CB, JA, KA and VE5. GM3JDR holds the first W.A.V. and W.G.S.A. certificates to reach GM and is awaiting his W.A.E. **G3AAE** paid a brief visit to the band and was rewarded by FY7YE, dug from under a seething mass! **B.R.S. 20135** was almost deafened by European 'phone clamour and settled for VS1FS. 6CW, KA7JS (19.00), YI2AM, TF2WAF and an OQ0. **B.R.S. 20106** is up to 185 countries this year, helped by FO8AB, 8AM (07.00), ZD9AC, YN1AA, YS1O, ZD3A, FI8BL (13.20), UA0KAD, 0KOA, VP5DC, VS5CT, EA0AB, 0AC, VU2MA, MP4JO, ZD2WAF, VQ6LQ, HE1OP and the brow-furrowing pair—YA6GAL and ZA1AB, on c.w. He also lists 'phone from KH6BBE, CP5CB, KG1AA (Thule), TG9RB, VK7AZ (S9 at 04.35), YS1MS, VP4LL, HI and ZS3AB etc. **R. J. R. Crocker** found things better, even in the commercial-infested early mornings, and heard such 'phone as SU1CN, 1AS, MP4QAI, VK7AZ, 7RX, 6DX, HC1, TI, VE8, OY2Z, VE7ZM, ET2US, 2XX, HC8GI (Galapagos) and MP4KK.

Afghanistan? Maybe!

One recent evening saw 20 metres burst into violent activity as a gentleman signing YA6GAL took the air. His operating was faultless. Ten to fifteen kc/s off his frequency or no QSO; good Morse; lots of contacts; please QSL to W6GAL. This went on for several hours with everybody happy until up popped W6GAL/7 himself, still firmly ensconced in Arizona, and wondering what all this was in aid of. The YA then faded out, or disappeared, which seems a pity because the two of them could have had an interesting QSO! Further comment on the subject comes from **W6YY,** who remarks; "The YA said he was W6NZK and to QSL to W6GAL. He peaked in the right direction and VQ4NZK is known to be moving around as sound man for a Hollywood movie crew. But W6GAL knows nothing of the matter and is hoping for lots of QSLs with dollar bills enclosed!"

News from Overseas

W6YY, just mentioned, provides in addition an impressive catalogue of "gen" on matters topical: VS1CZ says AC3SQ is now AC5SQ (Bhutan) and uses 14114 kc/s around 14.00 G.M.T. W6SYG received the first batch of logs from VR6AC; more are on the way. VQ8AX was heard on A3 on June 14. KP6AK, heard one evening after a long absence, worked only KH6s. VK9RH (Norfolk Is.) is active only on Saturdays and Sundays, N.Z. time (04.00-06.00 G.M.T.). By the end of May, BV1US (Formosa) had worked about 1,000 stations. W6VUP and party departed in early June for the Caribbean, where they hope to work from FG7 and St. Martin's Is. (PJ2), etc. The call-signs to be used are not yet known. VS5CT closed down on May 30 and commenced operation from VS4CT on June 5. After three months there and three or four in Br. N. Borneo

Frequency Predictions for July, 1955

PREPARED BY J. DOUGLAS KAY (G3AAE)

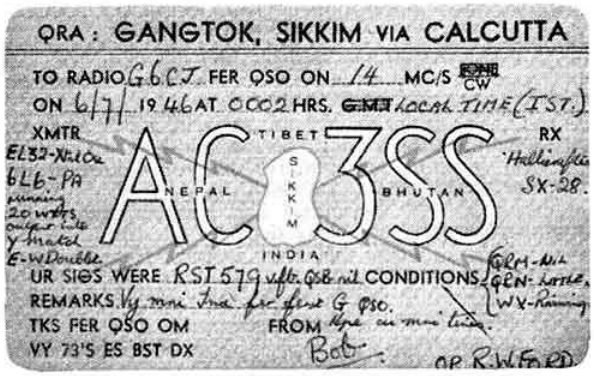
BAND	NORTH AMERICA	CENTRAL AMERICA	SOUTH AMERICA	SOUTH AFRICA	NEAR EAST	MIDDLE EAST	FAR EAST	AUSTRALIA
28 Mc/s	2200	2200	1930—2100	1600	1930—2000	1800	0700	0730
21 Mc/s	2200	2100—2330	1530—2300	0830—1700	0800—2130	0730—0900	0700	0730
14 Mc/s	1100—0030	1000—0030	1000—0030	0630—2000	0500—2300	0600—1930	1000—1600	0700—0830 2100—0100
7 Mc/s	0100—0700	0200—0600	0400—0700	2100—0430	2200—0400	2200—2400	2130—2230	1715—2100
3.5 Mc/s	0600	0400	0800	0400	0130	2230	2200	2030

These predictions are based on information provided by the Engineer-in-Chief of the Post Office. All times are G.M.T.

It should be noted that between May and September propagation by sporadic E may result in short skip contacts on the 14, 21 and 28 Mc/s bands. The incidence of sporadic E is unpredictable but is most pronounced around midday and dusk.

(ZC5) he may return to Brunei. VR6AC will definitely be on twice a week for W contacts. The rest of the week he charges his batteries. He is shielded from VK/ZL by a 1,000ft hill and is using a small Vee beam pointing to the U.S.A. W6YY has sent him a folded dipole to sling in another direction with perhaps a 15 and a 40 m dipole to follow. A QSL from **ZC2PJ** says "Returning to Ceylon in August but hope my relief will take the rig over so as to keep ZC2 on the air. Hope to try 'phone about the end of June. Am awaiting components."

The up-to-the-minute *Bulletin* of the Southern California DX Club has been ransacked for news of ZK1AB who is in New Zealand for additional surgery but expects to be back in Cook Is. by July. He finishes his term as Radio Inspector in October or November and will then retire to N.Z. Reports of QSOs with ZK1BC come in from time to time. To quote ZK1AB, "Some people have a very poor sense of humour and responsibility." ZK1BC was killed in the N.Z. train disaster of 1952 and the call has *not* been reissued. ZC3AC has replaced ZC3AB, who is now YJ1DL. ZC3AC was worked by a JA around 14080 kc/s.



A RARE CARD OF TOPICAL INTEREST

Bob Ford—recently released by Chinese Communists—once operated as AC3SS from Sikkim. "Dud" Charman, G6CJ, was one of the few G's to work him from that rare DX spot.

MP4QAL has worked CR8AB on c.w. C3WV is licensed for amateur operation in Formosa.

B.R.S. 18541 is active daily on 14 Mc/s with the call-sign **4S7PT.** So far, c.w. contacts have been with G3IRL, OH1PI, HB9NE, DL1JW and F3HA, plus "locals" such as 4X4, VU and VS1! **ZD3A** made contact with two unspecified G portables during N.F.D. but called G6VG/P, G2GA/P, GC2ASO/P and EI9Y/P without success. Unfortunately conditions on the Sunday of N.F.D. were bad. Both ZD3A and ZD3BFC were on 20 waiting to give the portable boys a chance, but they couldn't hear Europe at all. After a year at home, where he has been active as GM3IZE, George Stewart shortly returns to the Gold Coast. By mid-August he hopes to be operating again as **ZD4AE** and putting a healthy signal out from Tarkwa, where he will certainly find working DX somewhat easier than was the case from Scotland! **G2MI** says that SM5ARP recently visited the operator of FB8XX whilst in France. He saw a big pile of QSL cards being filled in!

* * *

And so another month passes. Thank you for your reports and comments, and should holidays and fine weather leave any time for Amateur Radio, may we have your findings by July 20, please? Good DX, luck and 73.

Slow Morse Practice Transmissions

B.S.T.	Call	kc/s	Town
Sundays			
09.00	G3GYV	1900	Hartford, near Northwich
09.30	G3BKE	1900	Newcastle-on-Tyne
10.00	G6MH	1990	Southend-on-Sea
10.30†	G3DGN / G3GZB	1930	North London
11.00	G2FXA	1900	Stockton-on-Tees
12.00	G3LP	1850	Cheltenham
12.00	G3JBU	1850	Northampton
12.00	G15UR	1860	Belfast
14.00	G5AM	1900	Witnesham, Ipswich
21.00	G2FIX	1812	Nr. Salisbury
Mondays			
19.00	G3NC	1825	Swindon
19.00	G3JBU	1850	Northampton
20.45	G3EKW	1915	Nottingham
21.00	G3BLN	1900	Bournemouth
21.00	G3FSM	1900	Brentwood
22.15	G2BRH	1900	Ilford
Tuesdays			
18.30	G2FXA	1900	Stockton-on-Tees
18.30	G3JMP	1875	Bristol
20.30	G3GDZ	1905	Kingsbury, N.W.9
21.00	G3EFA	1855	Southport
22.30	G3IIR	1915	Norwood
Wednesdays			
19.00	G3HUB/A	1902	Chelmsford
22.30	G3FBA	1910	Bath
Thursdays			
19.00	G3NC	1825	Swindon
19.15	G2FRX	1850	Plymouth
20.00†	G2CPS / G2CNX / G3GWT	1910	Hull, Yorks.
20.30	G3JQM	1878	Barwick, Yeovil
22.30	G3ADZ	1940	Southsea
23.00	G3LA	1915	Brentwood
Fridays			
18.00	G3GEN	1900	Gloucester
19.00	G3BLN	1900	Bournemouth
20.00†	G3CSG / G3EGX / G3ERB	1875	Wirral
Saturdays			
13.00	G2FXA	1900	Stockton-on-Tees

† *Alternately.*

Slow Morse transmissions are organised by Mr. C. H. L. Edwards (G8TL), 28 Morgan Crescent, Theydon Bois, Essex. Members using the service are requested to send listener-reports to the stations concerned.

LONDON MEMBERS' LUNCHEON CLUB

will meet at the Bedford Corner Hotel, Bayley Street, Tottenham Court Road,

at 12.30 p.m. on Friday, July 15 and August 19, 1955.

Telephone table reservations to HOL 7373 prior to day of luncheon. Visiting amateurs especially welcome.

International Gathering

BOB FORD (AC4RF, AC3SS) was entertained by the Immediate Past President, Arthur Milne (G2MI), the Executive Vice President, Reg. Hammans (G2IG), and the General Secretary when he visited London shortly after his return to England. At the same gathering were Luis Desmares (CE3AG, CE3AX, ex-CE0AA), Earl Anderson (W2UE) and William Schweitzer (W2KG). Bob Ford, whose adventures in Tibet and China have been the subject of a fascinating series of articles in the London *Daily Mail*, asked that his greetings be passed on to all old friends in the Society. He hopes to attend a meeting of the London Members' Luncheon Club during the autumn.

CQ Single Sideband

By H. F. KNOTT (G3CU)*

CONSTRUCTIVE self-criticism is a sign of a healthy institution and it is good to hear so much going on at the high end of the 3.5 Mc/s band. The discussions that have been taking place recently have been concentrated on operating practices and, in particular, on the frequent omission of call-signs. Several correspondents refer to this sorry state of affairs, one mentioning a multi-way contact which was apparently between stations with the following calls: Willie, Bo, Ted and Pete. Only one station signed correctly. One wonders if many s.s.b. operators are under the impression that they are exempt from the rules governing the use of call-signs as means of identification! Apart from the regulations, it should be remembered that call-signs are also a great help to newcomers to s.s.b. who naturally wish to identify the stations they hear.

While on the subject of operating, it is perhaps not out of place to ask for better netting. The constant readjustment of a receiver can be very harassing to the uninstructed when a contact is being followed and each station is transmitting for only a short time but sufficiently off frequency to be unintelligible.

Round and About

Since April at least thirteen more s.s.b. stations have come into active operation. GW3ELM (Llandudno), who employs an Edmunds filter exciter, is the first Welsh station regularly to use the system. G5UF (Dorchester) has a 2NH type filter, while G2HX and G2FJN each have two section half lattice exciters. Of those using phasing type rigs, G3FZB and G3HNU employ the G3CWC circuit and G2HQ a copy of the Multiphase.

G2FOS is active with a phasing exciter, while his brother G2AOO is in the process of building a filter transmitter to compare with his original phasing rig. G3GKA (Letchworth) is using a PT15 with pi-section output and 1500 V h.t. from a choke-less power supply. G3EFP, now resident in Cumberland, hopes to be active again soon.

G6HV, who is very interested in mobile s.s.b., expects to be fully operational with a 150 W peak signal shortly. To keep things simple and compact, he will be using a common filter and v.f.o. for the transmitter and receiver. G3FIH (Bath) is operating crystal control on 1930 kc/s. The rig uses a half lattice filter on 415 kc/s with an output of 1 W from a class A 12A6. The present set-up is intended for experimental purposes only; operation on 14 Mc/s is the real objective. Other stations heard using s.s.b. included G5BC (Pinner), G6ZQ, GW2BMN, G3ITI and G3ILD.

G3IXL is now an engineer with a Canadian company in Montreal. For the present his s.s.b. activities are at a standstill as he has to take another amateur examination (technical and Morse, 10 w.p.m.) and operate c.w. only for six months. This will be followed by a further six months on 28 Mc/s 'phone and a modulation technique examination before being granted full facilities. The cost of equipment in Canada is very high but G3IXL fortunately took his s.s.b. exciter with him.

Audio Phase-shift Network

From the numerous enquiries received it is clear that the phasing method is becoming extremely popular with newcomers to single sideband. Fortunately, components for the audio phase-shift network are now readily available; it is merely a question of obtaining some good quality types and assembling them. The capacitors may be bought commercially as sets matched to one per cent or alternatively made up of fixed mica components padded with good quality mica trimmers. The resistive elements should be the high stability (grade 1) type. For example, in the circuit shown in Fig. 1, R4 and R5 are standard 100,000 ohm 1 per cent tolerance resistors. However, R3 and R6 are made by putting 1.2 Megohm 10 per cent resistors in parallel with 150,000 ohm 1 per cent resistors. Careful selection of the former will enable the correct ratio of 3:4 to be obtained. The ratio rather than the actual value of the resistive elements is of great importance.

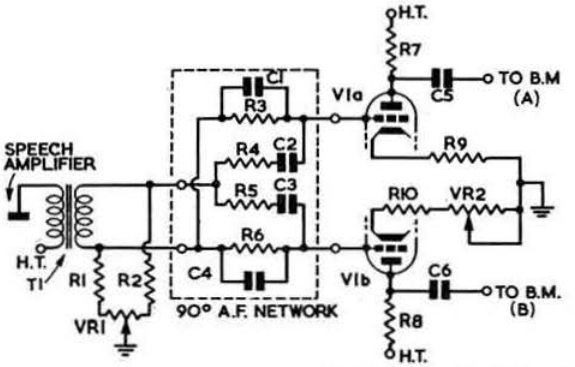


Fig. 1. The W2KUJ 90° Audio Phase-shift Network. C1, 2430 $\mu\mu$F (0.002 μF ± 5 per cent with 170–780 $\mu\mu$F trimmer); C2, 4860 $\mu\mu$F (0.0043 μF ± 5 per cent with 170–780 $\mu\mu$F trimmer); C3, 1215 $\mu\mu$F (0.001 μF ± 5 per cent with 50–380 $\mu\mu$F trimmer); C4, 607.5 $\mu\mu$F (500 $\mu\mu$F ± 10 per cent with 9–180 $\mu\mu$F trimmer); C5, 6, 0.05 μF 350 volt wkg., paper; R1, 430 ohms 5 per cent; R2, 1600 ohms 5 per cent; R3, 6, 133,300 ohms 1 per cent (see text); R4, 5, 100,000 ohms 1 per cent; R7, 8, 22,000 ohms 10 per cent; R9, 510 ohms 5 per cent; R10, 330 ohms 10 per cent; T1, 1.5:1 step down; V1a, V1b, 12AT7; VR1, 100 ohms pre-set; VR2, 500 ohms pre-set.

The circuit shown in Fig. 1 was developed for the "S.S.B. Jr." by W2KUJ of the General Electric Co. of New York and shows the 90° audio phase-shift network and its associated components. The speech amplifier preceding this should be designed to emphasize the intelligence bearing frequencies from 300 to 3000 c/s. With a suitably adjusted 90° r.f. phase-shift network a sideband suppression ratio of 39 db is possible at the worst points within the range. The average suppression ratio is approximately 45 db.

* * *

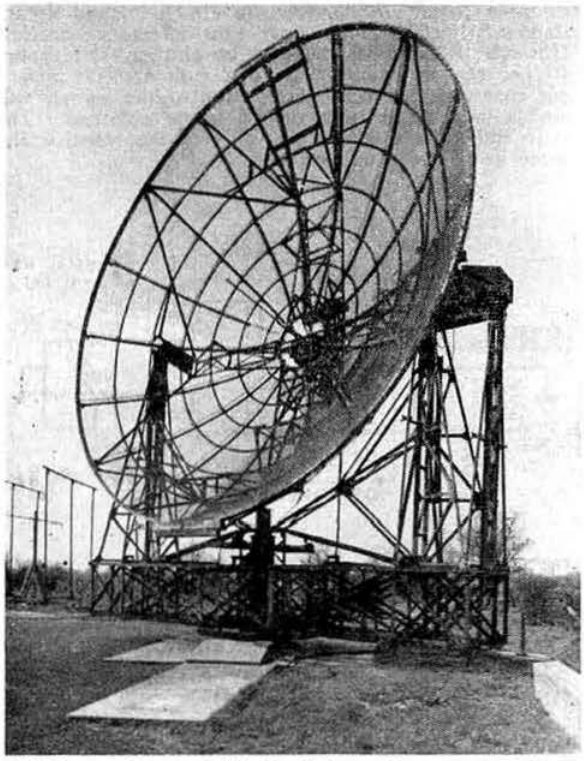
Correspondents are asked to note the writer's new address. The next issue to contain *CQ Single Sideband* will be that for October but letters well in advance of September 20 will be appreciated.

**15 Hampden Road, Wantage, Berkshire.*

Radio Astronomy and the Radio Amateur†

Part I

By R. C. JENNISON, Ph.D., B.Sc. (ex-G2AJV)*



A 30ft steerable paraboloid for hydrogen line measurements on 21 cm. Note the fine mesh of the bowl and diminutive aerial at the focus. The Yagis in the background (left) are used for meteor echo techniques.

It is now more than seven years since Martin Ryle (then G3CY) read a paper to the Society under the title "Radio Signals from the Sun." That paper—one of the very first delivered to a scientific body on the subject of Radio Astronomy—gave members an inkling of the tremendous strides which were then being made in this new field. Ryle's original work at the Cavendish Laboratory, Cambridge, is now widely acclaimed.

In the article which follows Roger Jennison (until recently G2AJV) seeks to bring our knowledge of Radio Astronomy up to date.

IT is hoped that this brief account may interest and encourage radio amateurs who are fascinated by the prospect of helping to unravel a little of the mysteries of the universe, and also those who enjoy just dabbling with electronics as a break from QSOs.

An acquaintance with the general picture of the astronomical universe is necessary if one is interested in pursuing the subject of radio astronomy, but there is certainly no need for every radio astronomer to be an astrophysicist. In this article, before very briefly reviewing some of the more simple and interesting of the present techniques, and before discussing the trials and tribulations that may be in store for the radio amateur, we shall first try to obtain a very broad picture of the universe around us and of our own place in it.

The Astronomical Universe

In this peep at the Universe we shall start with the solar system and a few facts which we all know and then work our way out to the stars and galaxies beyond.

The Moon revolves around the Earth at a mean distance of about 200,000 miles. As the velocity of light is 186,000 miles per second, moonlight takes about one second to reach us; radar echoes sent back to the Earth from the Moon therefore take about two seconds in transit. The Moon and the Earth together revolve around the Sun, as do the remainder of the planets. All the planets revolve around the Sun in elliptical orbits. The mean distance from the Sun to the Earth is about 90,000,000 miles and sunlight takes about seven minutes to reach us; the distance from the Sun to the outermost planet, Neptune, is approximately 3,000,000,000 miles.

The orbits of the planets are crossed by the much more elongated orbits of the comets and meteor streams. Unless we spend our lives star-gazing, most of us are lucky if we see one comet in a lifetime, but meteors may be seen quite frequently, especially on clear nights in the Autumn. Meteors are tiny pieces of compressed dust, about the size of a pin head. This dust is distributed in a continuous thin stream all the way round the orbit and it is thought that it may be the debris from disintegrated comets. As the orbits of the meteor streams are narrow and drawn out, they each cut the orbit of the Earth twice during the Earth's yearly voyage round the Sun. On entering the Earth's atmosphere their velocity is of the order of 10 or 20 kilometres a second and they burn up at a height of about 100 kilometres to leave a visible streak by which we see them, and a column of ionised gas which enables us to detect them by radar. It will be apparent from the diagram in Fig. 1 that the Earth's orbit always intersects that of a particular meteor shower at the same point, or pair of points. For this reason each meteor shower occurs regularly each year, and, furthermore, the trajectories of all the meteors in a particular shower are roughly parallel; as seen by an observer on Earth they therefore appear to radiate from a single point in the heavens—called the *radiant* of the meteor shower. All the meteor showers are known by the constellations wherein their radiants appear to be situated, e.g. the Perseids and the Leonids from the constellations of Perseus and Leo respectively. By measuring the velocity of a meteor as it enters the Earth's atmosphere it is possible to compute the shape of its orbit. If the velocity exceeds a certain definite value, known as the parabolic limit, the orbit of the meteor can no longer be an ellipse making a continuous circuit

†Based on a lecture delivered to the Society at the Institution of Electrical Engineers, London, on February 25, 1955.

**Jodrell Bank Experimental Station, Lower Withington, Macclesfield, Cheshire.*

round the Sun, but must be a hyperbola; this means that the particular meteor is not a member of the solar system, and, had it not been intercepted by the Earth, it would have made just one swoop round the Sun and then disappeared again away amongst the stars.

If we journey out beyond the solar system we have to travel about 4 light years before we encounter the nearest star. Now a light year is about 6,000,000,000,000 miles. The scale can be visualised if we consider the Sun as the size of a billiard ball in London; the nearest star would then be an object of the same order of size in Edinburgh! The separation between the Sun and its neighbours is typical of that between all the stars in our Galaxy; yet our Galaxy contains about 100,000,000,000 stars. All these stars are distributed in a flat disc having a spiral structure and a hub at the centre, rather like a gigantic catherine wheel except that, instead of one spiral arm, the Galaxy has several. The solar system is situated in one of these great tentacles about two-thirds of the way out from the Galactic nucleus, or hub, to the edge of the disc. The actual distance of the Sun from the nucleus is about 2×10^{17} miles. When we look into the sky on a clear night and see the Milky Way we are actually seeing the stars in

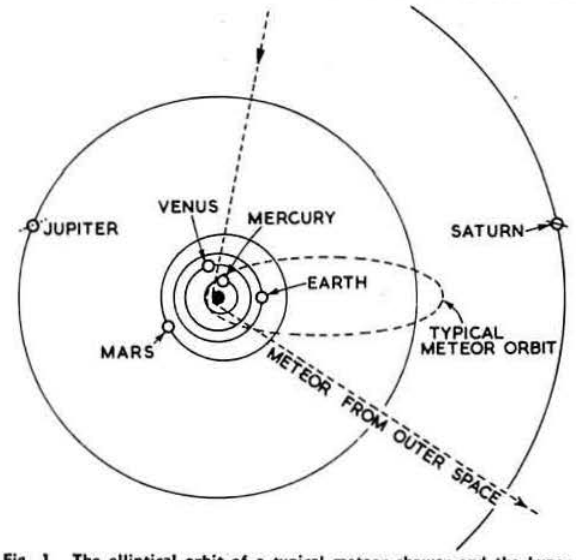


Fig. 1. The elliptical orbit of a typical meteor shower and the hyperbolic trajectory of a meteor from outer space.

the plane of the disc. Looking to either side of the Milky Way the stars appear less numerous as we are looking outwards through the nearer stars at right-angles to the plane of the disc. Why, the reader may ask, do we not see the bright nucleus of the Galaxy? The answer is that we do, but only on radio wavelengths; on optical wavelengths it is obscured by clouds of dust. These dust clouds are similar in form to ordinary earth-bound clouds but are on the average about 30 light years across. The distance between each particle of dust may be many miles, but the aggregate is sufficient to black out all the stars shining from behind. The dust clouds are confined to a very thin sheet in each spiral arm coincident with the plane of the Galaxy. When we look up at the Milky Way they appear to us as holes in the belt of stars. Also roughly coincident with the dust clouds there is a thin sheet of gas running through the Galaxy, which is almost entirely hydrogen and has a density of about one atom per cubic centimetre; that is, about 10^{-19} the density of air, yet it is one of the chief sources of emission of radio waves.

Our own Galaxy with its myriads of stars is just one of millions of similar galaxies scattered through space. They stretch to the limit of the observable universe, and there may be many more than the most intensive searches with the largest telescope have yet revealed. Though in some parts of the sky these galaxies occur in clusters, they move about to a large extent independently of each other. As the distance between each galaxy is not many times the size of each, collisions between them may sometimes occur. A striking example of such a cosmic catastrophe has been identified with the radio source in Cygnus, the second strongest of the radio "stars." The distance to the Cygnus radio source is 100,000,000 light years, the distance to the Andromeda nebula, the nearest of the external galaxies, is about a million light years.

Radio Astronomy Techniques

Equipment for the detection of meteor echoes may be either c.w. or pulse operated. In the former case the meteor reflections give rise to whistles lasting a fraction of a second; the radiants and velocities of the meteors in a particular shower may be determined by using a single receiver with two aerials pointing at right-angles. The measurement of the corresponding quantities for a single meteor, however, requires a more complex system of three receivers spaced at the points of a triangle about a mile apart. Pulse techniques require a peak pulse power of the order of a kilowatt and enable measurements to be more simply performed from one station, but as the meteor trails only reflect efficiently radio waves longer than about 3 metres, amateur work in this sphere must be largely confined to c.w. operation. The same equipment as that used for meteor echoes may also be used for detection of the Aurora Borealis; in this case the rays, curtains and streamers of the aurora consist of gas ionised to a similar degree to that in meteor trails, but the ionisation is less fleeting and the echoes persist for long periods, during which they usually show progressive motion in the direction of the magnetic poles.

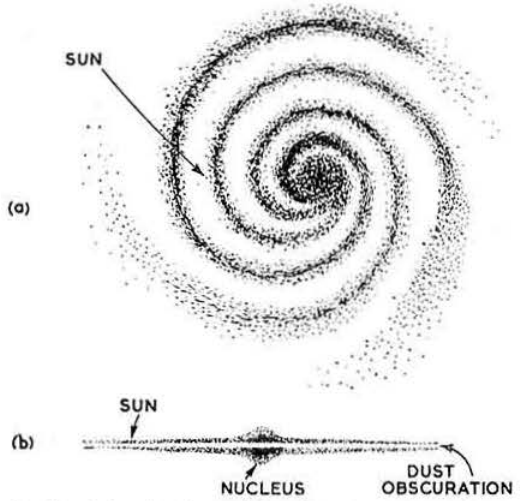


Fig. 2. The Galaxy in plan and elevation. Note the restriction of the obscuring matter to the plane of the system. The distance from the Sun to the centre is about 2.10^{17} miles. There are about 10^{11} stars in the Galaxy and there are millions of other similar galaxies distributed throughout space.

The aerial requirement for work on meteors and the aurora is essentially one Yagi. The optimum amateur band at the present time is 28 Mc/s.

Radio echoes from the Moon require a minimum mean power of about a kilowatt, preferably pulsed with a pulse length of the order of milliseconds in order to allow time for the echoes from the more distant parts of the Moon to be reflected back with those from the nearer central parts and thus give a reinforcement of the received signal. Lunar echoes suffer a severe rotation of the plane of polarisation of the radio waves during their passage through the ionosphere, and for consistent results it is advisable to use a circularly polarised aerial array with an aperture of at least 150 square metres. Much more complex techniques than those at present in use are required in order to glean useful information about the Moon from radio echoes. As shying pulses at the Moon is at the best of times a costly business, I would not recommend it to any amateur.

Radio noise signals from the Sun and the Galaxy give much more scope for the amateur with restricted means, for the requirements for simple but useful experiments in this field are both less costly and less cumbersome. In order to detect the solar radio emission anywhere in the range of frequencies from 30 to 200 Mc/s, a simple dipole connected to a stable receiver will suffice. The bandwidth of the receiver should be as large as possible, consistent with the avoidance of man-made interference—5 Mc/s is excellent but 100 kc/s will suffice—and the detector circuit should feed a time constant of about one second in order to integrate the noise output. If the detector has a square law characteristic then the increments of d.c. output are directly proportional to the increments of noise power at the aerial, but the noise ripple on the d.c. output, tending to mask very small changes of level, is inversely dependent upon the square root of the product of the bandwidth and integration time. In order to detect very small changes of noise entering the aerial one can therefore either use a very large aerial in order to increase the increments at the input, or one can more simply and cheaply use a broad band receiver having a large time constant at the detector (Fig. 3 (a)). A receiver has recently been constructed for use in this field in which the bandwidth is 20 Mc/s and the integration time ten hours. This, however, is most exceptional and requires fabulous stabilization of all the equipment. A dipole aerial connected to a simple superhet having a bandwidth of 0.5 Mc/s and an integration time of one second will give a clearly visible increase in output as the Galaxy moves through the aerial beam, but as the beam width is so large for a dipole the receiver itself must stay constant in gain for a very long time, practically a whole day. The detection of the radiation from the quiet Sun places similar requirements on the stability of the receiver if only a dipole aerial is used, though the very much stronger bursts of noise from sunspots and solar flares, when they occur, may easily be detected on an unstabilized receiver. Preferably, both the h.t. and l.t. supplies should be stabilized for all this work, though there are a number of circuit arrangements for the receiving equipment which only give an output for noise actually entering the aerial. In one of these methods (Fig. 3 (b)), the input of the receiver is continually switched between the aerial and a noise diode, whilst the output is switched in synchronism to feed a corresponding difference signal back to the filament of the noise diode; the noise diode therefore is always automatically maintained at the same level as the noise entering from the aerial. The level of the latter may be directly observed on a milliameter in the anode circuit of the diode. An entirely different method of obtaining an output from only the noise signals entering the aerial is to use a phase switched, or preferably a phase rotated, interferometer. We shall return to this method later.

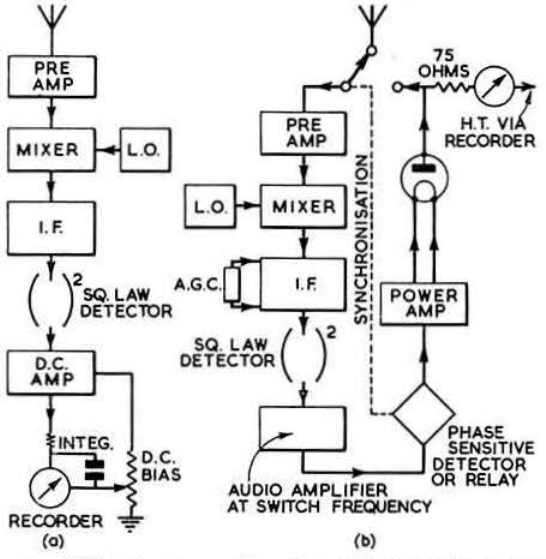


Fig. 3. (a) Simple noise receiver. The condenser across the meter is shown to represent an integration time of about 2 seconds obtained in practice from, say, a 1 MΩ resistance feeding 2 μF at the input of the d.c. amplifier or similar high impedance point. The gain of the d.c. amplifier should be 10 to 100. (b) A very stable and sensitive arrangement which self adjusts to the aerial noise. 3 db is lost in the switching process, but measurements of less than 1/1000 set noise are easily attainable.

Very simple aerial systems and equipment are used for the detection of the ionospheric scintillations which occasionally modulate the signals reaching the Earth from the radio stars. These scintillations correspond to the twinkling of ordinary stars and are due to the inhomogeneity of the upper layers of the Earth's atmosphere. If, say, a single Yagi is connected to a simple receiver tuned to a frequency between 30 and 100 Mc/s, the radiation from the Galaxy will be detected and the noise output of the receiver will be found to rise during the transit of the Galaxy through the aerial beam. About once or twice a week it may be observed that there also occurs a rapidly fluctuating signal lasting for a time comparable with the motion of a celestial body through the aerial beam. These signals will be due to the radio stars in Cygnus and Cassiopeia, the two most intense of the radio sources, but the fluctuations come from the F layer of the ionosphere, not from the radio sources. By comparing the records of twinkling received at two or three stations spaced about a mile apart it is possible to determine the size and shape of the irregularities in the ionosphere and also the speed at which they move. This simple experimental technique has contributed greatly to our knowledge of the ionosphere during the last few years and general surveys are now being undertaken by small institutions and amateur bodies all over the world.

To be concluded next month

Two Metre Activity in Kenya

FROM the *F.O.C. News-letter* we learn there is a great deal of 2 m activity in Kenya, and that efforts are to be made to capture the 2 m world record. Any further news would be welcomed.

TWO METRES AND DOWN

By F. G. LAMBETH (G2AIW)*

LAST month we quoted a report of the reception of U.S.A. signals on 2 m but unhappily the report could not be confirmed. It is now believed that the transmission may have been a re-broadcast. However, the event brings home to us once again the dream of many a v.h.f. man—namely, to be the first to work across the Atlantic on 2 m—which is, in the opinion of the writer, by no means impossible. Predictions on such matters are, of course, valueless, but it looks as if one day, in the not very distant future, such a contact will take place. It would be useful if those in a good position would keep an ear open in the westerly direction. It would also be an advantage if our American friends could co-operate in test transmissions at times to be arranged. The vagaries of conditions on 2 m are well known by now, and almost every opening brings something which has never been experienced before. The expectation that a British operator will one day set up a 2 m station on the top of one of our mountains and proceed to work a W or VE on that band is something quite pleasant to look forward to.

Aerial Change-over Arrangements

A correspondent has raised the point that little is known about the aerial change-over systems in general use by 2 m and 70 cm stations. It is pointed out that it is possible to adapt standard "high loss" relays for co-axial use on 2 m, but that for 70 cm this is undesirable. It is claimed that one of the old porcelain base d.p.d.t. knife switches operates quite efficiently for switching 300 ohm line at 435 Mc/s. As many people lose valuable S points at this extremely vulnerable point in their equipment, some information on tried and proven change-over systems would be very much appreciated.

Two Metre Band Plan

G2YB (Reading) voices a complaint that something should be done for stations in the western part of the country. He suggests that the Band Plan operates against them because Continental stations, especially, usually tune from the low frequency end and have made many QSOs by the time they reach the high end, if they ever do. G2YB thinks and we agree that Continental stations should be told about our Band Plan and, of course, we reiterate that British stations should adhere to it. G2YB also says that the attenuation on DX signals from east to west is greater than many London people think. This is partly due to location, however; shielded positions are seldom satisfactory.

Swiss Mountain-top Activity

From **G6LL** we learn that **HB9RO** will be operating on 2 m and 70 cm on the Dole Mountain (6° 07′ 39″ E 46° 25′ 17″ N) from the end of July. The equipment includes crystal controlled converters for both bands, a 4-element array for 2 m and a 32-element beam for 70 cm. The aerials are mounted 125ft above ground on top of a television station tower at a site 4,650ft a.s.l.

Preliminary tests on 2 m with the beam only 10ft above the ground and an input of 0.5 W to the transmitter have been most encouraging and HB9RO hopes to be able to work British stations on both bands.

Two Metre Activities

During the past month there would have been nothing special to report if it had not been for the phenomenal conditions of the Whitsun holiday period. With stations from North East Scotland and most of England (the Midlands and West appear to have been unlucky) working the Continent as never before and the band open at various times from Kiel to Cherbourg (with the odd OZ and SM audible as well), it is a pity this could not be more spread out in time. The bright point is, of course, that it coincided with a period when most operators were available to enjoy it. It is evident, however, that even at times outside openings there is still activity at DX level for those who will take the trouble to listen or to call for it. At the end of the period G-DX was again possible; GM2FHH (Aberdeen) was heard and worked in the south, with Lancashire and Yorkshire stations providing very strong signals.

Station Reports, 2 m

G3JGJ (Plympton) has erected his tower and should have a 4-element beam going by now. **G2ADZ** (Woolacombe) has been worked on *2 m*, '3JGJ using his *70 cm* beam as the 2 m aerial was not then ready. On erecting a temporary 4-element beam, F3LC, G3AUS, 2BAT, 5TZ, GC2FZC and GW8UH were all heard at good strength. No replies were received, however. **B.R.S. 19162** (Dewsbury) reports his best period as Whitsuntide, when he heard his first PA0s, but no DLs. G5TZ (I.o.W.), who is rarely receivable, was heard well on June 8.

G3XC (Slough) made a round trip during the period May 30 to June 2 and the results are in *Worked and Heard*. '3XC thinks activity in and around London during TV is poor, but in the Midlands seemed completely non-existent, with the North not much better (two stations)! '3XC's equipment is permanently fitted in the pocket of his car. The only external leads are for microphone and co-ax to the 4-element Yagi (portable) and ¼ wave vertical (mobile). **G5BD** (Mablethorpe) calls the period May 29-June 2 "super" and says that the band was full of S9 'phone Continentals (mainly DL and PA) from 20.00 on May 29 until 02.30 on May 30. About 100 different DX calls were heard during the opening. All stations appeared to be the same strength (S9). Later the direction changed and F stations, plus GC3EBK and GM2FHH, were worked. PA0BN informed G5BD that he had had 152 contacts with LX, DL, PA, ON, F and G. '5BD heard OZ7SP in contact with G2AIW, but could not raise him. A 21 Mc/s QSO with I1BLF/T brought the news that he operates also on 144.72 Mc/s with 22 W to a 5-over-5 array. **G2ARX** (Mablethorpe) had 25 QSOs with DL, ON and PA0, using 100 W to an 829B, a pair of slots and a

*21 Bridge Way, Whitton, Twickenham, Middlesex.

cascode converter. **G5LL** (Mablethorpe) with an 832, and an indoor 3-over-3-over-3, also had his first real DX contacts, working into DL and PA0.

GM2FHH (Aberdeen) says that all signals were good solid copy during the same period, his longest distance contact being with DL9LU (about 580 miles). Outstanding signals were ON4BZ, DL9BD and PE1PL. It seems that the opening missed Glasgow and Edinburgh and that the blank area extended to beyond Newcastle. GM2FHH was heard by G2AIW (Twickenham) on the night of June 18-19, but no QSO resulted. '2FHH worked G3GHO (Roade) and G6NB (Brill) as well as Yorkshire and Lincolnshire stations.

G2HIF (Wantage) has been operating portable in Berkshire, Dorset, Hampshire, Somerset, Rutland and Yorkshire. The Berks and Somerset trips were to get the equipment working "away from the soldering iron." Great difficulty was experienced in locating sites which had not been pre-empted by radio relay stations or other services, official or otherwise. A QSO with G3GNJ/P was followed by a personal one, as it transpired they were both working from the Mendips near Blagdon. They were, in fact, just out of sight of each other! Nobody appeared to be interested in the Rutland operations, an hour's calling bringing no replies although stations were heard on the band. After a poor start at Hessle (nr. Hull) the following day brought success of a sort as four stations were worked. G2HIF/P, undaunted, is liable to pop up anywhere!

G3EMU (Canterbury; he calls it the worst v.h.f. location) mentions the opening and says PA0 is still his best direction. DL, F and ON4 were also worked. A pair of QV06/20s have been "tied on" to the 832 and it is hoped to use them in a rebuilt transmitter soon. **G6TA** (Streatham) worked OZ7SP among other Continentals; turning his aerial north and north-west he worked a lot of Midland and North Country stations not previously contacted. **G3DGI** (Barnet), a newcomer on 2 m, is using 15 W to an 832A. The beam (a 3-element Yagi 12ft above ground) is temporary and will be replaced soon by a 4-over-4 about 450ft a.s.l.

G2CZS (Chelmsford) has done little lately, but was active during the opening at Whitsun. One "CQ" brought back *six* PA0s, a condition never before experienced even with G stations! Best DX to date (DL3QH, nr. Hamburg) who was worked on May 31. **B.R.S. 6327** (Earlsfield) sends a long list of Continentals heard. The aerial now in use is a 4-element Yagi (all metal) 31ft high. Experiments are also being made with a single-slot aerial. **G8PX** (Oxford) found May 30 very good. That day he worked ON4PA at 589. **B.R.S. 3003** (Coulsdon) has been building a 12-element stack which is at 10ft at the moment but is shortly going up to 30ft. The gain over a 4-element Yagi is pronounced and nine new counties were heard after erection. Continental stations and G-DX were heard late on Whit Monday. '3003 would like to hear more c.w. on the band—so would we all! **B.R.S. 16075** (Southampton) missed the opening but sends a fair list nevertheless. TV local oscillators make listening impossible until late night or early morning! PE1PL was heard on a dipole, with a 6BQ7A converter and tunable oscillator into an AR88LF.

G8LN (Plumstead) thinks that 2 m activity appears to be poor. The nearness of the Thames Estuary is suspected for the fact that conditions at '8LN are rarely so good as other people say they are! The sked with G3ANB (Brightlingsea) is still maintained, however; '3ANB is also working regularly nearly every day with PE1PL. '8LN doesn't agree with the Band Plan which places a solid wedge of London and Home Counties stations in the middle. He thinks the French Plan, with 300 kc/s for local working, far superior. As '8LN is more likely to hear Continentals than northern Gs the Band Plan falls down as far as he is concerned. He thinks Slow Morse should be encouraged on 2 m to get the B.R.S. men interested in the band. '8LN has made a simple crystal checker for calibration purposes. A triode (6C5, 6J5, EF91 or 6J6 etc.) provides harmonics on 144 Mc/s from all his 6 or 8 Mc/s crystals. **G3KHA** (Bristol) says the recent opening was not very obvious there. Continentals heard were not at workable strength. Although the portables have brightened the South West, '3KHA makes a plea for more Sunday activity, and praises stations such as G2HIF/P, 3XC/P, 8UQ/P and 4SA, without whom Sunday morning would be empty. **G3FIH** (Bath) agrees that the recent openings hardly touched the West. French stations only were heard apart from more easterly Gs whilst calling Continentals. In spite of this, however, 39 different stations were worked.

G5MR (Hythe, Kent) worked DL, F, ON and GC stations during the opening to say nothing of G-DX. Nothing was heard of Scandinavians; presumably the local screening will always prevent this. '5MR is the proud recipient of a certificate from Switzerland for Third G in last year's European V.H.F. Contest. **G3WW** (Wimblington), on a motoring holiday, visited G5YV who was unfortunately ill in bed. (He is better now—Ed.) Whilst in Gloucester at Whitsun, '3WW visited G5BM, and heard '3GNJ/P and another /P station in the Mendips. Several new Continentals were worked on the Tuesday after Whitsun, but the following day the band was in its usual "deadly" state. Things were better on June 18, with DX worked to Yorkshire and the South. **G5BM** (Cheltenham) has ceased operation from his 50ft high stack and will transmit semi-locally on a small indoor Yagi. '5BM will work /M or /P in the Cotswolds when band conditions warrant. May 24 was very good, with G3BW (Whitehaven) and '3DA (Liverpool) both S8. Many weak carriers were heard in the first 200 kc/s of the band which might well have been GMs, and they would have been easily worked on c.w. PE1PL (The Hague) was contacted at phenomenal strength on May 31 from Kilkenny, 5 miles s.e. of Cheltenham. Many G-DX, F, GC, ON and PA stations were also worked or heard. These stations were not heard in Cheltenham, thus tending to prove that it is screening, rather than attenuation, which operates in these cases. Many other G-DX stations were worked from Kilkenny on June 18.

GW3GWA (Wrexham) has a very poor return of QSOs for the number of calls made and puts this down to operation at the high frequency end of the band. It cannot be too often reiterated that the whole band should be tuned. There are many stations above 145 Mc/s! '3GWA thinks that now the major areas of activity are known they should be distributed evenly across the band with thinly populated areas in between, to give the "odd man out" a chance. Anyway, 11 new stations have been worked since last month. '3GWA recently heard EI2W, which is a mystery, as the west is completely screened by hills 2,000ft high. Portable operation is planned during the Second Two Metre Field Day from the usual location. **G5YV** (Leeds) sends a report which speaks for itself. During Whitsun 74 different Continentals were heard. As some of these were using only 10 W or less the terrific signal strengths were a revelation. A large number were worked.

Seventy Centimetre News

G2RD's usual Activity Report is as follows: DL9QV, G2AIH (435.15), '2BVW (434.37), '2DD (434.82), '2DD/M (434.82), '2DDD (435.66), '2DSP (434.97), '2FKZ (435.95), '2FNW, '2HDZ (435.17), '2RD (435.53),

'2WJ (436), '2XV (435.1), '3EOH (434.55), '3FSD (435.42), '3FP (434.98), '3GDR (435.39), '3HKD (434.7), '3IRW (434.4), '3IOO, '3JQN (435), '3KEQ (435.05), '3MI (434.13), '5CD (435.6), '5DT (434.9), '5KW (435.1), '5RD (435.25), '5UM (434.37), '5YV (432.7), '6NF (435.4), '8SK (435), ON4HN, PA0WAR (434.5).

The outstanding news is, of course, the Whitsun opening; some of the signals were stronger than on 2 m for at least a part of the time. **G2RD** (Wallington) worked G5YV (Leeds), contact being first established on 2 m. G3HKD (Norwich) was heard by '2RD but no QSO resulted, although '3HKD was heard in contact with G2FKZ (Dulwich) and G3KEQ (Sanderstead).

G5YV (Leeds) reports contacts with ON4HN, PA0WAR, G2FNW, '2RD, '3KEQ, '2BVW and '3IOO. DL9QV, PA0FP and G3GDR were heard but not worked. **G3KEQ** (Sanderstead) worked PA0WAR on 'phone at S9+ (May 29, 23.00). G2FNW was worked crossband duplex. ON4HN at S7 was heard calling G5YV. '3KEQ has now worked 12 counties and 2 countries on 70 cm. The transmitter has a QQV03/20 in the p.a. running at 20 W input. The aerial is four stacked slots. It has been suggested that 70 cm stations outside London should call on the hour and half-hour for 5 minutes and listen for replies during the following 5 minutes. G3KEQ considers more stations would be worked if they checked the band or called CQ more often. It should no longer be necessary to start a contact on 2 m.

On May 30, **G2XV** (Cambridge) worked G3KEQ. '5DT, '8SK, '3FP, '3EOH and '2DDD within 55 minutes and without pre-arrangement. '2XV says that all 70 cm needs is some "enthusiastic occupancy." '2XV wants 70 cm QSOs with stations in the following counties: Bucks, Suffolk, Kent, Lincs, Hunts, Notts, Warwicks and Staffs. He would like to work G3GZM, who is often heard but has never yet been raised.

Reports of genuinely active stations, with frequencies from other parts of the country would be welcome.

24 cm News

G3EOH is working on a 1250 Mc/s transmitter which will be crystal controlled. G2RD is still experimenting with a self excited rig. We would like more news of activities on this band, please. There is much going on, but reports are few.

Two Metre Ladder

The Ladder published herein is the final one for 1954-5. If there is sufficient interest, the Ladder will again be run during the year 1955-6.

Tailpiece

Late news from the Channel Islands comes from **GC2FZC** (Guernsey) who does not hear many signals but those he does hear are good enough! '2FZC has been running a sked with G2ADZ (Woolacombe) for nearly three months and contact is maintained in the worst conditions. G3AUS (Torquay) is also a regular.

GC3EBK reports that GC3KAV (Guernsey) will be active on 2 m shortly.

GM6WL reports that GM2FHH, who did so well during the opening, regularly works GM3IBV (Larkhill), GM3GAB (Rutherglen, Glasgow) and GM6KH (Hamilton). GM4HX (Paisley) and GM6ZV (Clarkston, Glasgow) have also been worked. G stations were well received in Glasgow on June 17. Among those heard were G6XM (York), RS56-7 and G3BW (Whitehaven). Later, G3CCH (Scunthorpe), '6KK (Blackpool), '5YV (Leeds) and '3GPT (Preston) worked GM3IBV and GM2FHH. G3BW also worked GM2FHH.

On *70 cm* GM3EGW (Dunfermline) often hears '3GAB (Rutherglen) at S6. This is quite cheering as '3GAB is on the outskirts of Glasgow, and this represents (almost) the first "inter-city" reception which has been long awaited. When '3EGW gets his transmitter going a QSO should materialize.

Don't forget the Manchester v.h.f. meeting on September 17.

* * *

All reports for the August issue should be in by July 21, please. Good hunting!

V.H.F. and U.H.F. Band Planning

NEWCOMERS to v.h.f. work are reminded that the following Band Plans for 144 and 420 Mc/s operation are used by the majority of serious workers. The Plans were adopted at a meeting held at Society Headquarters in July, 1953.

The British Isles Two Metre Band Plan

Zone	Mc/s	Area
A & B	144.–144.2	All Scotland.
C	144.2–144.4	Cumberland, Durham, Lancashire, Northumberland, Westmorland, Yorkshire.
D	145.8–146.	Ireland.
E	144.4–144.65	Cheshire, Derbyshire, Leicestershire, Lincolnshire, Nottinghamshire, Rutland, Staffordshire, Warwickshire.
F	145.65–145.8	Herefordshire, Monmouthshire, Shropshire, Worcestershire and all Wales.
G	144.65–144.85	Bedfordshire, Buckinghamshire, Cambridgeshire, Hertfordshire, Huntingdonshire, Norfolk, Northamptonshire, and Suffolk.
H	145.25–145.5	Berkshire, Dorset, Gloucestershire, Hampshire, Oxfordshire and Wiltshire.
I	145.5–145.65	Cornwall, Devonshire, Somerset and Channel Islands.
J	144.85–145.25	Essex, Kent, London, Middlesex, Surrey and Sussex.

The British Isles 70 cm Band Plan

Mc/s	Assigned to:
420–425	Self-excited oscillator emissions (Telegraphy and Telephony).
425–432	Amateur Television.
432–438	Frequency stabilised emissions (Telegraphy and Telephony) including Narrow Band Frequency Modulation.
438–445	Amateur Television.
445–455	Future Amateur Developments.
455–460	Self-excited oscillator emissions (Telegraphy and Telephony).

Stations operating on frequencies between 432 and 438 Mc/s should do so on a Zonal basis because of the harmonic relationship which exists between those frequencies and frequencies in the 144 to 146 Mc/s band.

Maps on stiff card showing the Two Metre Band Plan are available from Headquarters price 6d., post paid.

Worked and Heard on Two

Lists of stations worked or calls heard on 2 metres should refer only to stations 40 or more miles distant.

B.R.S.3003 (Coulsdon, Surrey) May 22-June 17, 1955.
Heard: F3LP, G2BVW, 2FJR, 2HCG, 2CCH, 3CQC, 3DMU, 3FIH, 3FW, 3GJJ, 3GNJ, 3IGT, 3IIT, 3KFT, 4GR, 5BD, 5BM/P (Cotswolds), 5YV, 6CW, 6UJ, 6WU, GW8UH, PA0HA.

B.R.S.6327 (Earlsfield) May 17-June 11, 1955.
Heard: DJ1XX, DL1FF, 1MI, 3VJ, 6OR, 9MK, G2FTS, 2HCG, 2HDY, 2XV, 2YV, 3EYV, 3FAN, 3FIH, 3FNL, 3FUL, 3GNJ/P, 3GOZ, 3IRA, 3MI, 3XC/P, 4GT, 4SA, 5KW/M, 5UM, 5TZ, 6AG/M, 6NB, 6XH, 8KW/P, 8UG/A, 8UQ/P, ON4BZ, 4DW, 4OZ, PA0AGJ, 0BN, 0FP, 0GER, 0HRX, 0IKS, 0JOB, 0ST, 0UU, 0VLM, 0ZJ.

B.R.S.16075 (Southampton) May 30-June 19, 1955.
Heard: F3LP, F9JY, F9QE, G2AIW, 2BMZ, 2DRA, 2DSP, 2DVD, 2DSW/P, 2FJR, 2FTS, 3BOC/P, 3CQC, 3EES, 3FAN, 3FIH, 3FMO, 3GAV, 3GNJ/P, 3GOP/M, 3GOP/P, 2NM, 5BD, 5TZ, 6AG, 6NB, 6OX, 8IL, GC3EBK, GW8UH, PE1PL.

B.R.S.19162 (Dewsbury) May 17-June 15, 1955.
Heard: G2BVW, 2FCL/P, 2HCG, 2HIF/P, 2HOP, 2XV, 3BPD, 3CC, 3DA/P, 3DOV, 3DJX, 3DVK/P, 3ENS, 3GHO, 3GPT, 3IOE, 3IOO, 3WW, 5AU, 5BD, 5CP, 5ML, 5TZ, 6CW, 6NB, 6TA, 8SB, ON4BZ, PA0FC, PE1PL.

G2AIW (Twickenham) May 25-June 22, 1955.
Worked: DJ1VK, DL1MI, 3QH, 3VJ, F9LD, G2ADZ, 2BMZ, 2HGR, 3BPD, 3BW, 3EPW, 3GHO, 3GNJ, 3GPT, 3IRA, 3KHA, 3XC/P (Rutland), 5BD, 5TZ, 5YV, 6FK, 8KW/P (nr. Bristol), GC2FZC, 3EBK, GW3XC/P (Abergavenny), 8UH, ON4BZ, 4DW, 4HN, 4ZK, OZ7SP, PA0FP, 0HRX. *Heard:* G6XM, 8DA, GM2FHH.

G2CZS (Chelmsford) May 22-June 3, 1955.
Worked: DL3QH, G2FJR, 3BPD, 3EMU, 3IIT, PA0FB, 0JOB, 0VLM, PE1PL. *Heard:* F3LD, PA0FC.

G2HIF/P *Worked:* May 29 (Blagdon, Mendips, Somerset): G3EES, 3FIH, 3GNJ/P, 3YH, 4SA, 5BM; May 31 (White Horse Hill, Berks): G3EES, 3GNJ, 3IER, 3JGY, 3YZ, 4SA, 5YV, GW3XC/P; June 5 (Picket Post, Hampshire): G4SA, 8UQ/P; June 5 (Stoney Cross, Hampshire): G5TZ, 3GOP/P, 8UQ/P; June 5 (Okeford Hill, nr. Blandford, Dorset): G3GNJ/P, 3HSD, 3HXZ, 3IER, 3KHA, GW8UH; June 12 (1 mile north of Brough, E. Yorks); G2DRA, 3DA, 6XM, 6XX.

G3DGI (Barnet) May 22-June 19, 1955.
Worked: G2HCG, 2HDY, 3CGQ, 3DJX, 3GHO, 3IIT, 3JMA, 4JJ/P, 5RZ, 5UM, 6AG/M, 6NB, 8KW.

G3EMU (Canterbury) May 16-June 16, 1955.
Worked: DL6SV, F8AA, 9LD, G2JF, 2CZS, 2HCG/M, 3VI, 3CVO, 5MR, ON4HH, PA0FB, 0LBS. *Heard:* DJ1XX, DL9BD, F8KF, 9LD, G2VA, 2HCG, 2YB, 2FTS, 2AIW, 3ANB, 3GHO, 3GOZ, 3GSE, 4SA, 5KW/P, 5TZ, 6TA, 8KW, PA0BA, 0FS, 0NO, 0WO, 0FC, 0FP, 0ZJ, 0UU, 0CJP, 0IKS, 0VLM, 0DSW, ON4BZ, 4VK.

G3FIH (Bath) May 20-June 19, 1955.
Worked: G2ADZ, 2BAT, 2BMZ, 3EPW, 3GGJ, 3GJJ, 3GOP/M (Portsdown Hill), 3GOP/P (5 miles n.w. Salisbury), G3GOP/P (Pepperbox Hill, nr. Salisbury), 3HXZ, 3IOO, 3IRA/A, 3ITF, 3MU, 3XC/P (6 miles s.w. Newbury), 5ML, 6OX, 6TA, 8DA, 8UQ/P (3 miles s.w. Wendover), GW3XC/P (nr. Abergavenny), GC2FZC, 3EBK. *Heard:* F3LP, 8GH, 8MW, 9JY, 9QE, 9RL, G2UN, 2AIW, 2DSP, 2DVD, 3CCH, 3FAN, 3FMI, 3GVC, 4SA, 5DS, 5TZ, 5YV, 6NB, GW8SU.

G3KHA (Bristol) May 20-June 19, 1955.
Worked: G2YB, 2AIW, 2HIF/P (Blandford), 3FD, 3FMO, 3FZL, 3GHO, 3ITF, 6NB, 6OU, 6OX, 6TA. *Heard:* G2XV, 2ADZ, 2AUD, 2BMZ, 2FJR, 2FTS, 2HDZ, 3XC, 3XC/P (Newbury and Abergavenny), 3WS, 3FAN, 3FNL, 3FYY, 3GVF, 3HBW, 3HXS, 3HZF, 4SA, 5DS, 5KW/P, 5LK, 5RD, 5TZ, 6AG, 6RH, 8UQ, ON4BZ, PA0FP.

G3WW (Wimblington) May 31, 1955.
Worked: DJ1XX, 2NT, DL1FF, 9BD, PA0BN, 0FC, 0FJ, 0DSW, 0HRX, 0MEL, 0VLM, 0YZ.

G3XC/P May 30 (near Newbury).
Worked: G3FAN, 3FIH, 3GNJ/P, 3IRA, 4SA, 6OU. *Heard:* F3LP. **G3XC/P/M** June 1 (Wolverhampton) *Worked:* G2AK, 2DCI, 2FJR, 3CRH, 3EPW, 3HAZ, 3IUD, 6FK, 6SN, 6TA, 8VP, GW3GWA. **G3XC/P** June 2 (Rutland) *Worked:* G2AIW, 2CVD/M, 2HCG, 3CKQ, 3DO, 3FW, 3IIT, 6CW, 6TA, 6YU.

G5BD (Mablethorpe)
Worked: DJ1VW, 1ZE, 1XT, DL1KM, 1MI, 3FR, 3QH, 3YH, 3VJ, 6SV, 9ARA, 9BD, 9LT, 9LU, 9MK, 9MZ, 9QN, 9QV, 9SM, F8KF, 9JY, GC3EBK, GM2FHH, PA0AGJ, 0BN, 0BX, 0DSW, 0EL, 0ES, 0FB, 0FP, 0FS, 0GER, 0IKS, 0JOB, 0LBS, 0PWZ, 0VLM, 0WAR, 0WI, 0YZ, ON4TW, 4HN.

G5MR (Hythe, Kent) May 24-June 18, 1955.
Worked: DL3VJ, F3JN, 9LD, 9QE, G2BVW, 2HCG, 3BPD, 3FZL, 3GGJ, 3INU, 3VI, 4GT, GC3EBK, ON4DW, 4TW. *Heard:* DL3FR, F3LP, 3ND, 8KF, 8MW, 9JY, G2AIW, 2DSP, 2DVD, 2FNW, 2HDZ, 2UN, 2VA, 2WJ, 3BJQ, 3CCH, 3DJX, 3DO, 3FD, 3FIH, 3GDR, 3GHO, 3GJZ, 3GOZ, 3HBW, 3HXS, 3JXN, 3KTF, 3WS, 3WW, 4SA, 5BM/P, 5KW, 5TZ, 5YV, 6AG, 6AG/P (Worcs.), 6LL, 6NB, 6RH, 6XH, 8KW, ON4BZ, 4HN, PA0FP.

Regional V.H.F. Ladder

TWO METRE BAND

FINAL POSITIONS

Psn.	Call & Location	Worked Regions	Worked Stations	Worked Countries
1.	G5YY ..... *Leeds, Yorks.*	15	348	10
2.	G3CCH ..... *Scunthorpe, Lincs.*	14	123	9
3.	G3IUD ..... *Wilmslow, Ches.*	14	114	6
4.	G6XX ..... *Howden, Yorks.*	13	131	8
5.	G2FJR ..... *Sutton Bridge, Lincs.*	13	108	6
6.	G6TA ..... *Streatham, London*	11	257	7
7.	G3DO..... *Sutton Coldfield, Warks.*	11	47	3
8.	G8VN..... *Rugby, Warks.*	10	90	3
9.	G3BW ..... *Whitehaven, Cumbs.*	10	20	5
10.	G2CZS ..... *Chelmsford, Essex*	8	128	5
11.	G5MR..... *Hythe, Kent*	8	106	6

G5YV (Leeds)
Worked: DJ1DC, 1VK, 1VW, 1XX, 2DH, 2QG, 2NT, DL1KM, 1MI, 3FR, 3YB, 3YH, 3VJ, 6FX, 6OR, 6SV, 6VH/P, 9ARA, 9BD, 9LT, 9LU, 9MK, 9MZ, 9QN, 9QV, 9QX, 9SM, 9ZM, ON4DE, 4BZ, 4HN, 4PA, OZ7SP, PA0AGJ, 0BX, 0BN, 0CJP, 0DSW, 0ES, 0FB, 0FC, 0FP, 0FS, 0GER, 0HA, 0HRX, 0HWL, 0HM, 0IKS, 0MU, 0NO, 0UU, 0WAR, PE1PL.

GC2FZC (Guernsey) April 14-May 21, 1955.
Worked: F9JY, G2ADZ, 2AIW, 3AUS, 3GOP, 3ION/P, 3FIH, 3CQC, 3FMO, 3BOC/P, 5TZ, 8DA, 8IL. *Heard:* F8MW.

GM2FHH (Aberdeen) May 29-May 31, 1955.
Worked: DJ1XX, DL1KM, 1MI, 3FR, 3VJ, 3YH, 9BD, 9LU, 9MK, 9QV, G2BDQ, 5BD, 5YV, GM3EGW, 3FGJ, 3FYB, ON4BZ, PA0BX, 0HA, 0WO, PE1PL. *Heard:* G5TZ.

GW3GWA (Wrexham) May 19-June 18, 1955.
Worked: G2BVW, 2FJR, 2HCJ/P, 2HOP, 2YB, 2YM, 3BW, 3CCH, 3ENY, 3FYY, 3ISA, 3JPJ, 3JZG, 3XC/P, 4SA, 5BM/P, 5TZ, 6CW, 6XM, 8BP, 8UQ/P. *Heard:* G2AK, 2FO, 2MV, 3KEQ, 3KFD, 3JGY, 3WW, 5BD, 6NB, 6OX, 6TA, EI2W.

GW3XC/P (Abergavenny, Mon.) May 31, 1955.
Worked: G2AIW, 2DSP, 2YB, 3FIH, 3FIH/P, 3GOP, 3GNJ, 3IER, 3YZ, 4SA, 6TA. *Heard:* G6AG, 8KW.

LONDON U.H.F. GROUP

will meet at the Bedford Corner Hotel, Bayley Street, Tottenham Court Road,

at 7.30 p.m., August 2, 1955.

All u.h.f. enthusiasts welcome.

The winning crew in the High Wycombe D/F Event.

The Amateur Bands

A Survey of the Current Position

EVERY now and then a letter reaches Headquarters from a new licencee asking for information about the various frequencies allocated to United Kingdom amateurs. The purpose of this article is to provide that information in simple form.

The Top Band

Notwithstanding the fact that the position has frequently been explained in these columns and elsewhere, a great many members are under the impression that the Society should ask the G.P.O. to take steps to have other Services removed from the Top Band.

It should be clearly understood that United Kingdom amateurs have no conferred right to operate in the Top Band at all; in fact if the R.S.G.B. had not been represented at the International Telecommunications Union Conference in Atlantic City eight years ago, there would be *no Top Band allocation in Region 1* (*Europe and Africa*) today.

Because the R.S.G.B. *was* represented at that Conference and because those representatives were on very friendly terms with the Post Office and other Government delegates, it finally became possible to persuade the Conference to accept a proposal, put forward by the United Kingdom, to the effect that in Region I "in the band 1715-2000 kc/s Austria, Ireland, the Netherlands, Northern Rhodesia, Southern Rhodesia, Switzerland, the Union of South Africa and the United Kingdom *may* assign up to 200 kc/s for the Amateur Service provided that the mean power of any amateur station does not exceed 10 watts and *that no harmful interference is caused to the authorized services of other countries.*" (The italics are ours.—ED.)

As from May 1, 1953, United Kingdom amateurs were authorised to operate between 1800 kc/s and 2000 kc/s and an announcement to that effect appeared in the May, 1953, issue of the BULLETIN. The announcement also listed the frequencies, call-signs and locations of a number of G.P.O. coast stations which it was suggested U.K. amateurs would do well to avoid.

Although four other countries in Europe are permitted to assign up to 200 kc/s between 1715 kc/s and 2000 kc/s to the Amateur Service, Ireland is the only other country to our knowledge that allows amateurs to use the Top Band. (Although not officially authorized to do so, the Government of Czecho-slovakia permits amateurs to use the Top Band.—ED.)

Members who complain of interference from other users of the Top Band would do well to bear in mind that they are allowed to use the band only provided they do not interfere with the Fixed and Mobile (other than Air Mobile) Services.

The 3.5 Mc/s Band

The position in respect to the 3.5 Mc/s band is different, in as much that amateurs in Region I have a conferred right to operate between 3500 and 3800 kc/s but—and here is the rub—they *must share the band* with the Fixed and Mobile (other than Air Mobile) Services.

For a very long while the Society has held the view that many of the fixed stations operating on frequencies between 3500 kc/s and 3800 kc/s use power far in excess of their service requirements. In that connection it is worth recalling that Article 45 of the current International Telecommunication Union Convention signed in Buenos Aires in 1952 states:—

> *"All stations, whatever their purpose, must be established and operated in such a manner as not to result in harmful interference to the radio services or communications of other Members or Associate Members or of recognized private operating agencies, or of other duly authorized operating agencies which carry on radio service, and which operate in accordance with the provisions of the Radio Regulations."*

At a recent meeting between representatives of the Society and the Post Office the suggestion was put forward that some form of time-sharing may be possible within the 3.5 Mc/s band. Whether such a suggestion would ever be supported by other Services using the band no one can say but the Society will, on all suitable occasions draw attention to Article 45 of the I.T.U. Convention.

It seems appropriate at this writing to remind members that the European Band Plan—as formulated by the R.S.G.B. and approved by the other Societies in Region I—recommends that telephony be restricted to the band 3600 kc/s—3800 kc/s. In recent months there have been signs that the Band Plan is being ignored by a minority of United Kingdom and European amateurs.

The 7 Mc/s Band.

The Atlantic City Frequency Allocation Table states that in Region I the band 7000—7100 kc/s shall become *an exclusive amateur allocation.* In addition the band 7100—7150 kc/s shall also be assigned to the Amateur Service *provided no harmful interference is caused to the Broadcasting Service!* (If this were not a serious article we should feel inclined to comment facetiously about that statement.—ED.)

For some reason which may not be too hard to discover the United Kingdom has not yet adopted the Atlantic City Frequency Allocation Table in so far as the 7 Mc/s band is concerned, with the result that U.K. amateurs are still permitted to work between 7000 and 7300 kc/s—*if they can!*

Under the terms of the Cairo I.T.U. Frequency Allocation Table (which is really the Table under which U.K. Amateurs at present operate), the band 7000—7300 kc/s was an *exclusive amateur allocation* but, unfortunately, broadcasting services have taken possession of the band in a big way.

Clearly United Kingdom amateurs would be much better off if a channel 100 kc/s wide were exclusively allocated to them, but for reasons which we suspect are connected with "The Cold War," the U.K. Government is unwilling to adopt the Atlantic City Frequency Allocation Table at the present time. If the Table *were* adopted the G.P.O. would have to give the B.B.C. notice to cease operating on frequencies in the band and that is something they presumably are unable to do at the moment.

The 14 Mc/s Band

The band between 14000 and 14350 kc/s should be an *exclusive amateur allocation in all Regions of the world.* The only minor exception concerns the 100 kc/s channel between 14250 and 14350 kc/s which the U.S.S.R. use for their Fixed Services.

Most regrettably commercial stations have penetrated into the low end of 14 Mc/s and in spite of official protests by the Society little has so far been done to get them shifted.

The biggest nuisances in the band are, however, the various "jammers". These noisesome pestilences appear to "idle" for hours on odd frequencies in the band ready to "pounce" on victims which come up

on frequencies outside the band. Teletype is also responsible for much of the noise heard at times in the band. These transmissions appear to emanate from North Africa.

The 21 Mc/s Band

The band 21000—21450 kc/s is an exclusive amateur allocation in all Regions. So far it has escaped the attention of commercial and broadcast stations but the position will have to be watched carefully as soon as the band begins to take on reliable DX characteristics.

The 28 Mc/s Band

The band 28000—29700 kc/s is an exclusive amateur allocation in all Regions. At the moment conditions do not permit reliable DX working. When the band opens it will be necessary to watch carefully the activities of radio sounding balloons. During the last big openings (1946-1948) many amateur contacts were spoilt by transmissions from radio sounding balloons.

The U.K. allocation on this band is from 28—30 Mc/s. The additional 300 kc/s will be a boon when the band comes into its own again.

The 144 Mc/s Band

Although this band is supposed to be an exclusive amateur allocation, the G.P.O., for some reason best known to themselves, have introduced a clause into the U.K. licence which states, in effect, that the channel between 144 and 145.5 Mc/s is allocated to the Amateur Service on a basis of non-interference with other Services. As far as the Society has been able to discover this restriction has been made to appease the United States Army Air Force authorities in the U.K.! Occasionally U.S. pilots flying over Great Britain have been heard to order U.K. amateurs "to get to H— out of this band". Our advice to those who meet such rudeness is to ignore it and carry on.

The 420 Mc/s Band

The band 420-450 Mc/s is allocated on a world-wide shared basis to the Aeronautical Radio-Navigation and Amateur Services, the former Service having priority. In Region I the band 450-460 Mc/s is also assigned to the same two services.

Until recently the band was used to accommodate Navigational Aids (radio altimeters) but such aids are now, in general, operated on higher frequencies. There is a strong possibility, however, that within about two years the 10 Mc/s channel between 450 and 460 Mc/s will be allocated to the Fixed and Mobile Civilian Service. When that time comes the channels 420—425 Mc/s and 440—450 Mc/s will be allocated to amateurs on a shared basis whilst the channel 425—440 Mc/s will become an exclusive amateur allocation.

The Ultra Highs

The bands 1215—1300 Mc/s, 2300—2450 Mc/s, 5650—5850 Mc/s and 10,000—10,500 Mc/s are assigned to the Amateur Service on a world-wide basis.

* * *

In concluding this brief survey of the various amateur bands we would again stress that the Society will continue to urge the authorities to honour international agreements.

Commander R. J. B. Hippisley, 90 not out

OLD timers in particular will wish to offer hearty congratulations to distinguished Vice-President Commander R. J. B. Hippisley, C.B.E., T.D., D.L., M.I.E.E., who reached his 90th Birthday on July 4, 1955. Commander Hippisley, who held the call HLX prior to the First World War, served on the Council of the Wireless Society of London during the early 1920's. He enjoys very good health and a visitor finds him daily in his study/museum which adjoins the workshop at his home, Ston Easton Park, near Bath.

Commander Hippisley has one of the finest amateur selections of tools and machine tools in the country.

Dealing with Interlopers

ZS6QJ in a letter to the Editor of the Johannesburg *Star* tells an interesting story of how South African radio amateurs dealt with a Lourenco Marques broadcasting station which was operating illegally in the 80 m band.

Representations made through Government channels were ignored and as this station had a popular following in South Africa the ZSs combined to keep one or more amateur transmissions going on the frequency whenever the broadcasting station was in operation.

Complaints came from the listening public and Lourenco Marques moved well out of the band, trying to justify their action with a bitter complaint against amateur interference! The South Africans just drew their attention to the Atlantic City Convention agreement which states the 80 m band is shared between amateurs and certain fixed and mobile services but excludes broadcasting stations.

Good for you fellows—and thanks ST2TC for sending us the press cutting.

Recorded Lecture Library

NEW recorded lectures now available in addition to those previously announced are as follows:

"Aerials" by F. Charman, B.E.M.
(This lecture is supplied with descriptive diagrams.)
"Radio over the Years" by Capt. P. P. Eckersley, M.I.E.E.

Applications for the loan of these recordings should be sent to Mr. E. Fish (G2HCZ), 107 Eton Road, Ilford, Essex. Those who borrow tapes are asked to take great care of them and to return them promptly after use.

Radio Amateur Emergency Network

LT.-COL. A. C. Dunn (G2ACD), County Controller for the East Riding of Yorkshire, has been elected chairman of the R.A.E.N. Committee in succession to Mr. W. J. Ridley (ex-G2AJF).

Current Comment (Continued from page 7)

world tension. Only in that way will there be a reduction in the number of propaganda broadcasts which have been cluttering up our 7 Mc/s band for the past 10 years—broadcasts which, we suspect, have no listening public other than the diplomatic mission across the road!

On pages 31 and 32 we publish a survey of the amateur bands as they are today. It does not make pleasant reading because the reader will be quick to realize that the British Government itself—although a signatory to the Atlantic City and Buenos Aires I.T.U. Conventions—is just as much to blame for breaking international agreements as are countries "behind the Iron Curtain."

Our greatest hope for the future of the "exclusive" amateur DX bands must lie in a return to peaceful conditions throughout the world.—J. C.

Council Proceedings

Résumé of the Minutes of the Proceedings at a Meeting of the Council of the Radio Society of Great Britain, held at New Ruskin House, Little Russell Street, London, W.C.1, on Friday, May 20, 1955, at 6 p.m.

Present.—The President (Mr. H. A. Bartlett in the Chair), Messrs. W. H. Allen, C. H. L. Edwards, R. H. Hammans, F. Hicks-Arnold, R. G. Lane, W. H. Matthews, W. R. Metcalfe, A. O. Milne, W. A. Scarr, R. L. Varney, and John Clarricoats (General Secretary).

Apologies for Absence. Apologies for absence were received from Messrs. L. Cooper, D. A. Findlay, J. H. Hum, and H. W. Mitchell.

* * *

Army Stations

A letter was submitted from the G.P.O. setting out advice to amateurs who are called by Army and other non-amateur stations. (A statement based on the information contained in the letter appeared in the June, 1955, issue of the BULLETIN.—Ed.). It was agreed to ask the G.P.O. to explain how Government stations may be identified by amateurs.

Membership

(a) *Resolved* (i) to elect 61 Corporate Members and 13 Associates; (ii) to grant Corporate Membership to 10 Associates who had applied for transfer.

(b) The Secretary reported that of the 765 members whose subscriptions became due on February 1, 1955, 208 became overdue on April 30, 1955. Of this number 40 were London, 121 were Country and 14 were Overseas Corporate Members and 33 were Associates. Of those overdue 23 London, 13 Country and 9 Overseas Members held call-signs.

The Secretary submitted details of the 22 members (including 2 Associates) who had written to resign during the five weeks ended May 14, 1955. Of this number 1 had resigned on financial grounds, 9 gave no reasons, 7 stated they had lost interest. The remainder gave various reasons for resigning.

Affiliated Societies

Resolved to grant affiliation to R.A.F. Stoke Heath Amateur Radio Club and to the Nigeria Radio Club.

Amateur Radio Exhibition

Resolved to set up a panel of three Members of the Technical Committee to act as judges of the equipment displayed at the Amateur Radio Exhibition.

Science Museum

The President and Secretary reported that they had that day discussed with representatives of the Science Museum a proposal to establish an Amateur Radio Station in the Communications Gallery of the Museum. It was agreed to appoint a small Committee to discuss the project in detail with representatives of the Museum.

R.S.G.B. BULLETIN

Resolved to renew the contract with The Haycock Press, Ltd., for printing the BULLETIN.

Call Book

Resolved to accept an estimate from South London Press, Ltd., for printing a new edition of the *R.S.G.B. Amateur Radio Call Book.*

It was reported that Mr. J. P. P. Tyndall was willing to act as Editor of the new Edition.

Regional and County Meetings

Resolved (i) to authorize the Regional Representatives concerned to arrange Meetings as follows during 1955:—

Region	*Venue*	*Period*
1	Manchester	Early September.
5	Cambridge	Late September.
7	London	Early November.
13	Edinburgh	Same week-end in early October.
14	Glasgow	
15	Belfast	Late September provided meeting in Dublin can also be arranged same week-end.

[It was subsequently decided to postpone the Manchester and London meetings until the Spring of 1956. —ED.]

(ii) to authorize the following members to attend the respective meetings:—

Manchester	Messrs. Hammans and Metcalfe.
Cambridge	Messrs. Edwards and Matthews.
Edinburgh, Glasgow	Messrs. Bartlett and Hicks-Arnold.
Belfast, Dublin	Messrs. Bartlett and Scarr.

(iii) to authorize the General Secretary to attend such meetings as his personal engagements permit.

(iv) to notify the Regional Representatives concerned that the Council proposes to recommend the 1956 Council to authorize meetings to be held as follows during 1956:—

Region	*Venue*	*Period*
2	York	June
3	Birmingham	April
4	Leicester	May
9	Torquay	May
10	Porthcawl	March
11	Llandudno	April
12	Aberdeen	September

Headquarters' Lease

The President and Secretary were authorized to sign a new lease covering a period of five years as from June 24, 1955, at an annual rent of £400 plus £40 for heating and maintenance. (This represents an increase of £40 per annum as compared with the previous lease.—Ed.).

Society Tie

The Secretary reported that the response to the enquiry regarding a Society tie (published in the March, 1955, issue of the BULLETIN) had been very satisfactory. Designs in rayon and silk were submitted for examination.

Resolved (a) to place an order with Burlington Textiles, Ltd., for 15 dozen Macclesfield All Silk ties; (b) to offer the ties for sale to members at 15s. each plus postage and packing.

It was decided to defer consideration of the question of offering a Society blazer badge until further designs had been submitted.

Cash Account

Resolved to accept and adopt the Cash Account for April, 1955, as prepared by the General Secretary.

Reports of Committees

R.A.E.N.

The Minutes of Meetings of the Committee held on March 5 and April 30, 1955, were submitted as Reports.

Resolved to receive the Reports and to accept two recommendations contained therein.

(The recommendations dealt with E.C.O.s who are not members of R.S.G.B. and a proposal to issue publicity material concerning R.A.E.N. to other Amateur Radio publications.)

Consideration of a third recommendation, dealing with a proposed R.A.E.N. Rally in September, 1955, was deferred until details of the scheme are brought to the notice of the Council.

The Secretary submitted a letter from Mr. Fenton intimating his wish to resign as Honorary Secretary, R.A.E.N. Committee, due to pressure of work. A letter was also submitted from the Chairman of the Committee (Mr. W. J. Ridley) in which he suggested that Mr. Fenton would probably be prepared to carry on provided he was authorized to engage the services of a clerical assistant for one evening a week.

Resolved to authorize Mr. Fenton to engage the services of a clerical assistant for one evening a week at a fee of 10s.

Technical Committee

The Minutes of Meetings of the Committee held on March 10 and May 10, 1955, were submitted as Reports.

Resolved to receive the Reports and to accept the recommendations contained therein.

(The recommendations dealt with the printing of a booklet embracing information on The Elizabethan transmitter and associated equipment and future Committee policy for dealing with technical articles.)

An estimate from South London Press, Ltd., for printing 2,000 copies of The Elizabethan booklet was approved.

Contests Committee

The Minutes of Meetings of the Committee held on February 24, March 24, and April 28, 1955, were submitted as Reports.

Resolved to receive the Reports.

The meeting terminated at 9.15 p.m.

Empire DX Certificate Holders

As at June 30th, 1955

No.	Name	Call-sign
	1947	
1	R. G. D. Holmes	G6RH
2	P. Pennell	G2PL*
3	J. M. Kirk	G6ZO
4	A. O. Milne	G2MI*
5	C. G. Allen	G8IG*
	1948	
6	F. A. Robb	GI6TK
7	R. A. Bartlett	G6RB
8	W. R. Joss	G2AJ*
9	H. Caunce	G6KS
10	H. B. Gortz	PA0GN
11	J. R. Letts	G8IL
12	D. A. G. Edwards	G3DO*
13	R. W. Rogers	G6YR
14	H. A. M. Whyte	G6WY
15	L. F. Coursey	G4JZ
16	G. Brown	G5BJ
17	D. Brown	ZL1HY*
18	W. H. Dyson	G8TD
19	L. H. Thomas	G6QB
20	J. Clarricoats	G6CL
21	G. Howard Williams	G3BI
	1949	
22	J. A. Hunt	G2FSR
23	W. T. Pickard	G8KP
24	H. A. G. Shepherd	G8II
25	H. S. Bradley	W2QHH
26	E. S. Cole	G2EC
27	G. F. Cole	VK2DI
28	T. W. Copleston	GW4CX
29	J. Mathis	W3BES
30	S. M. Gambles	G4GI
31	C. Amundsen	LA7Y
32	F. B. Jones	G2AKQ
33	R. L. Glaisher	G6LX
34	K. Hopkinson	G8QX
35	L. F. Viney	G2VD
36	H. Beaumont	G5YV
37	A. C. Simons	G5BD
38	S. Herbert	G3ATU
39	H. Scholz	VK4HR*
	1950	
40	R. Palmer	G5PP*
41	T. Martin	G2LB
42	H. J. Hunt	G5HH
43	D. R. Macadie	GM6MD
44	H. J. Gratton	G6GN
45	I. Hamilton	GM3CSM
46	W. W. W. Peat	GM3AVA*
47	D. A. V. Williams	G3CCO*
48	C. R. Shaffer	W3JKO
49	S. Southgate	G8FF
50	H. W. Green	ZS6CT
51	J. M. Reed	HC2JR*
52	F. Hooson	G3YF
	1951	
53	J. Hunter	G3AZ
54	J. M. Gady	VP9G*
55	H. A. Chenik	ZS6Q*
56	L. Hardie	GM2FHH
57	B. H. Stephenson	G2ZF
58	W. Schreuer	G3DCV
59	W. G. Johnson	G2BJY
60	P. R. Solder	G5FA
61	C. D. Abbott	G6TA*
62	F. Cropper	G6XS
63	T. F. Hall	ZD4AB
64	H. LeDain	GC4LI
65	L. W. Ensor	ZS6BJ
66	A. H. B. Bower	G3COJ
	1952	
67	G. Webster	G5GK
68	R. G. Wilson	W3GHD
69	D. E. Davies	GW3FSP
69a	P. J. Broom	G5DQ
70	D. J. Beattie	G2WW
71	G. A. Bird	G4ZU
72	B. Case	W5FNA
	1953	
73	P. A. Tremaine	G8PB
74	A. E. J. Cooper	G5VT*
75	J. M. Ivison	G3BKF
76	T. A. St. Johnston	G6UT
77	A. J. Perkins	G6KP
78	J. E. Bazley	G2BOZ
79	J. Bieberman	W3KT
80	F. J. North	VP6CDI
81	R. F. B. Featherstone	VQ4RF*
82	S. R. Baxter	VK4FJ*
	1954	
83	J. M. Ahumada	LU8CW
84	Rev. J. A. Stone	EI4Q
85	B. M. Scudamore	G6BS
86	J. W. Swinnerton	G2YS
87	R. Faessler	HB9EU
88	G. W. D. Brown	GM3DHD*
89	Rev. A. B. Trewin	ZS2AT
90	W. F. Meyer	ZS6DW*
91	A. H. Mason	GM6MS
92	A. Sachs	ZS6BW*
93	A. M. Hix	W8PQQ*
94	C. R. Perks	G4CP
95	E. G. Bright	G3JW
	1955	
96	H. V. Wilkins	G6WN
97	F. H. Cooper	G2QT
98	M. W. Weeks	W6ZZ
99	A. J. Slater	G3FXB
100	J. H. duBois	K2CPR
101	G. L. Brownson	G5CR
102	L. J. McDougall	GM3CIX
103	W. H. McGee	ZL3LR

* Denotes Telephony endorsement

Telephony only

	1948	
T1	D. Lamb	GM2UU
T2	E. Robson	VQ4ERR
	1950	
T3	S. W. Bridges	WINWO
T4	K. Wydler	HB9DS
T5	C. Collins	VQ4SC
	1952	
T6	M. H. Carragher	MF2AA
T7	W. J. Prestidge	G2BXP

Tests and Contests

First Two Metre Field Day, 1955

"SORRY! No photographs, but no underwater camera available! If we have this event often enough, we are bound to have fine weather. . . . I think!"

No competitor commenting on the contest failed to remark on the atrocious weather. Heavy rain and high winds were general and more than damped everything but the ardour of the participants. The comment quoted above was typical, so perhaps we might remember that a year ago the weather was described as "excellent."

L. J. Kennard (G3ABA), whose call-sign has frequently appeared to the fore in v.h.f. events, wins the contests with a handsome majority over J. C. Aldred (G8UQ). Both contacted 31 portable and mobile stations, but G3ABA/P worked 65 fixed stations against the 39 of G8UQ/P.

Several mobile stations were active, but logs were received from only two. G2ATK/M travelled from Shirley, Warwicks., to Broadway Hill, Worcs., and back. He made several contacts—including one of 110 miles with G5BM/P—en route. Most of his 55 contacts, which included 20 portables and another mobile, were made from Broadway. G3AYT/M, in a long run through five counties, operated from seven stationary positions at Penistone and Holme Moss, Yorks., Ashton-under-Lyne, Lancs., Alderley, Ches., Leek, Staffs., and Buxton, Derbyshire. He contacted 31 stations, including 8 portables. One contact was made while under way.

Conditions were less favourable than during the last two Field Days, judged both by distances covered and by aggregate scores, though a few contacts of over 200 miles were made.

Equipment

G3ABA erected a 24 element stack at a maximum height of 65 ft, and used a four-stage transmitter with 832 p.a. and a crystal controlled converter with 6J6 r.f. and 6J6 mixer into an S640. G8UQ's equipment was entirely home constructed, comprising four-stage transmitter with 832A p.a. at 20 W, a 10 element stack at 30 ft and a double superhet, with three earthed grid stages, crystal controlled injection and a tunable first i.f. of 15 to 17 Mc/s.

G2ATK's transmitter, receiver and modulator occupied only 10 in. x 6 in. x 4½ in., delivering 5 watts to the aerial for an input of 10 watts to a pair of 6C4s. The receiver was a double superhet. Aerials were a quarter wave vertical when moving and a 3 element Yagi when stationary. G3AYT/M used a four-stage transmitter with an EL91 p.a. at 5 watts input, and an R.S.G.B. converter into a modified BC455. A horizontal half wave aerial was used when mobile and a 4 element Yagi when stationary.

Other equipment varied quite widely over the usual range. The 832 was by far the most popular p.a., among a collection varying from 6J6s, push-pull 6AK5s to a QQE06/40. Receivers used cascodes, push-pull 6J6s and various earthed grid types. Aerials varied between 3, 4 and 5 element Yagis, skeleton slots and stacked arrays.

Judging

It was unfortunately necessary to deduct a large number of points from a contestant whose mileage estimates considerably exceeded figures calculated from grid references and the estimates of the stations contacted.

A small but welcome increase in numbers of entrants and of check logs was noted. Let us look forward to a further increase and to good weather for the next event.

Mobile Stations

G2ATK/M Birmingham to Broadway, Worcs., and return.

G3AYT/M Penistone, Yorks., Holme Moss, Yorks., Ashton-under-Lyne, Lancs., Alderley, Ches., Leek, Staffs., and Buxton, Derbys.

Check Logs

The following are thanked for submitting useful check logs: G2WS, G2YB, G2DTO/P, G3NL/P, G3ISA, G5MR, G6WF, GC2FZC and B.R.S.6327.

Results of First Two Metre Field Day.

Psn.	Call-sign	Portable Location	Best QSO (miles)	Points
1	G3ABA/P	6m. N.W. Coventry ...	165	7060
2	G8UQ/P	7m. S.E. Basingstoke ...	212	6432
3	G3DIV/P	Eastbourne	183	6402
4	G4JJ/P	8m. E. Buxton	152	5683
5	GW3GWA/P	8m. S.W. Wrexham ...	154	5202
6	G5BM/P	1m. N. Blaenavon, Mon.	160	4739
7	G6XM/P	6m. E. Thirsk	245	4284
8	G2HCJ/P	12m. W. Crewe ...	152	4186
9	G3ION/P	4m. S.E. Shaftesbury ...	107	4092
*	G5KW/P	3m. E. Watlington ...	152	3780
10	G3FD/P	2m. S.W. Dunstable ...	164	3579
11	G3YZ/P	6m. S. Cheltenham ...	135	3578
12	G3MA/P	5m. E. Gloucester ...	128	3500
13	G2LW/P	Woldingham, Surrey ...	182	3290
14	G3GOP/P	3m. E. Corfe, Dorset ...	127	3160
15	G3FKO/P	2m. N.N.E. Wells ...	165	3071
16	G3BJQ/P	2m. S.E. Daventry ...	172	2735
†	G5MA/P	Gt. Bookham, Surrey ...	158	2633
17	G3FEX/P	3m. N. Brighton ...	125	2510
18	G8PX/P	4m. N.E. Oxford ...	120	2414
19	G3HSD/P	2m. S. Bristol	168	2388
20	G3AZT/P	12m. S. Rugby	92	2323
21	G3BHS/P	9m. N.E. Southampton	200	2281
22	G5ML/P	4m. N.W. Coventry ...	96	2248
23	G3FRG/P	2m. S.W. Storrington ...	112	1894
24	G3DVQ/P	Ditchling Beacon ...	95	1569
25	G3IRA/P	5m. S. Swindon	70	1528
26	G3ELG/P	6m. W. Rotherham ...	98	1257
27	G2XV/P	Linton, Cambs.	86	1221
28	G3BK/P	5m. S.W. Ely, Cambs. ...	75	775
29	G2FCL/P	4m. S.E. Bradford ...	160	745
‡	G4BP/P	2m. S. Scarborough ...	110	326
30	GM6WL/P	2m. W. Kilsyth	99	265

* *Late entry.* † *Located in permanent building.* ‡ *No declaration.*

Second Two Metre Field Day, 1955

ONLY minor changes to the rules for this event as compared with those which applied to the First Two Metre Field, 1955, have been made. Apart from the different dates, the only alteration is that relating to the method of giving the location of the station as it applies to competitors.

It has been decided that entrants must exchange National Grid References instead of the estimated distance from the nearest town. This information must be inserted in the appropriate column of the log. The change is intended to help contestants to calculate accurately the distance between stations. A short article dealing with the mathematics involved appears elsewhere in this issue.

The rules published on page 497 of the April issue of the BULLETIN, amended as shown below, will apply:

Rule 7 " Location " to read " N.G.R. or location."

Rule 9 Alter date to August 7, 1955.

Rule 13 Delete and insert the following " An exchange of reports (RS or RST) and Full Six Figure National Grid Reference will be required between portable stations before points for contacts may be claimed. In the case of contacts with fixed stations the distance from, and the name of, the nearest town must be given."

Rule 15 Alter date to August 15, 1955.

D/F Qualifying Events

DURING the last few weeks a number of competitors have qualified for the National Final to be held in September. In the event organized by the Radio and Television Section of the B.T.H. (Rugby) Recreation Club and held at Naseby in Northamptonshire, R.S.G.B. members from Salisbury, High Wycombe, Birmingham, Romford and Rugby took part. The first to find the hidden transmitter was T. Reynolds (Rugby) at 14.52, followed by G. T. Peck (High Wycombe) at 14.54, and P. N. Prior (Rugby) at 14.57. All three qualify for the Final. Seven competitors succeeded in reaching the finish within an hour.

A notable event after this contest took place at the B.T.H. Recreation Club-house when Mr. Reynolds was presented with a new trophy donated by the Organizing Committee. In future, the trophy will be awarded annually to the winner of the D/F Qualifying Event organized alternately by B.T.H. (Rugby) and the Slade Radio Society, Birmingham.

In the South Manchester contest, organized by M. Denny (G6DN) on behalf of the South Manchester Radio Club, competitors were dogged by very bad weather. Nevertheless, A. Brennan, G2AUC (South Manchester) located the hidden transmitter at 15.05, followed by J. J. Grant (B.T.H., Rugby) at 15.13, N. Ashton, G3DQU (South Manchester) at 15.23, and M. Barnsley, G3HZM (South Manchester), at 16.05. Messrs. Ashton, Brennan and Grant qualified for the National Final.

Contestants in the High Wycombe event not only had incessant rain to contend with but also found that the transmitter was hidden in an area where excavations had been made in the past for clay. Sandpits, gulleys and water-filled holes all had to be negotiated in making a direct approach. R. D. Charlton (Twickenham) did well, therefore, to arrive at 15.02, closely followed by A. C. A. Newman (Salisbury) at 15.03, P. J. Evans (Rugby) at 15.14, J. F. Finch (High Wycombe) at 15.30, J. J. Grant (Rugby) at 15.40, T. C. Reynolds (Rugby) at 15.41, R. Seabrook (Southend) at 15.42, H. Drury (Southend) at 15.44 and D. H. Simmonds (Slade) at 16.01. Messrs. A. C. A. Newman, P. J. Evans and R. Seabrook qualified for the Final.

DETAILS of the Salisbury qualifying event are as follows:

Sunday, August 21

Organizer: H. G. Futcher, 171 Castle Road, Salisbury.

Call-sign: G3FKF/P.

Frequency: 1810 kc/s.

Assembly Point: Stonehenge Car Park, N.G.R. 123/422.

Map: Ordnance Survey, New Popular Edition, Sheet 167.

Assembly Time: 13.30 B.S.T.

Intending competitors should notify the Organizer at least 7 days in advance, stating the number in their party requiring tea. Competitors will be informed of the venue for tea at the start.

* * *

The Edgware D/F Qualifying Event arranged for August 7 has been cancelled owing to lack of support.

European DX (W.A.E.) Contest

THE German society, D.A.R.C., sponsors of the W.A.E. Certificate, are promoting a European DX Contest during September. The contest will be in two 48-hour sections:—

Telegraphy: 00.00 G.M.T. September 17 to 24.00 G.M.T. September 18
Telephony: 00.00 G.M.T. September 24 to 24.00 G.M.T. September 25.

During the event, European competitors must observe the I.A.R.U. European Band Plan. All bands from 3.5 to 28 Mc/s may be used but cross-band contacts will not be allowed to count for points.

Special log and total sheets may be obtained from D.A.R.C. together with copies of the rules. Applications, stating the number of sheets required, should be accompanied by an International Reply Coupon (two for air mail).

Entries must be postmarked not later than November 20, 1955, and should be addressed to the Contests Committee, D.A.R.C., DX Bureau, Fuchsienweg 51, Berlin-Rudow, Germany.

Governor visits N.F.D. Station

GUERNSEY members taking part in National Field Day were honoured with a visit from His Excellency The Lieutenant-Governor of the Channel Islands, Air Marshal Sir Thomas Elmhirst, who expressed great interest in all that was going on. The opportunity was taken to explain to His Excellency the work of the Radio Amateur Emergency Network.

Region 15 re-enters N.F.D.

AFTER a break of two years, members in Region 15 took part in National Field Day. At the Belfast station, despite time lost in re-erecting two masts brought down by a strong wind, GI5UR/P did well. With the exception of GI5UR and GI3ML, all taking part held three-letter calls.

Visitors to the site included GM3HLQ and Bill Everingham of the B.B.C.'s Northern Ireland Regional staff whose recording was unfortunately not broadcast.

Medway Hamfest

THE annual Medway Hamfest will be held at the Franklin Rooms, Franklin Road, Gillingham, Kent, on July 17, commencing at 2.30 p.m. An excellent programme has been arranged in addition to the famous raffle.

A steward will be on duty at Gillingham Station to direct visitors to the venue. Tickets, price 1s. 6d. (family tickets 2s. 6d.), may be obtained from W. E. Nutton (G6NU), 42 Richmond Road, Gillingham, or at the door. Refreshments, including drinks, will be free.

Contests Diary

1955

August 7	-	Two Metre Field Day (No. 2)*
August 21	-	D/F Qualifying (Salisbury)†
September 4	-	Low Power Field Day
September 10–11		420 Mc/s Contest (No. 2)
September 11	-	D/F National Final
September 24–25		420 Mc/s Contest (No. 2)
October 1–2	-	Low Power
November 12–13		Top Band (No. 2)

†*For details, see opposite.* **For rules, see page 35.*

National Grid References and Calculation of Distances

A BRIEF explanation of the National Grid system and of two of its uses is offered, primarily for the assistance of v.h.f. operators, some of whom have shown in the recent Two Metre Field Day an inability to give an accurate N.G.R. or a reasonable estimate of distances from stations contacted.

The system is used by the Ordnance Survey, and is described on each sheet of the New Popular Edition of One Inch maps. It is also used in the new edition of the Automobile Association Road Book.

The location of any point in Great Britain is given by two measurements; its distance to the east and its distance to the north of a point selected to the w.s.w. of Land's End. The country is divided into squares with 100 kilometre sides, and the maps are further subdivided into 10 km, 1 km and 100 m squares, according to the scale of the map. The one inch map is divided into 1 km squares, and positions may be estimated to the nearest 100 metres.

For example, a point in Beckenham, Kent, is 537.7 km east, and 169.2 km north of the origin. Thus it falls in the 100 km square whose s.w. corner is 5 hundred km east and 1 hundred km north of the origin, *i.e.*, in square 51. The N.G.R. of the point consists of the identification of the 100 km square, and its position in that square, *i.e.*, 51/377692. "Eastings" are given before "Northings" in each part of the reference. This reference is called the "full six figure reference" of the point. The Ordnance Survey now uses letters instead of numbers to indicate the 100 km squares, and both systems are given on the maps. The above reference is now given as TQ/377692.

The distance between two points can be obtained from their N.G.R.s by application of Pythagoras' theorem. Consider a point NX/377692, or 25/377692 (which happens to be in Kirkcudbright) and let us find its distance from the above point in Beckenham. The point is 237.7 km east and 569.2 km north of the origin, *i.e.*, it is 300 km west and 400 km north of Beckenham. Remembering that $3^2+4^2=5^2$, the distance between the points is 500 km. Since 1 km=0.621 miles, the distance is 310.5 miles.

Similarly, any distance can be calculated as follows:— The N.G.R. of each point is split into its "Eastings" and "Northings." (51/377692 becomes 537.7 E and 169.2 N, and a point in S.E. Birmingham 42/075850 becomes 407.5 E and 285.0 N.)

The differences between Eastings and between Northings are calculated by subtraction, *i.e.*, 537.7—407.5= 130.2; 285.0—169.2=115.8. The differences are squared and added, and the square root of the sum extracted, *i.e.* $(130.2)^2=16952$; $(115.8)^2=13410$: $(130.2)^2+(115.8)^2=30362=(174.2)^2$. The distance between the points is then 174.2 km, or, multiplying by 0.621 is 108.2 miles.

The tedious arithmetic can be avoided quite readily by a graphical method which allows distances to be read off at some speed. It requires only a sheet of squared paper and a simply prepared scale. In fact the squared paper can be dispensed with at the cost of drawing and subdividing two perpendicular straight lines.

In a typical case, a sheet of squared paper, 25 x 20 cm, divided into mm was used. It was marked off every 5 cm to read 0, 50, 100, 150, 200 and 250 km on one edge, and similarly up to 200 km on the other. The cursor was made from a strip of thin transparent plastic (*e.g.*, perspex), about 16in. long and 1in. wide. A fine line was scribed along the centre, and a zero mark made close to one end. At 16.09 and 32.18 cm from the zero mark, 100 mile and 200 mile marks were made. With a pair of dividers, further calibrations were made at 50, 150 and 250 miles, and then every 10 miles. The first 10 mile section was further divided into 2 mile divisions. The scribed lines were labelled at each 50 mile division, and all the scribings filled with Indian ink. It is worth while spending some time and care in dividing the cursor, as upon its accuracy depends the accuracy of the measurements. In use, the cursor is placed across readings on the two edges of the graph paper corresponding to the differences in "Eastings" and "Northings" of the two locations, and the mileage read direct from the cursor to the nearest mile.

Accuracy of the graphical method is increased in proportion to the size of the paper used. For shorter distances, the scale of the drawing was reduced mentally by a factor of 2, 5 or 10. Thus in the last case, 1 cm on the paper would correspond to 1 km and 10 miles on the cursor to 1 mile.

T. L. H.

Amateur Radio in Oils

PASSERS-BY in Newgate Street, London, E.C., at lunch time on June 24 stopped to admire a finely executed painting in oils of Amateur Radio Station G5VF painted by the licensee, Mr. C. S. Matthews. The picture was included as part of the Post Office Art Club's weekly Open Air Show. Mr. Matthews lives in St. Albans.

Birthday Honours List

FRIENDS of Mr. Jack Cookson (G6KK) of Blackpool will be glad to hear that he was awarded the B.E.M. in the Queen's Birthday Honours List.

Letters to the Editor . . .

Home-built Receivers

DEAR SIR,—I am in agreement with Mr. Powell's views on the above subject in the May issue, and would like to support him further with the following remarks which I hope will tend to convince his rather sceptical amateur operator friends that there is a great deal of truth in what he says.

(a) I have built a nine-valve receiver with this line up—2 r.f. stages (both regenerative) 1st detector, oscillator, 2 i.f. (one regenerative), detector, audio, b.f.o, and rectifier. It is fitted with a crystal filter, band-switched and bandspread for the 1.8, 3.5 and 14 Mc/s bands—all this measuring 21 in x 15 in x 11½ in high. This receiver, which is my own idea of what a receiver should be, was built in my hut in the garden. The hut is 7 ft by 6 ft and contains all my radio gear including a home-made 150 W transmitter; the total area of flat space available measured 13 *inches* by 24 *inches* after removing Morse keys!—so much for whether expensive workshop facilities are required.

(b) I had no test gear to line up the receiver, so used my v.f.o.

(c) It is possible therefore to build a quite good receiver that really works.

(d) I am a radio amateur and not a professional radio engineer, and have to use in consequence a lot of "hit or miss" methods, but I could eliminate 150 W transmissions from G3ARI 400 yards away (both aerials running parallel) a few kilocycles off his beat on 14 Mc/s, quite successfully—that is why I have eleven controls on the panel, but in ordinary working it is single dial tuning.

(f) The only tools used were a tank cutter, a hand drill, two pairs of pliers, screwdriver, soldering iron, oh! yes, and a saw to make the cabinet (in the garden this time).

(g) I must admit it took five months of careful lay-out, planning and circuit design, and nearly as many to build it.

The keynote of success is methodical stage by stage construction, infinite construction and knowing "how it works."

Yours faithfully,

Potters Bar, Middlesex. A. H. BRUCE (G5BB).

DEAR SIR,—I was interested to read the letter by Mr. D. K. Powell in the May issue of the BULLETIN.

While stationed in West Africa during the war I wished to build myself a receiver to pick up the B.B.C. Overseas Service on 7 and 14 Mc/s (as far as I can remember). I decided to build a superhet, as I had never built one before.

I had a most unpromising selection of old junk to work with, some of which was salved after six months under the sea and two or three months in the open in the tropical sun and rain. I had a selection of American 2.5 V valves, a couple of variable (2 gang) 0.0005 μF condensers, and some iron cored i.f. coils whose frequency I did not know.

I could not get hold of an oscillator, so had to do without.

My method was as follows:—

(1) I calculated the size of coil necessary for the coverage I required and built up a suitable local oscillator.

(2) I arranged the coupling of the oscillator so that when I shorted out the variable condenser I got the same change in anode current over the whole tuning range.

(3) I built an oscillating detector with one of the i.f. coils and a variable condenser.

(4) I built an r.f. stage, arranged it to oscillate, and tuned it with the other half of the oscillator condenser. The oscillator condenser was graded, so I did not use padders.

(5) By beating the r.f. stage against the oscillator and the result against the detector I was able to decide on the final coil sizes and fix the i.f. coil and tuning.

(6) The r.f. stage was next turned into a pentode frequency changer by putting the i.f. coil in the anode circuit.

(7) The oscillating i.f. detector was used to pick up anything which came out, and the rig was lined up sufficiently to pick up a station.

(8) An r.f. stage and i.f. stage and detector and amplifier were then added and the whole lot lined up on the station.

The line-up and tuning of the r.f. stages was done by lengthening and shortening the coils and slipping pieces of mica between the vanes of the condensers, these being removed after the coils had been adjusted. I am afraid I never knew the i.f. of that set!

This all seems very crude, but the set worked very well. It had two-knob tuning and even an Engineer Officer, who was a friend of mine and knew nothing about "Wireless," could get any station he wanted.

I know it's much easier if you have a test oscillator, but it isn't necessary if you have a good pair of ears and a bit of patience.

Yours faithfully,

Topsham, Devon. R. T. MANLEY, B.Sc., A.M.I.E.E. (B.R.S.11643).

The Amateur (Sound) Licence
Another Criticism of G.P.O. Arrangements

DEAR SIR,—May I add my protest to that of "Ex DX" and Mr. Barlow (G3CVO) in the matter of the handling by the G.P.O. of applications for Amateur (Sound) Licences from suitably qualified and experienced persons?

My own application for exemption from the R.A.E. met with no success despite what I considered to be more than sufficient evidence of capability, coupled with some ten years' experience in the aeronautical wireless field, including operation of ground transmitting stations. After some months of argument I gave up the unequal struggle and sat the R.A.E. At about the same time I sat also for a Radio Engineer's Licence in Civil Aviation. The result of this was known quickly and I advised the G.P.O. Only then did I receive a favourable reply and it was agreed that I could be granted a licence. Unfortunately that letter came too late—in fact it arrived the day I sailed overseas!

Much time, and a certain amount of money, had been wasted and the R.A.E. had been sat for needlessly. (I received the result of the R.A.E. about six months later.) Shortly after arriving in West Africa I applied for, and obtained, my present licence, but I suppose when I return to the United Kingdom on leave and apply again for a licence, it will be granted on a c.w. only basis; or will the G.P.O. have changed its ways and grant me permission to use R/T if I wish?

Certainly I think the G.P.O. staff responsible for handling licence applications could take a more realistic view of those received from obviously capable and experienced persons.

There is one last thing I feel I must add. Most of the communications received from the G.P.O. were signed by the same person. Not until the last, and favourable, letter was sent was "Miss" added to that signature. Could it be, I wonder, that she had had, until then, something of a guilty conscience over the matter and would have me assume I was dealing with male staff? . . . She need not have worried.

Yours faithfully,

E. H. WEDLOCK (ZD2EHW).

Wireless Station Superintendent, Posts and Telegraphs,
Benin, Nigeria.

Plea for a Novice Licence

DEAR SIR,—Mr. R. Winters (B.R.S.20133) in the April issue of BULLETIN has once again emphasised the need for a review of conditions governing the issue of amateur licences to keen people who are anxious to join the ranks of Amateur Radio operators.

By all means let us copy our American friends and institute a "Novice Licence" whereby those seriously intending to learn all they can about Amateur Radio can do so by practical means without the necessity of a theoretical examination to contend with at the start of their hobby. The Morse test should also be relaxed to allow novices to acquire the necessary knowledge and speed by contact with others. When a novice feels he has acquired and mastered the theoretical and practical sides of Amateur Radio he should be able to apply to the G.P.O. for a full amateur licence. No doubt the G.P.O. or R.S.G.B. could devise suitable circuits to be used by novices. Power should be restricted to 5 watts input, crystal controlled, using c.w. or phone in certain specially assigned bands. The licence fees charged would be a useful increase to P.O. revenue. By the same token, the R.S.G.B. would find a considerable increase in membership if these ideas were adopted with the Society's backing.

I realize, however, that such revolutionary suggestions will cause an outcry of condemnation from some "regular" amateurs who had to do it the hard way (to them). On the other hand I feel that those who have the best interests of their hobby at heart will give the suggestions their encouragement thereby helping their less theory-minded brethren to the required standard for a full licence. By all means limit the period of the novice licence to 6 months, with a single extension of 6 more months, if necessary. If the applicant is unable to qualify for a full licence in that time, then the novice licence should be withdrawn altogether as the person concerned is unlikely to make the grade.

Yours faithfully,

Cambuslang, near Glasgow. WILLIAM DUNCAN (B.R.S.19308).

V.H.F. Beam Rotating System

DEAR SIR,—Mr. G. I. Turner's description of his system of beam rotation in the March issue of the BULLETIN was very interesting to me because we both appear to have had the same idea in mind originally.

I have been using my system very successfully for several years, but as it differs from that of G3DGN I am prompted to send this brief description. I did not have to produce a specially sensitive

relay as the normal surplus types were satisfactory, *i.e*, 24-50 V.

In the arrangement I use (Fig. 1), once the mains are switched on the equipment is ready; once the motor is switched on it can be left scanning the 360°, back and forth, whilst my hands are occupied with the receiver. On hearing a signal, S2 is used to stop the aerial movement; should I have passed over the station it is easy to reverse the rotation. An arm on the aerial spindle closes either C or D at the end of the circle thus changing over the relays and reversing the motor which is geared down. Luckily, I had a 200:1 gear-box with the high to low spindles in line. With a 3:1 type in tandem this gives a total reduction of 600:1. Scanning speed is of the same order as in Mr. Turner's case.

Originally I used a milliammeter to show the aerial's direction. As a meter movement does not cover 360° a suitable gearing had to be fitted to the potentiometer in the 100 V d.c. line. I found that if not used regularly, the wiper contact on the potentiometer varied the current giving a false indication of direction on the meter. Until I can obtain a reliable type I am using a flexible drive to a pointer indicator in the shack. The system reverses at " south."

Yours faithfully,
W. H. MATHEWS. (G2CD)

Seven Kings, Essex.

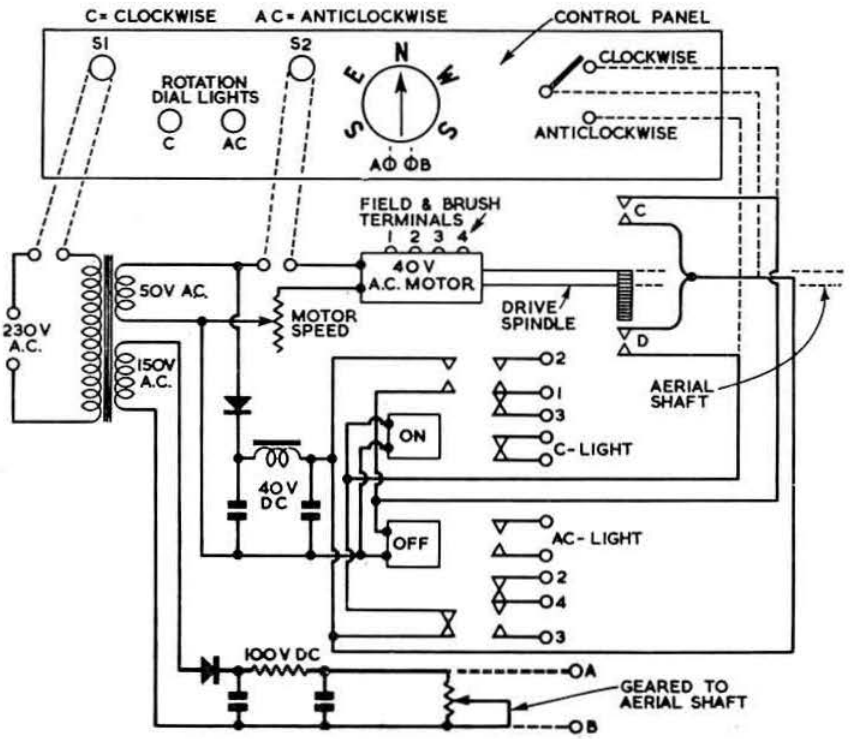


Fig. 1.
G2CD's beam rotating system.

B.R.S. Reports

DEAR SIR,—As an amateur who was a short wave listener for some six years, I believe I can help D. H. Collins in his quest (June issue) for the ideal form of listener report. I have written an imaginary report which can be filled in on an ordinary QSL card provided the back is utilised to its fullest extent. A covering letter may also help the amateur, and certainly gives the friendly touch, but I believe the R.S.G.B. QSL Bureau only handles cards. (Correct—Ed.)

SPECIMEN REPORT

From *B.R.S.123456*
Name ....., *full QTH.*

To Radio VQ4AB. Ur c.w. sigs rcvd hr at 1620-1640 G.M.T. on June 18, 1955, on 14065 kc/s (measured). U called CQ twice, then worked ZL3AG followed by ZS3B at 1630 G.M.T. Ur sigs RST579 average, peaking to S9 with QSB to S4. Note excellent, pure d.c. without clicks or chirps. VQ4BC was being rcvd RST569, VQ5BA at 579 and VQ5DQ at 589 within the same half hour. Occasional QRM caused by European stations. No QRN.

RX hr is R1155 (SH6) using loudspeaker. Aerial 14 Mc/s folded dipole running N/S 15ft high.

73 es gud DX,

A. SMITH.

PSE QSL VIA RSGB.

Of course, for a phone station full details of modulation (under-, full- or over-modulation), speech quality, any distortion, sufficiency of bass and treble, and effect of QRM upon readability should all be included in the report.

I hope this will be of value to B.R.S. members.

Yours faithfully,
M. DRANSFIELD (G3JKO).

Nottingham.

A New S-Code Proposed

DEAR SIR,—May I join a small voice of hearty agreement to Mr. Turner's suggestion (in the June BULLETIN) that the S-code of nine points is overdue for reform? But I would go much further than Mr. Turner!

Surely no-one, using his ears alone, can be expected to differentiate between *eight* shades of signal strength between the present S1 and S9. What is the difference between a " very weak " signal and a " weak " one? Or (worse!) between a " fair " signal and a " fairly good " one?

To give anything approaching an accurate answer would need more careful consideration of many factors—physical, psychological, electrical—than the average amateur has time or inclination for in a short QSO. The result is a vague, and almost always flattering, guess.

In the absence of an absolute standard (S-meters themselves being purely relative) may I suggest that the majority of amateurs would find a four-point S-code adequate for all normal reporting purposes:

S1—Very weak signal (I *think* it was a signal!).
S2—Fair signal (but hope no QRM or QRN comes up!).
S3—Strong signal (don't mind if it does!).
S4—Exceptionally strong signal (please QSL!).

The comments in brackets are not entirely facetious. They offer a clue to the strengths indicated.

The whole subject of signal strength as read at the receiver is a thorny one, and the Society might render a real service to the amateur movement by exploring it thoroughly. Perhaps there is even a brilliant BULLETIN contributor who would give us an article called (if I may give a title to provoke thought in the right direction): " Towards an *absolute* standard in signal strength reporting."

Yours faithfully,
E. H. SIMMONDS (ex-G8QH).

Roquebrune-Cap-Martin
A.M., France.

Can You Help ?

● A. S. Burden (G3IIZ), 1 Repton Manor Road, Ashford, Kent, who wishes to obtain information on the British Army Set No. X42A, particularly the valve line-up and front panel plug connections?

● G. Henry (G13BHX), Carrowlaverty, Armoy, Ballymoney, Co. Antrim, N.I., who requires the manual and conversion data for the British Army Transmitter-Receiver No. 11?

● Captain G. R. K. Lyon (DL2XR), 3rd Carabiniers, B.A.O.R. 10, who requires the circuit diagram or any other information regarding the use of a v.f.o. with the B2 transmitter?

Silent Key

E. J. HEWINES (G4CT)

It is with deep regret that we record the death on May 24, 1955, of E. J. Hewines (G4CT), of Stafford, at the early age of 38. Although his station was not often heard on the air, he was a keen constructor and enthusiastic experimenter in the fields of electronics and television.

To his widow and young son David we extend our sympathy in their sudden bereavement.

N. W. A.

Regional & Club News

Bristol.—" Stroke P and All That " was the topical title of T. C. Bryant's (G3SB) talk at the June meeting. On June 19, local members welcomed a large party from the Southampton Group. Visits were paid to the B.B.C. and Portishead Radio. On July 22 members will be visiting the Burden Neurological Institute to see the latest equipment, in which extensive use is being made of transistors. *Hon. Secretary:* D. F. Davies (G3RQ), 51 Theresa Avenue, Bishopston, Bristol 1.

Chislehurst and Sidcup.—The Group will meet at 8 p.m. on July 25 at the United Services Club (Mons Room), Main Road, Sidcup (near the Police Station) to discuss the future programme, R.A.E.N., preselector design and a receiving contest for B.R.S. members. *Town Representative:* A. Swindon (G3ANK), 135 Station Road, Sidcup.

East Kent Radio Society.—Prospective members and visitors are cordially invited to attend the Society's fortnightly meetings at " The Two Brothers," Northgate Street, Canterbury. Activities include lectures, junk sales and raffles. Morse classes by G2BBT and Radio Theory classes by G3FCT commence shortly. *Hon. Secretary:* D. Williams, " Llandogo," Bridge, Canterbury.

Grafton Radio Society.—The Society's Annual Field Day on Hampstead Heath on June 11–12 was again most successful, many contacts being made on all bands from 1.8 to 14 Mc/s. The " G2AAN Cup " for the recent Top Band Contest was presented by the President (G2AAN) to A. Latham (G3JLA). Certificates of merit were awarded to J. Mulcahy (G3JVV) and H. Lassman (G3JZX). *Hon. Secretary:* A. W. H. Wennell (G2CJN), 145 Uxendon Hill, Wembley Park, Middlesex.

Leeds Amateur Radio Society.—At the A.G.M. on June 15 the following Officers and Committee Members were elected: *President:* R. Thornton; *Chairman:* A. Chapman; *Hon. Secretary:* J. M. Gale (G3JMG), 104 Bentley Lane, Meanwood, Leeds 6; *Hon. Treasurer:* W. Ripley (G4AD); *Committee Members:* E. Ellis, B. A. Payne, K. T. Preston, G. Roberts and L. Stephenson (G3IVD). For details of meetings, see *Forthcoming Events.*

Maidstone.—Local members are invited to communicate with the *Town Representative:* John Oliver (G3CWG), " Shangri-la," 6 Shelley Road, Maidstone, who will be pleased to give details of local activities.

Medway Amateur Receiving and Transmitting Society.—The Society now meets on alternate Mondays at the " Golden Lion," High Street, Brompton, adjacent to the previous meeting place. The next meeting will be on July 18 at 7.30 p.m. *Hon. Secretary:* D. Brett, 14 Connaught Road, Chatham.

QRP Society.—A U.S. section of the Society has been formed under the direction of W0PRM. The Portable Amateur Radio Equipment Contest, open to members and non-members alike, closes on September 30. Full details of this and other aspects of the society's work may be obtained from the *Hon. Secretary:* John Whitehead, 92 Rydens Avenue, Walton-on-Thames, Surrey.

Slade Radio Society.—Meetings at the Church House, Erdington are arranged for July 22 (" Two Metre Mobile Equipment," T. Tallboys, G2ATK/M), August 5 (" Brains Trust ") and August 19 (" Design of Transformers "). On Mondays, there are lectures on " Station Operation and Procedure," and on Wednesdays " Morse Practice and Equipment Design." R.A.E. classes will be held on July 29, August 26 and September 23. The fourth of the season's Harcourt Trophy D/F Tests will be held on August 28. Full details may be obtained from the *Hon. Secretary:* C. N. Smart, 110 Woolmore Road, Erdington, Birmingham 23.

Southend & District Radio Society.—The Mullard film *The Manufacture of Radio Valves* was shown at a meeting at the Middleton Hotel on July 8 and was followed by a technical discussion led by a Mullard Technical Executive. *Hon. Secretary:* P. C. Baldwin, 13 Inverness Avenue, Westcliff-on-Sea.

Stockport Radio Society.—R.S.G.B. members of the society operated two stations in N.F.D. and improved upon last year's score by 25 per cent. Recent lectures have included " The Electronic Balance " by P. H. Briggs, B.Sc.(Tech.). *Hon. Secretary:* D. Hall (G3KAH), 13 Hallam Street, Heaviley, Stockport.

Tees-side Amateur Radio Club.—" Crystal Filters and I.F. Amplifiers " will be the subject of G3JMO's talk on July 15. R. Weir will give a lecture on " Colour Television " on July 29. Other forthcoming lectures include " Radio Mathematics " by J. B. Harding (G3JYH) and " V.H.F." by M. Beck (G3DTK). *Hon. Secretary:* B. B. Wilson (B.R.S.19449), 297 Linthorpe Road, Middlesbrough.

Torbay Amateur Radio Society.—National Field Day was the main topic of discussion at the meeting on June 18. G2GK announced that recorded lectures and film shows are being arranged. Visitors are cordially invited to attend meetings of the society, the next being on July 16 at the Y.M.C.A., Castle Road, Torquay, commencing at 7.30 p.m.

More than 80 members with their ladies and visitors from neighbouring clubs attended the Annual Dinner of the Wirral Amateur Radio Society held recently at the Coach and Horses Hotel, Moreton. In this picture, the Society's Chairman, J. Wylde (G8BM) is in the centre of the top table and on his right Basil O'Brien (G2AMV), No. 1 Regional Representative. Seated at the bottom left-hand corner is the Honorary Treasurer (E. N. Evans, G3FRT), who was largely responsible for the success of the event.
(Photo by Wm. Cull, Birkenhead)

Forthcoming Events

REGION 1

Blackpool (B. & F.A.R.S.).—July 26, 7.30 p.m., 25 Abbey Road, Blackpool.
Bury.—July 14, 7.30 p.m., 52 The Drive, Seedfield, Bury. (No meeting during August.)
Chester (C. & D.A.R.S.).—Tuesdays, 7.30 p.m., Tarran Hut, Y.M.C.A., Chester.
Crosby.—Tuesdays, 8 p.m., over Gordon's Sweetshop, St. John's Road, Waterloo.
Isle of Man (I.o.M.A.R.S.).—July 20, August 3, Manor Guest House, Victoria Road, Douglas.
Lancaster (L. & D.A.R.S.).—August 3, 7.30 p.m., "George Hotel," Torrisholme.
Liverpool (L. & D.A.R.S.).—Tuesdays, 8 p.m., St. Barnabas Hall, Penny Lane, Liverpool, 15. **(M.R.S.).**—July 27, August 10, 24, 8 p.m., Larkhill Mansion House, Queen's Drive, Liverpool, 13.
Manchester (S.M.R.C.). — Fridays, 7.45 p.m., Ladybarn House, Mauldeth Road, Manchester, 14.
Preston.—July 15, 29, August 12, 26, 7.45 p.m., St. Saviour's Parish Hall, Manchester Road, Preston.
Rochdale (R.R.T.S.).—Fridays, 7.45 p.m., 1 Law Street, Sudden.
Southport.—Thursdays, 8 p.m., Sea Cadets' Camp, Esplanade, Southport.
Stockport (S.R.S.).—July 20, August 3, 17, 8 p.m., "The Blossoms Hotel," Buxton Road, Stockport.
Warrington (W. & D.R.S.).—July 21, August 4, 18, 7.30 p.m., "King's Head Hotel," Winwick Street, Warrington.
Wirral (W.A.R.S.).—July 20, August 3, 17, 7.45 p.m., Y.M.C.A., Whetstone Lane, Birkenhead.

REGION 2

Barnsley.—July 22, 7.30 p.m., "King George Hotel," Peel Street.
Bradford. — July 26, 7.30 p.m., Cambridge House, 66 Little Horton Lane.
Catterick.—Wednesdays, 7 p.m., Loos Lines, Catterick Camp.
Darlington.—Thursdays, 7.30 p.m., 129 Woodlands Road.
Doncaster.—August 10, 7.30 p.m., Y.W.C.A., Cleveland Street.
Gateshead.—Mondays, 7.30 p.m., Mechanics' Institute, 7 Whitehall Road.
Hull.—July 26, August 9, 7.30 p.m., "William IV Hotel," Cottingham.
Leeds.—Wednesdays, 7.30 p.m., Swarthmore Educational Centre, 4 Woodhouse Square.
Middlesbrough.—July 15, August 5, Settlement House, Newport Road.
Pontefract.—July 21, August 4, 8 p.m., "Fox Inn," Knottingley Road.
Rotherham.—Wednesdays, 7 p.m., "Cutlers Arms," Westgate.
Scarborough.—Thursdays, 7.30 p.m., B.R. Rifle Club, West Parade Road.
Sheffield.—July 27, 8 p.m., "Dog and Partridge," Trippet Lane, August 10, 8 p.m., Albreda Works, Lydgate Lane.
Slaithwaite.—Fridays, 7.30 p.m., 3 Dartmouth Street.
York.—Thursdays, 7.30 p.m., Club Rooms, Y.A.R.S., Fetter Lane.

REGION 3

Birmingham (M.A.R.S.). — July 19, 7 p.m., Midland Institute. **(Slade).**—July 22, August 5, 7.45 p.m., Church House, High Street, Erdington.
Coventry.—July 15, 7.30 p.m., Priory High School. **(C.A.R.S.).**—July 18, August 7, 15, 9 Queens Road.
Kenilworth, Warwick & Leamington.—July 21, 7.30 p.m., Dalehouse Lane.
Redditch.—July 28, 8 p.m., 10 Woodlands Road, August 9, 8 p.m., "Scale and Compasses," Birchfield Road.
Rugby.—August 8, 7.30 p.m., B.T.H. Recreation Club, Hillmoreton Road.
Solihull.—July 25, August 8, 7.30 p.m., Defence Headquarters, Sutton Lodge, Blossomfield Road.
Stoke.—July 27, 8 p.m., "Lion's Head," John Street, Hanley.
Stourbridge.—August 2, 8 p.m., King Edward's School.
Walsall.—July 27, August 10, 8 p.m., Technical School, Bradford Place.
Wolverhampton.—July 18, August 1, 8 p.m., Stockwell End, Tettenhall.

REGION 4

Alvaston.—Tuesdays, Thursdays, 7.30 p.m., Sundays, 10.30 a.m., Nunsfield House, Boulton Lane, Alvaston, nr. Derby.
Chesterfield.—Tuesdays, 7.30 p.m., Bradbury Hall, Chatsworth Road.
Derby (D. & D.A.R.S.).—Wednesdays, 7.30 p.m., Derby College of Arts and Crafts, Subbasement, Green Lane.
Ilkeston (I. & D.A.R.S.).—Thursdays, 7 p.m., Room 5, Ilkeston College of Further Education, Field Road.
Leicester (L.R.S.).—July 18, 7.30 p.m., Holly Bush Hotel, Belgrave Gate.
Lincoln (L.S.W.C.).—No meeting in August.
Mansfield (M. & D.A.R.S.).—No meeting in August.
Newark.—August 7, 7 p.m., Northgate House, North Gate, Newark.
Northampton (N.S.W.C.). — Fridays, 7 p.m., August 5, 6 p.m., Club Room, 8 Duke Street.
Nottingham.—July 15, 7.30 p.m., Sherwood Community Centre, opposite Woodthorpe Drive, Sherwood.
Peterborough.—August 10, 7.30 p.m., 21 Hankey Street.
Worksop.—No meeting in August.

REGION 5

Chelmsford. — August 4, 7.30 p.m., Marconi College, Arbour Lane, Chelmsford.
Lowestoft and Beccles (L. & B.A.R.C.).—July 27, August 10, 7.30 p.m., Y.M.C.A., Lowestoft.

REGION 6

Gloucester (G.R.C.). — Thursdays, 7.30 p.m., The Cedars, 83 Hucclecote Road, Gloucester.
Jersey, C.I.—July 26, 7.45 p.m., Chamber of Commerce, Royal Square, Jersey.
Oxford (O. & D.A.R.S.).—July 27, August 10, 7.30 p.m., Club Room, "Magdalen Arms," Iffley Road, Oxford.
Portsmouth. — Tuesdays, 7.30 p.m., British Legion Club, Queen's Crescent, Southsea (Clubroom open every evening).
Stroud.—Wednesdays, 7.30 p.m., Subscription Rooms, Stroud.

REGION 7

Acton, Brentford and Chiswick.—Tuesdays, 7.30 p.m., A.E.U. Rooms, 66 High Road, Chiswick, W.4.
Barnes, Putney and Richmond.—September 2, 337 Upper Richmond Road, S.W.14.
Bexleyheath.—July 28, August 11, 7.30 p.m., Congregational Hall, Chapel Road, Bexleyheath.
Bromley (N.W.K.A.R.S.).—August 5, 8 p.m., "Shortlands Hotel," Station Road, Shortlands, Kent.
Chingford.—July 22, August 5, Venue from G4GA (SIL 5635) or B.R.S.19765 (SIL 6055).
Chislehurst and Sidcup.—July 25, United Services Club, Main Road, Sidcup.
Croydon.—August 2, 7.30 p.m., Blacksmith Arms, 1 South End, Croydon.
Dorking.—Tuesdays, 7.30 p.m., 5 London Road.
Ealing.—Sundays, 11 a.m., A.B.C. Restaurant, Ealing Broadway, W.5.
East Molesey.—August 3, 8.30 p.m., "Carnarvon Castle Hotel" ("Aspects of 2m Operation," G2AIW).
Enfield.—July 17, 3 p.m., George Spicer School, Southbury Road, Enfield.
Epping.—Alternate Wednesdays, July 27, Hancock & Smith, 55 High Road, Epping.
Finsbury Park.—July 19, 7.30 p.m., 16 Albion Road, Stoke Newington, N.16.
Hendon and Edgware.—Wednesdays, 8 p.m., 21 Goodwins Avenue, Mill Hill.
Hoddesdon.—August 4, 8 p.m., "Salisbury Arms."
Holloway (Grafton R.S.).—Mondays (R.A.E.) and Fridays, 7 p.m., Grafton School, Eburne Road, N.7.
Ilford.—Thursdays, 8 p.m., G2BRH, 579 High Road.
Kingston (K. & D.R.S.).—Alternate Wednesdays, 7.45 p.m., Penrhyn House, Penrhyn Road.
Lewisham (R.A.R.C.).—Wednesdays, 8 p.m., Durham Hill School, Downham.
London (L.M.L.C.).—July 15, August 19, 12.30 p.m., Bedford Corner Hotel, Bayley Street (off Tottenham Court Road), London, W.C.1.
London (U.H.F. Group).—August 4, 7.30 p.m., Bedford Corner Hotel, Bayley Street (off Tottenham Court Road), London, W.C.1.
Norwood.—July 16, August 20, Windermere House, Weston Street, Crystal Palace.
Southgate and Finchley.—August 11, Arnos School, Wilmer Way.
Slough.—August 2, Venue from G2HOX or G3BTP, 13 Quaves Road, Slough.
Sutton and Cheam (S. & C.R.S.).—July 19, August 16, "The Harrow," Cheam Village.
Welwyn Garden City. — No meeting during August (next meeting September 6).

REGION 8

Brighton (B.D.R.C.). — Tuesdays, 7.30 p.m., "Eagle Arms," Gloucester Road.
Chatham (M.A.R.T.S.).—July 18, August 1, 15, 7.30 p.m., "Golden Lion," High Street, Brompton.
Hastings (H. & D.R.C.).—July 26, August 9, 23, 7.30 p.m., Saxons' Cafe, Denmark Place.
Isle of Thanet (I.o.T.R.S.).—Fridays, 7.30 p.m., Hilderstone House, Broadstairs.
Sussex R.A.E.N. — July 16, August 20, 7.30 p.m., Kings Head, Fishersgate.
Worthing (W. & D.R.C.).—August 8, 7.30 p.m., Adult Education Centre, Hawley Street.

REGION 9

Bristol.—July 15, August 19, 7.15 p.m., Carwardine's Restaurant, Baldwin Street, Bristol, 1.
Exeter.—August 5, 7 p.m., Y.M.C.A., St. David's Hill.
Falmouth (W.C.R.C.).—July 21, August 4, "The Fifteen Balls," Penryn.
North Devon.—August 4, G3BO, Rosebank, Westcombe, Bideford.
Torquay. — July 16, August 20, 7.30 p.m., Y.M.C.A., Castle Road.
Weston-super-Mare. — August 2, 7.30 p.m., Y.M.C.A.
Yeovil.—Wednesdays, 7.30 p.m., Grove House, Preston Road.

REGION 10

Cardiff.—August 8, 7.30 p.m., "The British Volunteer," The Hayes, Cardiff.
Neath and Port Talbot.—August 2, 7.30 p.m., "Royal Dock Hotel," Briton Ferry.

REGION 13

Dunfermline.—Thursdays, 7.30 p.m., behind 34 Viewfield Terrace, Dunfermline.

REGION 14

Falkirk.—July 29, August 12, 7.30 p.m., The Temperance Café, High Street, Falkirk.
Glasgow.—No meeting in July. (Next meeting August 26.)

In order to avoid mistakes and misunderstandings details of meetings for inclusion in this feature can be accepted only from Regional Representatives or appointed Scribes.

Town Representatives and Honorary Secretaries of clubs affiliated to the R.S.G.B. should send details to the appropriate Regional Representative (whose addresss is on page 5 of this issue) so that they reach him not later than the 18th of the month preceding publication.

Items for *Regional and Club News* should, of course, be sent direct to the Editor.

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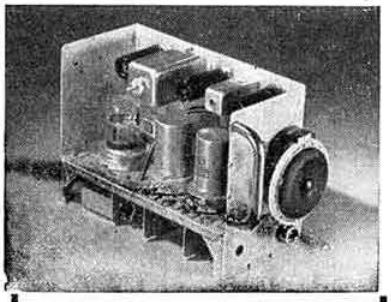

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(Continued on page 47)

EXCHANGE AND MART SECTION (Cont.)

HAMMARLUND Super Pro 200LX, 100 kc/s to 20 Mc/s coverage in five bands, with power supply, both units rack mounting but with outer cases. First-class job with speaker, spare valves and manual, £33, delivered by car any reasonable distance. Hallicrafters, SX24, 550 kc/s to 44 Mc/s coverage in four bands, self-contained with exception of external speaker, with spare valves and manual, £21, delivered as above. Editors & Engineers 10th Radio Handbook, 7/6. ARRL 29th Radio Amateurs' Handbook, 12/6. Principles of Electron Tubes, Reich (U.S.A.), 5/-. Tube VCR 138 (2), brand new, 10/- each, with base. Valves 832 (2), new, 8/- each, 6B4G (4), 5/- each, 1622 (3), new, 7/6 each, 6AG7 (8), 7/- each, EF36 (2), new, 3/- each, EL35 (4), new, 7/- each, ECC31 (2), 3/6 each. Labgear Multiband Turret for balanced circuits (150 watts), 45/-. Labgear Coils with swinging link and base (150 watts) for balanced circuits, 80, 40 and 20 metres only, 30/-. Cyldon 50+50 pf (150 watts), Transmitting variable, 12/6. English and American block capacitors, 4 μF, 1,000 V (2), 4/- each, 4 μF, 2,500 V (1), 6/-, 6 μF, 2,500 V (2), 6/6 each, 4 μF 1,500 V (1), 5/-, 24, 6 inch Ceramic Feeder Spreaders, 6/-. Set of 4, B2 transmitter coils, 10/-. Many BC 375 Tuning Unit components, coils, switches, variable and h.v. mica capacitors, s.a.e. Gear must be cleared regardless, please include postage for the cheaper items listed. Ron. G. Barrell, G3FOP, 4 Bromyard Road, Tenbury Wells, Worcestershire. (725

LABGEAR commercial transmitter, 50 watt, cw/phone, WBCs, all bands, crystal calibrator, complete in two section small rack, £25. 60-watt transmitter by G6HP, cw/phone, 3 section table rack, TU5B Clapp v.f.o., £10. Command transmitter, 3.5 Mc/s, 807s, mod., keying, £2 10s. Wanted: S750, Tomkinson, 24 Mead Way, Coulsdon, Surrey. (729

METALWORK.—All types cabinets, chassis, racks, etc., to your own specifications. Philpott's Metal Works Ltd. (G4BI), Chapman Street, Loughborough. (99

MORECAMBE holiday, near sea, overlooking bay and lakeland mountains, ham shack, write brochure. G3AEP, "Ferncliffe," Drewton Avenue, Morecambe. (530

PATENTS and Trade Marks, Handbooks and advice free. Kings Patent Agency, Ltd. (B. T. King, G5TA, Mem. R.S.G.B., Reg. Pat. Agent), 146a Queen Victoria Street, London, E.C.4. Phone: City 6161. 50 years' refs. (98

Q-MAX B4/40 transmitter and Canadian V.R.L. receiver for sale. Offers to G3GXX, 33 Clarence Avenue, Cleveleys, nr. Blackpool. (712

QQVO6/40 v.h.f. double tetrode internally neutralised, new, unused. New low-loss base to suit. Reasonable offers, or swap tape deck. Eddystone 640 lab aligned, perfect, £25 o.n.o. Box 714, National Publicity Co., Ltd., 36/37 Upper Thames Street, London, E.C.4. (714

QSLs and log book (P.M.G. approved). Samples free. State whether G or B.R.S. Atkinson Bros., Printers, Elland. (400

RADIOCRAFT PS 7 band-switched pre-selector, 1.5-30 Mc/s. Complete and self-contained, £6. One Westinghouse and two RCA 813 valves, boxed, £2 each. Box 702, National Publicity Co., Ltd., 36/37 Upper Thames Street, London, E.C.4. (702

REAL bargain. Portable O.V.1, S.W. battery receiver, will cover all bands, fitted set, spread calibrated, very economical, excellent condition, very cheap, s.a.e. for particulars. Box 739, National Publicity Co., Ltd., 36/37 Upper Thames Street, London, E.C.4. (739

SALE: TV time-base chassis with 12 in. Mazda tube, £8. Sound and Vision receiver for above (A.P. TRF), £4. 3 ft. 6 in. rack, 15/-. 805 (2), 15/-. 6AG7 (6), 5/-. Transformer, 2,200-0-2,200 V, 200 mA, 30/-, carriage extra. "Braunston," St. Nicholas Road, Witham, Essex. (730

SX28 spare set valves, speaker, manual, £40. Prop Pitch Motor, 50/-. 813, £1. 35Ts, 10/-. 829B, £2. 8019s, 10/-. Bug, 30/-. Woden UMI, £1. Woden and Thermador transformers, Chokes, valves, wide band couplers, turrets, valves, meters, Table-top cabinet and metalwork, etc. Lists, Surman, Lyncote, Coltsfoot Drive, Guildford. (705

SALE: 1.5-24 Mc/s Lorenz EO/4139 receiver, £15 or offer. Also large collection miscellaneous parts by late enthusiast. View by appointment. St. George's Vicarage, Shirley, Croydon. (735

SALE: 9 inch blue CRT, unused, scanning and focus coil assembly, line transmitter, 25/- the lot. Motors, dynamos, transformers, condensers, temperature gauge, immersion heaters, cheap; selling up; s.a.e. for list. BRS 3835, 14 Fontmell Park, Ashford, Middlesex. (732

TAYLOR valve tester 45A, £11. 300W 12V Petrol Electric Lighting Set, new, £15. RCA transformer Pr 190/250V sec. 2000-1500-0-1500-2000 at 800 mA, £5 10s. Set B2 Coils, 10s. 6ft enclosed rack, 35/-. 25W transmitter, Woden trans, £3. Several TUB's, 10/- each. 1625 valves (10), 6/-, 6V6 (A), 7/-. 120W Amplifier and Power Supply; offers various transformers, cheap, state requirements, Cooknell, Hangland, Rounds Hill, Kenilworth. (704

TRANSMITTER required, perfect, 50-150W cover 14 Mc/s modulator. All power supplies. No junk. Also Class "D" wavemeter. Box 720, National Publicity Co., Ltd., 36/37 Upper Thames Street, London, E.C.4. (720

TU5B crystal substitute v.f.o. QST July 1947. Offers over 50/-, carriage forward. Wanted: 5RV low-pass filter. Trowell, 4a Clyde Avenue, Sheerness. (723

WANTED BC. 610 Hallicrafters, E.T.4336 transmitters and spare parts for same. Best prices. P.C.A. Radio, Beavor Lane, Hammersmith, W.6. (626

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EXCHANGE AND MART SECTION (Contd.)

WANTED: HRO coils, receivers, power packs, AR88Ds, AR88LFs, SX28s, BC348s, AR77s, and many other types, also laboratory test equipment and R54/APR4, TN17, TN18 and TN19 units. Details please to R. T. & I. Service, 254 Grove Green Road, Leytonstone, London, E.11 (LEY 4986). (101

WANTED Receiver and/or transmitter sections of Sets 68.P (1.7-3 Mc/s) and 68.R. (3-5.2 Mc/s). Purchase or part exchange for new 803, 12H6, MS4B, transformer 5000 volts, 30mA. G3FPW, 40 Dark Lane, Hollywood, nr. Birmingham. (718

WANTED SX28 communication receiver or any other good receiver. State condition and price. Box 716, National Publicity Co., Ltd., 36/37 Upper Thames Street, London, E.C.4. (716

YOUNG amateur, twenty-five, working Ponders End, requires accommodation in Enfield, Oakwood, or to the West. Reply to G3IMW, 21 Woodcote Close, Epsom, Surrey. (728

APPOINTMENTS SECTION

Situations vacant

AMATEUR or keen S.W.L. required for radio and T.V. service. Transmitter knowledge desirable. Apply G2ACC, Southern Radio, Sorad Works, Redlynch, nr. Salisbury. (722

A VACANCY has arisen in the Editorial Department of Murphy Radio, Ltd., for an editorial assistant to help in the production of the Company's three house magazines. Applicants should be in their early twenties and should possess thorough knowledge of English and a fair technical radio background. Exceptional prospects. Pensions scheme. Successful applicant will be expected to reside within reasonable reach of Welwyn Garden City. Send details of experience, age, and salary required to Personnel Department, Murphy Radio, Ltd., Welwyn Garden City, Herts. (717

BRITISH TELECOMMUNICATIONS RESEARCH, LTD., have a number of vacancies for qualified and experienced SENIOR and JUNIOR RESEARCH AND DEVELOPMENT ENGINEERS to work on Wide-Band Microwave Radio Systems, Aerials and Propagation. Considerable expansion in the field is envisaged, and there are, and will be, excellent opportunities for advancement. The Company operates a superannuation scheme, and offers attractive working conditions with good social and recreational facilities. All applications will be dealt with in confidence and should be addressed to The Director of Research, Taplow Court, nr. Maidenhead, Berks. (676

SENIOR RADIO SUPERINTENDENTS required for the EAST AFRICA HIGH COMMISSION DIRECTORATE OF CIVIL AVIATION for permanent and pensionable employment subject to a probationary period of two years. Established civil servants could be appointed on " temporary transfer " terms. Salary scale (including inducement pay and present 10 per cent temporary allowance) £1,320 rising to £1,498 a year. Free passages. Liberal leave on full salary. Candidates preferably between 30 and 40, must have had ten years in civil aviation with considerable experience of flying or aeronautical ground station operating. They should have had extensive experience in installation and maintenance work and the organization of communication and maintenance systems. Preference will be given to candidates with a City and Guilds Full Technological Certificate. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/40895/RC. (711

SENIOR TECHNICIAN (AERADIO) required by the EAST AFRICA HIGH COMMISSION DIRECTORATE OF CIVIL AVIATION for permanent and pensionable employment subject to a probationary period of two years. Established civil servants could be appointed on " temporary transfer " terms. Salary scale (including inducement pay and present 10 per cent temporary allowance) £1,320 rising to £1,498 a year. Free passages. Liberal leave on full salary. Candidates should have served an engineering apprenticeship and possess up-to-date knowledge of modern telecommunications practice with particular reference to aeronautical radio ground station equipment including radar and radio aids to navigation. They should also have a knowledge of radio workshops servicing methods and practice. Preference will be given to candidates with City and Guilds Full Technological Certificate in Telecommunications Engineering. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/40898/RC. (710

SUPERVISING TECHNICIANS (AERADIO) required by the EAST AFRICA HIGH COMMISSION DIRECTORATE OF CIVIL AVIATION for permanent and pensionable employment subject to a probationary period of two years. Established civil servants could be appointed on " temporary transfer " terms. Salary scale (including inducement pay and present 10 per cent temporary allowance) £1,161 rising to £1,280 a year. Free passages. Liberal leave on full salary. Candidates should preferably have served an engineering apprenticeship and should have had at least five years' experience in the installation and servicing of aeronautical telecommunications equipment including radio and radar aids to navigation. They should have an up-to-date knowledge of workshop practice with experience in servicing diesel generators. Preference will be given to candidates who possess a City and Guilds Intermediate Certificate in Radio Communications or equivalent qualifications. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/40899/RC. (713

(Continued in next column)

TECHNICIANS (Aeradio) required for the EAST AFRICA HIGH COMMISSION DIRECTORATE OF CIVIL AVIATION for permanent and pensionable employment subject to a probationary period of two years. Established civil servants could be appointed on " temporary transfer " terms. Salary scale (including inducement pay and present 10 per cent temporary allowance) £772 rising to £1,122 a year. Free passages. Liberal leave on full salary. Candidates should preferably have served an engineering apprenticeship and should have experience in the repair and maintenance of modern aeronautical telecommunications equipment including radio and radar aids to navigation. They should also possess an up-to-date knowledge of workshops practice. Preference will be given to candidates with a City and Guilds Certificate in Radio Servicing or equivalent qualification. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/40902/RC. (709

WIRELESS OPERATOR MECHANICS required by FALKLAND ISLANDS DEPENDENCIES SURVEY for service at isolated British Bases in the Antarctic. Must be able to transmit and receive morse at 20 words a minute (plain language or code) and be capable of elementary maintenance of wireless transmitting and receiving equipment. Salary according to age in scale £330 rising to £420 a year with all found, including clothing and canteen stores. Candidates should be keen young men, between 20 and 30 years, preferably single, of good education and high physical standard with a genuine interest in polar research and travel and willing to spend 18 to 30 months under conditions which are a test of character and resource. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/41024/RC. (734

ELECTRONIC ENGINEERS are required by the ENGLISH ELECTRIC CO., LTD., to fill vacancies in the Company's Laboratories at LUTON and STEVENAGE.

SENIOR MICROWAVE ENGINEER—applicant should have a good theoretical background to degree standard and experience of design or engineering of microwave equipment. The work includes investigation of new methods of construction with a view to miniaturisation and weight reduction.

SENIOR ENGINEER—to lead a group of engineers in the development of specialised electronic test gear.

SENIOR ENGINEER—for work on general circuit development, with sound fundamental knowledge of electronics and the ability to apply it.

SENIOR INSTRUMENTATION ENGINEERS—with a degree or H.N.C. and experience of the design of equipment for use in the instrumentation field.

SENIOR ENGINEER—to lead a group concerned with development and field trials of ground radar. Previous experience essential.

SENIOR RADAR & ELECTRONIC ENGINEERS—for development and field and flight experiments of radar equipment. Degree or H.N.C. standard preferred but applicants without these qualifications but with wide experience of this work considered.

SENIOR ENGINEER—for missile telemetry installation planning. Applicants must be familiar with existing telemetry systems and measuring techniques, suitable to a man with trial experience.

JUNIOR ENGINEERS & LABORATORY ASSISTANTS—are required to assist in the above work. Vacancies also exist for junior staff with experience of, or an interest in Microwaves.

Housing assistance may be given in some cases.

All of the above posts are permanent and progressive and pensionable after qualifying period, attractive salaries are offered to the successful applicants. Applications should be sent to Dept. C.P.S., 336/7 Strand, W.C.2, quoting ref. No. 1260B.

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