THE T. & R.

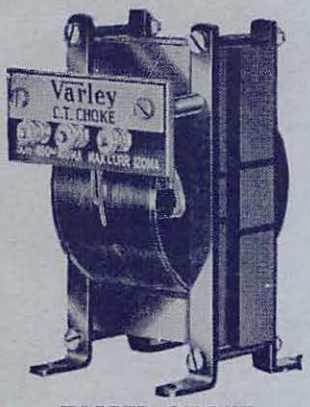
BULLETIN

THE INC. RADIO SOCIETY OF GT. BRITAIN

AND THE BRITISH EMPIRE RADIO UNION

Vol. 11 No. 6 DECEMBER, 1935 (Copyright) Price 1/6

—TO YOUR SPECIFICATION—



TAPPED CHOKE
(DP31) 25/-

In addition to the standard range of Chokes and transformers shown in our catalogue, we are prepared to make special equipment to customers' specifications. Here is a typical example. Input and output transformers for use with two PX25a valves in push-pull, giving an output of 30 watts. K1479 Input Transformer 17/6. K1479 Output Transformer 37/6. The secondary winding is tapped for 5,000, 10,000 and 15,000 ohm loads. It is intended to be coupled through a condenser and choke to a P.A. stage, enabling 100% modulation of a 60 watt carrier to be obtained with a modulator H.T. supply of only 430 volts 200 m.a.

BLOOMFIELD ROAD - WOOLWICH, S.E.18.

Telephone : WOOLWICH 2345.

Varley

PROPRIETORS:- OLIVER PELL CONTROL LTD.

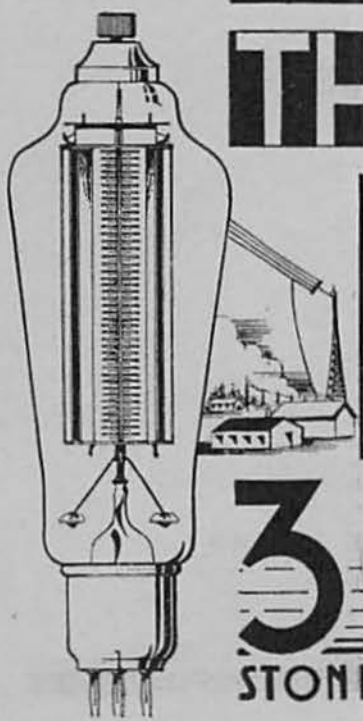
1,000 VOLTS 120 mA. CONSTANT UNDETERIORATING H.T.

TWO H.T. 11 RECTIFIERS in series deliver an output of 1000 volts, 120 mA., in parallel 500 volts, 200 mA.

Write to Dept. "T.R." for a copy of "THE ALL METAL WAY 1936." It's full of interesting information.

METAL WESTINGHOUSE **RECTIFIERS**

WESTINGHOUSE BRAKE & SIGNAL CO., LTD., 82 York Road, King's Cross, London, N.1.



THIS IS NEWS

RFP 362—£3. SUPPRESSOR GRID TRANSMITTER. Output 75 watts at 125 watts input, 50 watts dissipation. Pair in P/P 200 watts output at 300 watts input. Mutual Conductance of 8 mA/V requires negligible radio input on short wave.

ACME 4c—13/-. LOW FREQUENCY PENTODE. Suitable for modulation feed. Screen 250 v. max. Anode 400 v. max. Output at 250 Va. 3½ watts. Output at 400 Va. 4½ watts.

ACPX 4a—9/-. OSCILLATOR FOR EXCEPTIONALLY SHORT WAVES. Should be ordered without cap for below 2½ metres. 4 volts 1 amp. Directly heated.

UPX—13/-. POWER TRIODE FOR D.C. MAINS. Speech output of 3 watts at only 9½ watts input and 250 volts anode. Indirectly heated, 25 volts .3 amps.

P 2—4/6. POWER TRIODE FOR BATTERIES. Speech output .9 watt. Anode volts 250. Fil. volts 2, .2 amp. Mut. cond. 3 mA/V. Mag. factor 9.

ACFC 4—15/-. FREQUENCY CHANGER. For superheterodyne reception of weak signals. Oscillation anode voltage should be increased to 250 for ultra short. **Exceptionally low noise level.**

RB 42—10/-. BI-PHASE RECTIFIER. Output 500 v. 120 mA. at 500-0-500 input.

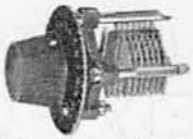
362 RADIO VALVE CO LTD

STONEHAM WORKS E 5 CLissold 6607

WHEN YOU WANT THE BEST—

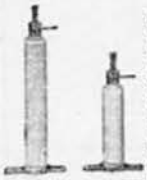
MIDGET TRIMMER. A small trimming condenser with Frequentite insulation and Mica dielectric. For balancing, trimming, padding or band-spreading of short wave circuits. ½ in. by ½ in. Cap 3-30 m.mfd. No. 1023. Price 1/-.

MIDGET INSULATOR. Made from Frenquentite for high frequency work with N.P. metal parts. 1" overall height. No. 1019 Price 4/6 doz.

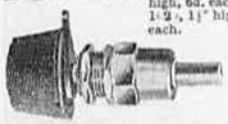


MIDGET CONDENSER. A small size variable condenser for S.W. circuits. Soldered moving and rotor vanes with DL-9 H.F. insulation. With knob and scale, 3-65 m.mfd. No. 1013. Price 4/3.

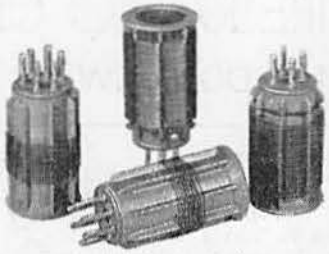
ULTRA SHORT WAVE COILS. The coils are wound with 14 g copper wire, heavily silver plated. The mean diameter is ½ in. A Frequentite base is used for mounting purposes. No. 1/2, 3 turns, 1/6; 4 turns, 1/8; 5 turns, 1/7; 6 turns, 1/8; 8 turns, 1/10.



INSULATING PILLARS. Invaluable for mounting components in ultra short wave receivers. White DL-10 insulation 7/16" diameter. Long 6BA adjustable screw shank at top. N.P. metal foot. No. 1/2, 2" high, 6d. each. No. 1/2, 1½" high, 4½d. each.



SLOW MOTION DRIVING HEAD. This slow motion driving head has a 9 : 1 reduction ratio with the pointer moving through 1-9". Complete with dial. No. 1012. Price 3/-.



INTERCHANGEABLE COILS. New low loss formers of DL-9 high frequency insulation. Rigidly made and each coil matched. First class results assured. 4-pin coils have two windings, 6 pin three windings.
No. 1/29 6 pin Set of 4 12 170 metres. Price 16/-.
No. 932 4 pin " " " Price 14/-.

FLEXIBLE COUPLER. Free from back-lash but very flexible, this coupler banishes alignment troubles. DL-9 H.F. insulation. For ¼" spindles. No. 1009. Price 1/6.

ADJUSTABLE BRACKET. A strong baseboard bracket for mounting components controlled by an extension rod. Has adjustable (2" to 3½ side of DL-9 H.F. insulation. No. 1007. Price 1/6.

EXTENSION CONTROL OUTFIT. Ample length adjustment is obtainable with the 4" non-warp precision drawn insulating tube and 3 brass rod provided in this outfit. Complete with panel, bush and nut. No. 1008. Price 1/3.

BUY EDDYSTONE SHORT WAVE COMPONENTS

STRATTON & CO., LTD., Bromsgrove Street, Birmingham. London Services Depot: Webb's Radio, 14 Soho Street, Oxford Street, W.1

DUBILIER oil-immersed paper dielectric condensers — Type 951

Dubilier's new departure in radio and amplifier design, a range of new Oil-Immersed Paper Dielectric Condensers, has come as a boon to designers of apparatus for Television, Radio and Low Frequency Amplifiers, using the higher voltages.

Each condenser comprises a multiple paper dielectric element, impregnated, oil-immersed and hermetically sealed into a sheet metal container. Leakage is impossible, but expansion is adequately accommodated. For capacity and working voltage these condensers are the smallest on the market. Their low price enables a capacity value hitherto prohibitive to be used in resistance capacity coupled amplifiers. Prices from 10/- to 21/- each.

DUBILIER CONDENSER CO (1925) LTD

Ducon Works, Victoria Road, N. Acton, London, W.3.

THE INCORPORATED
RADIO SOCIETY of GREAT BRITAIN

HEADQUARTERS:

BRITISH EMPIRE RADIO UNION

53, VICTORIA STREET, LONDON, S.W.1 'Phone: Victoria 4412

Patron:
H.R.H. THE PRINCE OF WALES, K.G.

President:
ARTHUR E. WATTS, G6UN

Executive Vice-President and Honorary Treasurer
E. DAWSON OSTERMEYER (G5AR)

Honorary Editor:
H. BEVAN SWIFT (G2TI)

Council:

J. D. CHISHOLM (G2CX)
E. A. DEDMAN (G2NH)
A. D. GAY (G6NF)
A. O. MILNE (G2MI)
H. B. OLD (G2VQ)
T. A. ST. JOHNSTON (G6UT)
G. W. THOMAS (G5YK)
V. M. DESMOND (G5VM)
L. W. PARRY (G6PY)
H. C. PAGE (G6PA)

Secretary:
JOHN CLARRICOATS (G6CL)

Honorary Members:
SIR OLIVER LODGE, D.Sc., LL.D., F.R.S.
SENATORE G. MARCONI, G.C.V.O., D.Sc., LL.D.

Past Presidents:
The late A. A. CAMPBELL SWINTON, Esq., F.R.S., M.Inst.C.E., M.I.E.E. (1913-1920)
The late MAJOR J. ERSKINE MURRAY, D.Sc. (1921)
The late ADMIRAL SIR HENRY B. JACKSON, G.C.B., K.C.V.O., F.R.S., D.Sc. (1922)
PROFESSOR W. H. ECCLES, D.Sc., F.R.S., M.I.E.E. (1923-1924)
SIR OLIVER LODGE, D.Sc., LL.D., F.R.S. (1925)
BRIG.-GENERAL SIR CAPEL HOLDEN, K.C.B., F.R.S., M.I.E.E. (1926-7)
SIR IAN FRASER, C.B.E., M.P. (1928)
GERALD MARCUSE, Esq. (1929-30)
H. BEVAN SWIFT, Esq., A.M.I.E.E. (1931-3)

Honorary Vice-Presidents:
PROFESSOR SIR AMBROSE FLEMING, M.A., D.Sc., F.R.S.
G. F. GREGORY, Esq., M.I.M.E., M.I.C.E.
E. H. RAYNER, Esq., D.Sc.
E. H. SHAUGHNESSY, Esq.

Vice-Presidents:

MAURICE CHILD, Esq.
CAPTAIN P. P. ECKERSLEY, M.I.E.E.
COMMANDER R. J. B. HIPPISLEY, O.B.E.
RENE H. KLEIN, Esq., F.R.S.A., M.I.R.E.
COMMANDER F. G. LORING, R.N., M.I.E.E.
LESLIE MCMICHAEL, M.I.E.E., M.I.R.E.
J. H. REEVES, Esq., M.A., M.B.E.
E. J. SIMMONDS, Esq.
JOHN WYLLIE, Esq.

THE T. & R. BULLETIN

CONTENTS.

	Page
Editorial	205
Piezo-electricity Stabilisation	206
A Frequency Meter Monitor for the Amateur Station	211
Propagation to Europe and South America	214
The Ten Metre Band during November	215
Correspondence	216
Station Description No. 45	217
Some 56 mc. Work in Hong-Kong	218
Book Reviews	220
Soliloquies from the Shack	222
Valve Reviews	223
Research and Experimental Section	225
C.W. Communication on 56 mc.	227
News and Views from 53	229
Notes and News from the British Isles	235
Forthcoming Events	237
Empire News	245

Honorary Editor:—
H. Bevan Swift (G2TI)

Advertising Manager:—
Horace Freeman, Esq.

Vol. 11

No. 6

REPRESENTATION.

IN our last issue we published details of the new Town Representation scheme, on another page appeared a brief announcement that Headquarters had for disposal a few second-hand copies of American handbooks and call-books.

It is interesting to record how the membership responded to the two announcements. A glance at an inner page will show that just over 20 members have been nominated to serve as Town Representatives. On the other hand, considerably more than 100 members wrote in for the bargains! It is no exaggeration to say that never in the history of the Society has so much response been accorded a single announcement in this Journal. We need not enlarge upon the fact that we should have saved money if the books had been given away, and the only excuse we have for mentioning the matter at all is because the attention paid to one announcement was so overwhelming, compared with the apparent lack of interest shown in the other.

The objects of the T.R. scheme were carefully explained last month, and no useful purpose would be served by repeating them here, but we feel that the notice of our members should be drawn to the general apathy which exists whenever a scheme aimed at assisting them in their work is launched. The T.R. scheme before being introduced was discussed very thoroughly by Council on two occasions, and to help it to "go with a swing," every D.R. received information in advance of publication. To-day we have over 2,000 home members, the majority of whom live in, or around, the large towns, yet judging by the list of nominations, one might reasonably assume that our membership was in the hundreds, and centralised in about four or five parts of England.

> The Editor and Headquarters Staff wish all Members A Merry Christmas and a Happy and Prosperous New Year.

Several years ago, when the County Representation scheme was first introduced, we endeavoured to make it clear to our members that in order that it should operate on truly democratic lines, we desired nominations from every county, but what was the result? On an average twenty C.R.'s were elected; the remainder were nominated at a later date by Council.

The T.R. scheme appears to be heading in a similar direction unless our members wake up to the fact that it is their duty to see that the best possible man in each town is put forward for the position of T.R. We purposely intimated to our District

(*Continued on Page* 250.)

PIEZO-ELECTRICITY, QUARTZ CRYSTALS AND FREQUENCY STABILISATION*

I.—Piezo-Electricity.

1. *Introduction.*

WHEN certain materials, notably a number of crystalline substances, of which the most important nowadays are quartz, tourmaline and Rochelle salts, are heated or cooled, or subjected to stresses in certain directions, they exhibit electrical charges at particular regions, and potential differences arise between opposing surfaces. In the former case the effect is called pyro-electric, and in the latter piezo-electric. Such materials are known as pyro-electric or piezo-electric substances. All piezo-electric substances are pyro-electric, and it appears doubtful if any pyro-electric effect would be obtained if stresses were eliminated during the heating or cooling. The phenomenon has been known for a long time.

Since time immemorial it had been known in India and in the Island of Ceylon that when tourmaline was thrown into a fire it acquired the property of attracting the ashes. The Dutch, to whom the natives of the country showed this phenomenon, were the first to make it known in Europe. In 1717, Lemery presented a tourmaline crystal to the French Academy of Science, and Canton, in a paper read before the Royal Society of London in 1759, suggested the hypothesis that tourmaline neither emits nor absorbs electric fluid except by the increase or decrease of heat.

It is curious to note that, but for the work of Gaugain, the phenomenon of piezo-electricity might perhaps not yet have been discovered. Gaugain, by a remarkable piece of work, demonstrated the simplicity of pyro-electric phenomena. The laws enunciated by him were compared with those of piezo-electricity, formulated by the Curies, in their note to the French Academy in 1881, and it was shown how easily they could be traced one from the other, if the phenomena resulting from variations of pressure and those due to variations in temperature were regarded as due to one and the same cause, namely, contraction or dilatation.

As early as 1817, Hauy believed to have discovered that calc-spar became electrified on compression, but his work passed almost unnoticed, until, in a communication to the Academy in 1880, the brothers Pierre and Jacques Curie formulated a number of empirical rules which they had discovered governing the piezo-electric effect. They continued their researches for more than 15 years, and in 1895 they were awarded the Gaston Plante prize by the French Academy. Like Hauy, Becquerel, in 1828, was an earlier worker in the field, but it is almost certain that the true cause of the electrical effects they obtained was not pressure but friction, and the discovery of the piezo-electric effect is therefore generally attributed entirely to the Curies. There is little doubt, however, that their preliminary experiments were stimulated by the earlier work of Gaugain on pyro-electricity.

The existence of a true pyro-electric effect has been questioned by several investigators. Rontgen and Voigt carried out numerous researches on pyro- and piezo-electricity in this connection, but failed to establish the existence of a true pyro-electric effect. Voigt, who has formulated a remarkable theory of piezo-electricity, has shown that, in the case of tourmaline, at least 80 per cent. of the pyro-electricity observed was in reality piezo-electricity arising as a result of the deformation produced by the variation in temperature, and not more than 20 per cent. can be regarded possibly as true pryo-electricity. Lindman, who worked on the subject subsequently to Voigt, was likewise led to the conclusion that the existence of a true pyro-electric effect is doubtful, and this is still the position to-day, although the evidence for the existence of true pyro-electricity is now very great as the result of recent researches using extremely sensitive instruments which enable a pyro-electric effect to be detected in certain crystals warmed only by the heat of the hand.

Scarcely had the phenomenon of piezo-electricity been discovered than Lippmann conceived the idea of apply simultaneously to its study the principle of the conservation of electricity in the form which he had just given it and the principles of thermo-dynamics. As a result of this theoretical research he was led to the discovery of the laws of inverse piezo-electricity, namely, the production of a contraction or an elongation by the application of an electric field suitably oriented with respect to the crystal. Although this application of the principles of thermodynamics to a solid substance has appeared very disputable, it is to be noted that according to the most recent research, in particular that of Ny Tsi Ze, there is an excellent agreement between experiment and Lippmann's theory.

For several years the study of piezo-electric phenomena was confined to the laboratory, but during the War, Langevin had the idea of producing ultra-sonic frequencies by means of the vibrations of a lamina of suitable dimensions cut from a quartz crystal (using the inverse piezo-electric effect) and of detecting them by the same crystal (using the direct effect), for the purpose of depth sounding. The piezo-electric effects, in general very small, were magnified in the experiments of Langevin, by utilising the phenomenon of resonance.

Very soon after the work of Langevin, the American Cady, to whom the former's work had been communicated, studied systematically the variations of capacity of a condenser having a quartz dielectric, and was the first to realise a continuous wave oscillator stabilised by quartz. Since this time progress in the subject has been rapid, as a result of the researches during the last ten years or so of Butterworth, van Dyke, Dye, Hund, Pierce, Giebe and Scheibe, and many others.

* *Editorial Note.*—We are publishing this article through the courtesy of the Editor of *The Royal Signals Quarterly Journal*, 95, Belgrave Road, London, S.W.1, to whom our grateful thanks are extended.

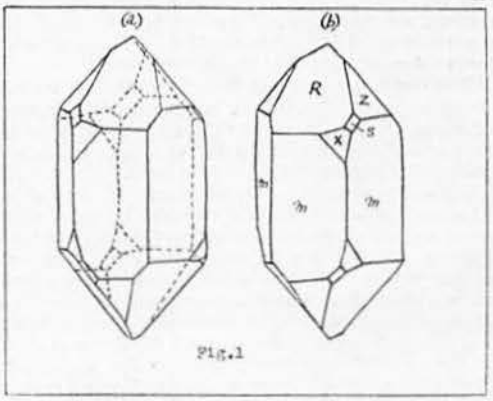
2. *The Detection of the Piezo- and Pyro-Electricity of Crystals.*

The piezo-electric crystal tourmaline was the substance mostly used in early experiments, chiefly because its piezo-electric properties are so marked, but the experiments described below may be almost equally well performed with quartz. The crystalline form of tourmaline is shown in Fig. 4; the two ends of the crystal are markedly different. When the temperature of the crystal is raised, or the crystal extended, one end becomes positively charged and the other negatively; on cooling, or if the crystal is compressed, the signs of the charges are reversed. If the crystal is powdered and the particles heated or cooled the polar charges produced cause the particles to gather in the form of chains.

The existence of the so-called pyro-electric effect is most easily demonstrated by heating a tourmaline crystal in an oven, and dusting it, after removal, with a dry powdered mixture of red lead and sulphur. The mixture should first be shaken through a piece of dry muslin, when, by friction, the sulphur becomes negatively electrified and the red lead positively electrified. The former adheres to the positively charged end of the crystal, and the latter to the negatively charged end, the two opposite electrifications being thus shown up in a striking manner by the red and yellow colours of the two powders. If, after being heated, the crystal is allowed to cool, the polarity is reversed. If the crystal is maintained at a steady temperature no further electrical effects are observed at high or low temperatures, the original electrification acquired during approach to the steady temperature gradually disappearing by leakage. A heated crystal, taken from the oven, and suspended by a fine fibre, may be attracted and repelled by electrified bodies or by other heated crystals which exhibit the pyro-electric effect; such crystals are those of Rochelle salt, cane sugar, tartaric acid, quartz, zinc blend and sodium chlorate. With quartz, there is sometimes difficulty in finding good specimens, as it is prone to twinning, and two twin crystals (in one composite crystal) have opposite effects, so that over a relatively small area the total effect may be frequently very small.

To demonstrate the piezo-electric effect it is convenient to place flat electrodes on the opposite faces of a slab of tourmaline or quartz, suitably cut from a crystal, and connect the electrodes to the two opposite quadrants of an electrometer. When pressure is applied the electrometer is deflected, and when the pressure is released a deflection in the opposite direction is obtained. The relation between the pressure and the electric charge was found by J. and P. Curie to be a linear one, the equation being $Q=K.P.$, where Q is the charge, P the force, and K a constant, known as the piezo-electric constant of the material. Rochelle salt in the crystalline form was found by the Curies to have the largest piezo-electric constant of any substance so far examined. Its value is several hundred times that of quartz and tourmaline.

The "dust" and electrometer methods of detecting piezo- and pyro-electricity were first used by Kundt and by the Curies, respectively. Only the latter method is suitable for quantitative measurements, the "dust" method being only of use for rough qualitative observations. A third method, the crystal power method, is more recent, and is due to Giebe and Scheibe, but is also only of use for qualitative work. It is, however, an extremely sensitive method and requires only small fragments of crystal of linear dimensions about 1 millimetre. These are placed between the plates of a fixed condenser arranged in parallel with the variable tuning condenser of a valve oscillator. On slowly varying the frequency of the latter over a range, say, from 50 to 1,000 metres, a rustling or crackling noise is heard in the phones of a detector circuit coupled to the valve oscillator, due to the reaction of the micro-crystals, set into elastic vibration in the high frequency field of the condenser containing them, on the frequency of the valve oscillator.



The following method, a fourth one, is characterised by its great sensitivity, combined with simplicity. It enables the detection of piezo-electricity in a piece of crystal of any shape, and in certain cases, also of the piezo-electric axes (defined later). The piece of crystal is placed between two metal electrodes and subjected to periodic changes of pressure. The latter is conveniently accomplished by resting on the crystal the stem of a tuning fork, which can be set into vibration by hand. Pressure changes in the crystals are thus produced at the frequency of the fork. The latter forms one electrode on the crystal, and a metal plate placed under the crystal serves as a second electrode. Whilst the fork is vibrating periodically fluctuating charges are produced on the electrodes, and these can easily be amplified by the aid of a low-frequency amplifier and listened to in telephones.

The tuning fork can be arranged to exert always the same pressure on the crystal by inserting a spring between the stem of the fork and the crystal, and mounting the fork with its stem sliding in a collar so that the weight of the fork is the pressure applied. Rigid mounting of the fork would result in varying pressures on different occasions. If the orientation of the piece of crystal is varied so that different points come into contact with the end of the fork stem and the bottom electrode, and the magnitude of the effect in the telephones is observed at each setting the directions in the crystal for which the piezo-electric effect is a maximum

can be approximately determined. These directions are known as the piezo electric axes of the crystal. If more accurate measurements are required the telephones in the output of the amplifier can be replaced by a transformer and rectifier, and a measuring instrument included. An electrically-maintained tuning fork would be desirable for such precise measurements, in order to ensure the vibrations of the tuning fork taking place at constant amplitude.

3. *Piezo-Electricity and Crystalline Form.*

Since the piezo-electric properties of quartz, tourmaline, etc., are dependent on the crystalline form of these substances, an elementary knowledge of some of the fundamentals of crystallography is necessary for a proper appreciation of piezo-electric phenomena. It is interesting to note that the word "crystal" comes from the Greek word for ice, and was applied to the water-clear quartz, or rock crystal, of the Alps, it being thought that this was really ice that had been subjected to such intense and prolonged cold that it could not melt.

The outer geometrical form is the most striking character of most crystals, but is only the external evidence of the internal structure, and it is the regular arrangement of the atoms within the crystal that is the real criterion of a crystal. Even liquid crystals are known. The atoms of a crystal are arranged in a multitiude of straight rows which cross one another in a regular three-dimensional pattern. The rows of atoms may be combined in many ways to form a large number of atomic planes, and the whole assemblage of rows and planes constitutes what is known as a space lattice. The faces of a crystal are parallel to planes of atoms in the crystal structure; and so are the crystal cleavages, i.e. the planes along which most crystals have a tendency to split if a sufficient shearing force is applied.

If the process of crystallisation be slow large crystals are built up, but the more rapidly it takes place the smaller are the crystals. The same substance may develop different crystal structures according to the conditions under which it crystallises, and irregularities in the development of portions of the structure of crystals are the rule rather than the exception. Perfectly formed crystals are generally only produced under very carefully controlled artificial conditions. Crystals formed under human control are often called "artificial" crystals to distinguish them from "natural" crystals found in the rocks of the earth's crust.

One of the simplest crystal structures is that of sodium chloride (common salt). The crystal structure of this substance is rectangular, and a crystal of sodium chloride has a space lattice made up of cubic cells having atoms of sodium and chloride at alternate corners. Most crystal structures consist of six-sided cells like those of sodium chloride, but they are by no means always cubes, for in many cases the edges of the cells do not meet at right angles, and as a rule those parallel to different directions are unequal in length.

In crystals it is not the size of the faces that is important, since that varies as the crystal grows, nor their shape, since this depends on the development of the adjoining faces. The really essential point is the angle between the faces. In 1669, Nicolaus Steno found that the angles between corresponding faces of quartz crystals are always the same, however irregular the crystals might be in the development of faces, and a similar uniformity of angles has since been found to be general among crystals. This law of the constancy of angles in all crystals of the same substance is the fundamental law of crystallography.

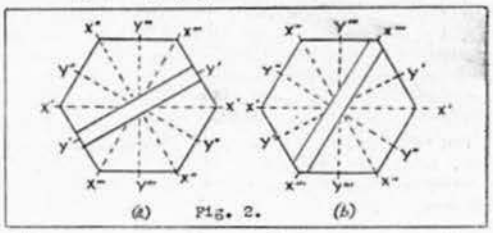


Fig. 2.

The symmetry of crystals is the property of greatest importance in relation to piezo-electric behaviour. The latter is closely related to certain well-defined directions in the crystal known as axes, the arrangement of which depends on the symmetry of the crystal. Among animals and plants various types of symmetry are seen, the most familiar being the bilateral (i.e. two-sided) symmetry shown by most vertebrates. The right half is the mirror image of the left half. This is an example of symmetry about a plane, and in the type of example considered there is only one plane of symmetry.

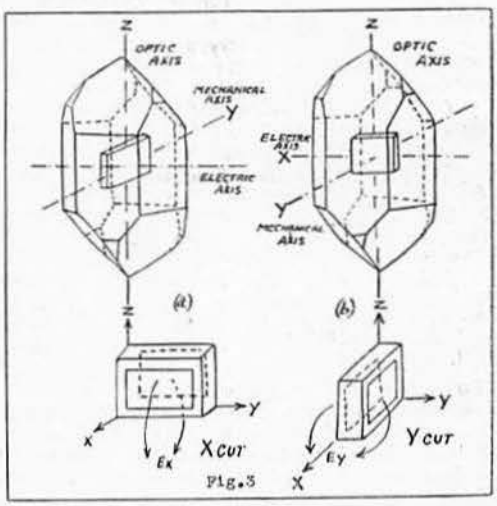


Fig. 3

Likewise, in crystals there may be one or more planes of symmetry. A plane of symmetry may be defined as a plane which has on opposite sides of it a similar distribution of similar points, and hence of similar edges and faces. In a cube there are nine planes of symmetry; three of these are parallel to the faces of the cube and pass through the centre of the cube, and six pass through the cube edges and diagonally across the cube faces.

Crystals may also exhibit symmetry about a line. In ideal crystals a line of symmetry is such that every point on the crystal has a similar point at the same distance on the opposite side of the line of symmetry, and lying on the plane normal to it. The cube possesses nine lines of symmetry.

Many crystals have also symmetry about a point. Such a point, or centre of symmetry, has the property that all straight lines that can be drawn through it will pass through a pair of similar points lying on opposite sides of the centre of symmetry, and at the same distance from it. It necessarily follows from this that all faces and edges will occur in parallel pairs on opposite sides of a centre of symmetry. The cube obviously possesses a centre of symmetry. In all cases where a centre of symmetry is present, there is a line of symmetry at right angles to every plane of symmetry, and *vice versa*, so that the number of planes and lines of symmetry is the same, e.g. in the cube.

If a crystal be rotated through a half turn (180 deg.) about a line of symmetry, all the faces and edges will occupy the same position as the similar but opposite faces and edges did at first. If the half turn is the smallest angle through which a crystal can be rotated about a line of symmetry and reproduce the original configuration, the line of symmetry is said to be a half-turn or diagonal axis of symmetry. If, however, a quarter turn (90 deg.) about a line is sufficient to produce the same result, such a line is said to be a quarter-turn or tetragonal axis of symmetry. If a sixth of a complete rotation (60 deg.) about a line will give a like result, that line is a hexagonal axis of symmetry. Every tetragonal or hexagonal axis is a line of symmetry. Some crystals, e.g. quartz, present an unaltered appearance after a rotation about a line through a third of a circle (120 deg.). Such a line is a one-third turn or trigonal axis, but it is not a line of symmetry, as it has not similar faces, edges and points on opposite sides of it.

All crystals belong to one or other of thirty-two classes according to their symmetry, and these classes fall into six or seven systems which are based on the crystallographic axes and also take into account the relative dimensions of crystals in the directions of these axes. The crystallographic axes are simply axes of reference to which the positions of all the faces of a crystal may be referred. Any three faces, no two of which are parallel to one another, may be taken as planes of reference; these planes will intersect in three straight lines which are taken as the crystallographic axes. It is usual for these planes and axes to be chosen in directions which are clearly important with regard to the shape and regularity of the crystals; in many cases at least two of these axes can be chosen at right angles to one another, and one or more may coincide with lines of symmetry.

Lippmann, Pockels, Voigt and others who extended the work of the Curies by experiment and theory, established definite laws relating the piezo-electric effect to the type of crystal structure and the elasticity properties of the material. From these laws we learn that all crystals which do not possess a centre of symmetry can be expected to exhibit the piezo-electric effect. Of the thirty-two classes of crystal structure, twenty fall into such a group, and hence should be piezo-electric; only 10 per cent. of the known minerals, however, belong to the asymmetric classes of crystals, and many of these are available only in small specimens.

The absence of a centre of symmetry in piezo-electric crystals is due to the fact that the ends of such crystals are generally markedly different and that faces apparently alike are dissimilar; asymmetry of structure is also shown by the difference in the effect of solvents on the crystal faces and by the rotation of the plane of polarisation of polarised light passed through the crystal. Piezo-electricity and optical activity in crystals always exist simultaneously, but optical activity also arises in certain solutions which are optically active.

4. *Quartz.*

As crystalline quartz is one of the most important of the few piezo-electric substances that are useful, the relation between piezo-electricity and crystalline form will now be further discussed with particular reference to this substance, and then the properties of quartz will be described. Quartz crystallises in hexagonal prisms, terminated at the ends of the pyramids, which are more or less perfectly formed. One or both of the pyramids may be missing, and other irregularities are common. The more perfect crystals required for scientific purposes are obtained mostly from Brazil, Madagascar and Japan. Quartz crystals are in general colourless and glassy, but occasionally have a yellowish tinge.

The crystalline form of an ideal quartz crystal is shown in Fig. 1. The line joining the vertices of the two pyramids is an axis of crystal symmetry. Close examination reveals, however, that the symmetry of crystalline quartz is not hexagonal, but only trigonal, as already mentioned. It will be seen on looking carefully at a quartz crystal (see Fig. 1) that three alternate faces of a pyramid are larger than the remaining three. It follows from this that, for rotation of the crystal in directions at right angles to the above-mentioned axis of crystal symmetry, there are three and not six diagonal axes (i.e. axes about which it is necessary to turn a crystal through 180 deg. before the original pattern is restored). Quartz, therefore, has three diagonal axes perpendicular to a trigonal axis, and the former are lines joining the middle points of opposite edges of the hexagonal prism, or lines parallel thereto and perpendicularly intersecting the trigonal axis. No line perpendicular to any face of the hexagonal prism can be an axis of symmetry, because the faces of the end pyramids adjacent to a face of the hexagonal prism are unlike. There are no other axes of crystal symmetry, and quartz crystals have neither plane nor centre of symmetry. The trigonal axis, being the only one of its sort in the crystal, may also be called the principal axis.

Quartz crystals occur in nature in two distinct classes, about equally common, of which one is the mirror image of the other. The two varieties are shown in Fig. 1. The first is a left-handed crystal and the second a right-handed crystal. They may be simply differentiated by inspection in practice if the following characteristics are borne in mind. The letters on the faces in the figure are those normally used in crystallography. In a right-handed crystal the position of an x face lies below the right-hand corner of an R face, and the zone zsxm is in the direction of a right-handed screw. Also s faces often exhibit a striated appearance, and the striae when present are in the direction of the zone zsx. These striae serve to distinguish between R and z faces; also, in some cases these faces differ in that z is dull and R is bright and marked with little curved triangles. In a left-

handed crystal the zone zsxm is in the direction of a left-handed screw. It will be seen from the figure that the small s and x faces occur on only three of the six edges of the hexagonal prism.

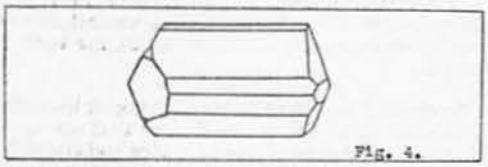


Fig. 4.

Quartz crystals rarely exhibit the regular appearance shown in Fig. 1, for though the angles between faces are constant, similar faces may differ widely in the extent of their development. It is common for a quartz crystal to exhibit "growth lines" or "steps" in the faces; a peculiarity of the crystalline structure, however, is that these steps are always squarely across the line of the true faces.

A remarkably optical property of quartz crystals is their ability to rotate the plane of polarisation of polarised light transmitted in the direction of the trigonal or principal axis which is for that reason also known as the optic axis. The angle of rotation produced depends on the thickness of the plate and on the colour of the light, being of the order of 10-30 deg. for each millimetre of thickness of the quartz. The direction of rotation of the plane of polarisation is intimately related to the crystalline form, being right for right-handed quartz and left for left-handed quartz. Another optical property possessed by quartz is that of double refraction, which is exhibited by many other crystals, notably Iceland spar.

A disadvantageous property of quartz in connection with piezo-electricity is twinning, which is of frequent occurrence. A twinned crystal contains portions having different orientations which are, however, symmetrically related to one another. A number of varieties of twinning are possible in quartz. Briefly, twinning may be defined as the combination of elements some of which are right-handed, and others left-handed, or of elements of one kind or the other combined with elements which bear some simple symmetrical relationship to them. Great care must be taken in selecting good specimens of quartz, because of the frequency of occurrence of twinning, the effect of which is that a plate cut from a crystal may exhibit opposite polarity at adjacent points, and the net piezo-electric effect over an area may be very small or even zero.

The usual method of obtaining a plate for experimental purposes is first to cut a hexagonal prism from the crystal, by two planes perpendicular to the principal or optic axis. The prism is then examined in polarised light to see whether it contains any portions which exhibit twinning and must be removed. Wherever there are twinned portions or flaws of any kind, the planes of polarisation of the various incident rays on neighbouring points are not all rotated by the same amount, and characteristic interferences and colour effects are produced. Even though a piece of quartz passes this test, it may be desirable to examine it point by point for electric polarity after it has been cut from the hexagonal prism; a plot can be made of the polarity over the entire surface in terms of the charge produced, measured with an electrometer, when the same pressure is applied at each point in turn throughout the surface.

The piezo-electric properties of a quartz crystal are usually expressed with reference to three sets of axes, of which two are identical with crystallographic axes and the other is in simple relation thereto. Stresses applied in the direction of the optic axes (which is the trigonal or principal axis for the crystal symmetry of quartz) produce no piezo-electric effect. This axis is generally referred to by the letter Z. The three axes X^{I}, X^{II}, X^{III}, passing through the corners of the hexagon that forms the section perpendicular to the optic axis, and represented in Fig. 2, which shows plan views of a hexagonal slice cut from a crystal as explained above, are known as electrical axes; these are the diagonal axes of the crystal symmetry: the three axes Y^{I}, Y^{II}, Y^{III}, which are perpendicular to the faces of the crystal, are known as the third or mechanical axes, and are 30 deg. spaced from the electrical axes, being each also perpendicular to one of the latter owing to the hexagonal shape of the crystal.

Plates for experimental purposes may be cut from a hexagonal slice such as that referred to above, and the two types of section most commonly taken are those shown in Figs. 2a and b: the orientations of these with respect to a complete crystal are shown in Figs. 3a and b. If the flat sides of the plate are perpendicular to an electrical (X) axis, the "cut" is known as an X or Curie cut (this cut was used by the Curies); and if the flat sides are perpendicular to a Y axis (third or mechanical) the cut is known as a Y cut. X cut and Y cut plates are shown at the bottom of Figs. 3a and b, and the directions in the plates of the X, Y and Z axes are indicated by arrows. Electrodes are usually applied to the faces of the plates as shown, and the electric field applied or obtained by pressing the plate is in the same direction as the axis which gives its name to the cut. Plates may be cut in any direction with respect to the X, Y and Z axes, depending on the kind of vibration desired.

A quartz plate is a mechanical vibrator, and the same modes of vibration may occur in it as in other mechanical systems. A quartz plate, however, constitutes an extremely complex vibrating system having a large number of degrees of freedom. The general relation between stress and strain, which in an ordinary isotropic (uniform) medium involves only two constants, in quartz requires six. The choice of the particular constants that enter into a given mode of vibration depends on the orientation of the quartz plate with respect to the axes defined above. The frequency of vibration of a quartz plate depends on the density of the quartz and the elasticities of the quartz involved in the particular cut adopted, and also on the dimensions of the plate.

When an alternating voltage is applied across a quartz plate in such a direction that there is a component of electric stress in the direction of an electric (X) axis, alternating mechanical stresses will be produced, causing the plate to vibrate, and if the frequency of the applied alternating voltage approximates a frequency at which mechanical resonance can exist in the crystal plate, the amplitude of the vibrations of the plate will

(*Continued on page* 250).

A FREQUENCY METER MONITOR FOR THE AMATEUR STATION

By G. McLean Wilford (G2WD.)*

A FREQUENCY meter should be one of the first items installed at an amateur station, but due to the almost universal use of crystal control, at least in Great Britain, the tendency is to ignore this useful piece of apparatus.

It is not until one begins to use a frequency meter that an appreciation is obtained of its value in other directions. For instance the meter can be used (*a*) to check the calibration of a receiver on all amateur bands ; (*b*) to check the frequency of commercials who wander into our bands ; (*c*) as a separate heterodyne unit accurately calibrated.

The meter to be described performs all of these functions and is also designed to act as a monitor for transmissions from G2WD.

Valve and Circuit.

It was decided in the early stages of its design to make use of a dual purpose valve ; a *Mazda* AC/TP, triode pentode being selected for the purpose. This has a common heater and cathode, but separate triode and pentode assemblies.

Electron coupled circuits are eminently suitable for this class of work by reason of their stability, and the arrangement shown in Fig. 1 was selected. The suppressor grid and screen grid are strapped together to give a better screening effect. The pentode portion is used as the E.C. circuit for the oscillator part of the meter, whilst the triode is resistance capacity-coupled to the oscillator circuit, and acts as a detector for monitoring purposes only. It will be noticed from the diagram that this portion of the circuit does not function until the headphones are inserted into the jack. Self bias is used throughout.

The oscillatory circuit is so designed that its fundamental frequency will be within the 3.5 mc. amateur band, with an overlap at each end. The meter can be calibrated in several ways ; one method is to produce a graph for each band, but the method preferred by the writer is to prepare one graph only from a number of check points. It is then a simple matter to multiply the fundamental frequency by 2 if working on 7 mc., by 4 if working on 14 mc., and so on.

Construction.

As a frequency meter of this type is a precision piece of apparatus, the first requirement is that it must be stoutly made, so that parts cannot move out of position or vibrate unduly.

The general construction of the meter will now be described.

On the front panel is mounted an *Eddystone* full vision dial 0° to 100°, with standard 22-1 slow-motion drive fitted to a 3/16" ebonite panel ; this,

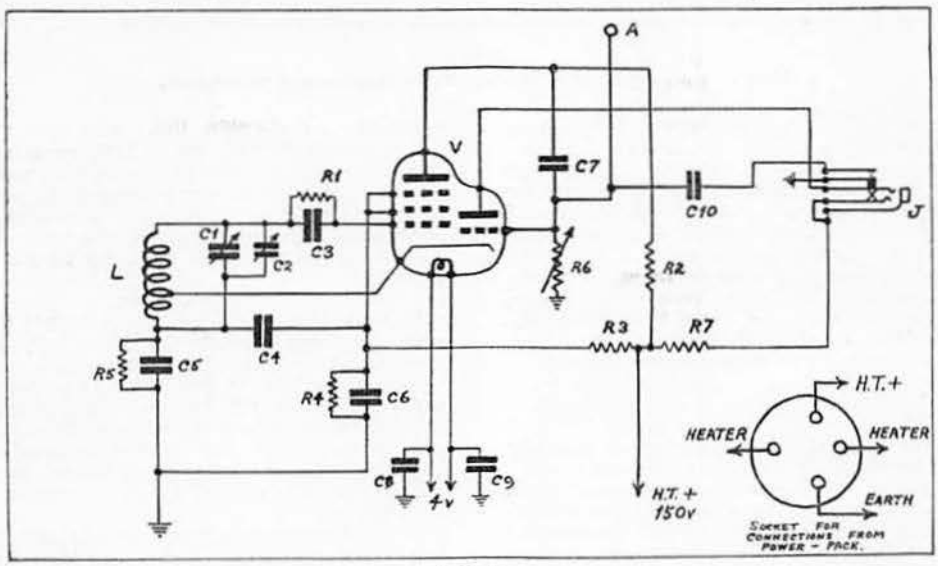


FIG. 1.
Circuit Diagram of Frequency Meter Monitor.

C1	*25 μμF Condenser, Eddystone.*	*R3*	*10,000 ohms, 2 watts, Dubilier.*
C2	*65 μμF Padding, Eddystone.*	*R4*	*20,000 ohms, 2 watts, Dubilier.*
C3	*.0002 μF Mica, Dubilier.*	*R5*	*300 ohms, 1 watt, Amplion.*
C4, 5,	*.25 μF Tubular, Dubilier.*	*R6*	*1 megohm Potentiometer, Bulgin.*
C6	*1 μF, Dubilier.*	*L*	*80 turns close wound 30 s.w.g. enamelled on 1 in. Paxolin former tapped at 25 turns from earth end.*
C7	*.002 μF Mica, Dubilier.*	*J*	*Filament control Jack, Igranic.*
C8, 9, 10,	*.1 μF Tubular, Dubilier.*	*A*	*Clix socket for external aerial.*
R1, 2, 7,	*100,000 ohms, 1 watt, Amplion.*	*V*	*AC/TP Mazda valve.*

* Head of R.E.S. Transmitter Design Group.

in its turn, is backed by a sheet of 16 s.w.g. aluminium. By means of an angle across the front panel, the shelf holding the valve, condensers, etc., is affixed. On the underside of this shelf are fitted $\frac{1}{4}'' \times \frac{1}{4}''$ aluminium angles to attach the sides and back; these are shown in the underside view photograph. Additional $\frac{3}{4}'' \times \frac{1}{4}''$ angles are used to attach the sides to the front panel and the back to the sides.

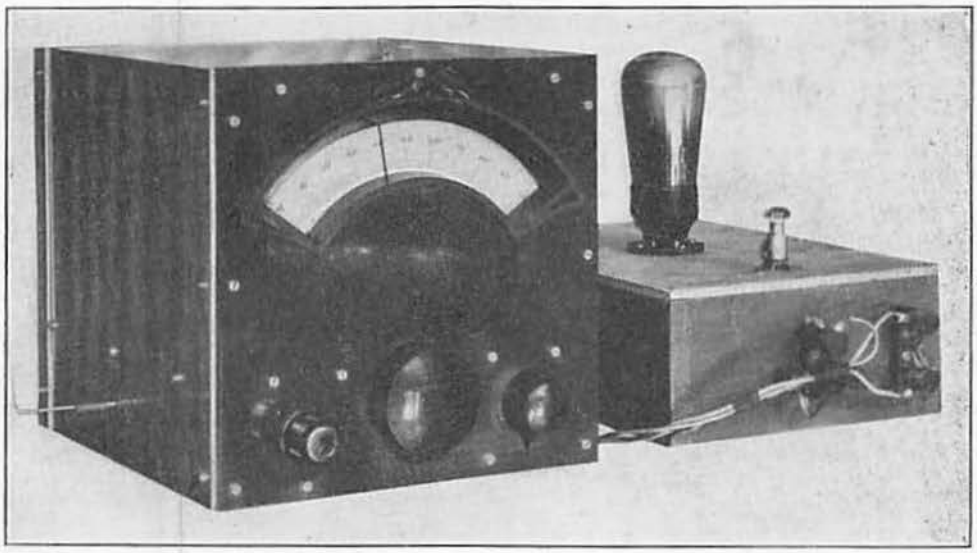


FIG. 2.
View of the completed Frequency Meter Monitor and power pack.

This method of construction was adopted in preference to a box, as one side and the back and front were assembled, and the chassis fixed, prior to wiring up. An open side gives easy access for this purpose. All screws and nuts are 6B.A., and every nut is locked into position by shake-proof lock washers. Thus, when the meter is assembled and wired, a most rigid piece of apparatus is the result. The lid is fixed by two hinges and locked by means of two bolts and nuts on the front; the bottom is held in place by clips. This portion, *i.e.*, the lid and bottom, are not shown in the illustrations and can be left to the individual constructor to fix in the manner which appears most suitable.

The finished dimensions are 8" wide, 8" high and 9" deep, the height of the chassis being regulated by the shaft for driving the tuning condenser.

The coil L is wound on a paxolin former, 1" dia., 2" long, and the winding terminates in two terminals which are attached to the stator and rotor of the variable condenser, which for hand-spread purposes is a 25 μμF *Eddystone* micro-condenser. This is attached to the dial by an *Ormond* insulated coupling and supported on a small bakelite bracket; the reason for this is because both sides of the coil and condenser are above earth. A small *Eddystone* padding condenser (Type 978) is mounted close to the coil and variable condenser in parallel to give a semi-variable fixed capacity for band setting. Once set it is not altered.

The grid leak and condenser are mounted rigidly on to the variable condenser, and from thence to the grid cap on the valve. This is clearly shown in the photograph.

The underside view of the chassis shows the wiring and placement of parts. There is, however, one modification that has been included since the photograph was taken. It was found that when the meter was used for monitoring purposes, the signal was too powerful; further, there was a slight tendency for audio oscillation. Condenser C10 was put across the 1 megohm variable resistance and two leaves of the filament control jack were connected to this condenser; consequently, when the jack is inserted for monitoring, the condenser is automatically cut in and a nice clear note is heard which can be varied in pitch by means of the rheostat.

Power Supply.

The whole of the power supply comes into the meter by means of a chassis-mounting valve socket; the connections are shown in the sketch.

The meter has its own separate power supply using an *Osram* U10 rectifier. The transformer gives 220 volts on load and a *Bulgin* 20 watt 25,000 ohm resistance acts as bleeder and voltage divider, a point being found which gives a 150 volt supply to the meter. The current taken is between 6 and 8 milliamps.

While this separate power supply is not absolutely necessary, the author would stress the fact that there *must* be a separate filament supply for the AC/TP valve, because before any accurate frequency measurements can be taken the valve must reach a stable temperature, a process which takes about 20 minutes. Room temperature will also affect the precision of this meter, which in the writer's case was designed for a room temperature of about 65° F.

The H.T. supply can be obtained from the receiver power supply and can be controlled by a

switch when frequency measurements are being taken.

Operation and Calibration.

The valve should first be warmed up for 20 minutes and then H.T. may be switched on.

Using this meter with an ordinary regenerative receiver, a station is first tuned in, the regeneration

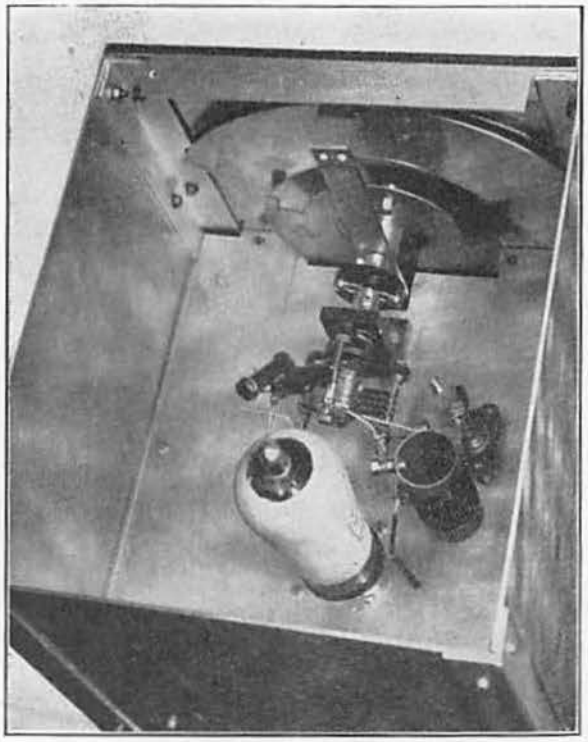


FIG. 3.
A view of the Frequency Meter Monitor with the lid removed.

is then backed off until the detector stops oscillating, but still giving regeneration as is the case when receiving a phone station. The meter is then switched on and the condenser varied until the station is again heard, thus giving the frequency of the station. With a superhet the same procedure is adopted with the beat oscillator on. When the station is tuned in the beat oscillator is switched off, and the frequency meter itself then acts as a beat oscillator, and the meter is again adjusted until the same station is heard ; the frequency of the station can thus be measured. The calibration can be carried out by using marker stations whose frequencies are known at each end of the amateur bands, and a curve plotted, but the best method is to have the calibration carried out by the R.S.G.B. Calibration Section, and then a definite certificate can be obtained and its errors are known.

If by any chance the frequency meter has to be used at some distance from the receiver or transmitter, a small external aerial for pick-up purposes is provided ; this plugs into the *Clix* socket (insulated type) on the side of the meter, and can be clearly seen in the photograph of the meter and its power supply. A pilot light on the filament supply serves as a reminder that the meter is switched on.

The Society's Calibration Manager reported on this meter, and the only criticism he had to offer concerned the pointer on the dial, which, he considered, was rather thick, thus making it difficult to read to closer than 0.25 of a dial division. The drift between switching on and the valve warming up was less than 3° F., but after half-an-hour the correct operating temperature was reached and the frequency drift from that period until several hours afterwards was not appreciable. In other words, accurate measurements can be made half-an-hour after switching on the heater supply.

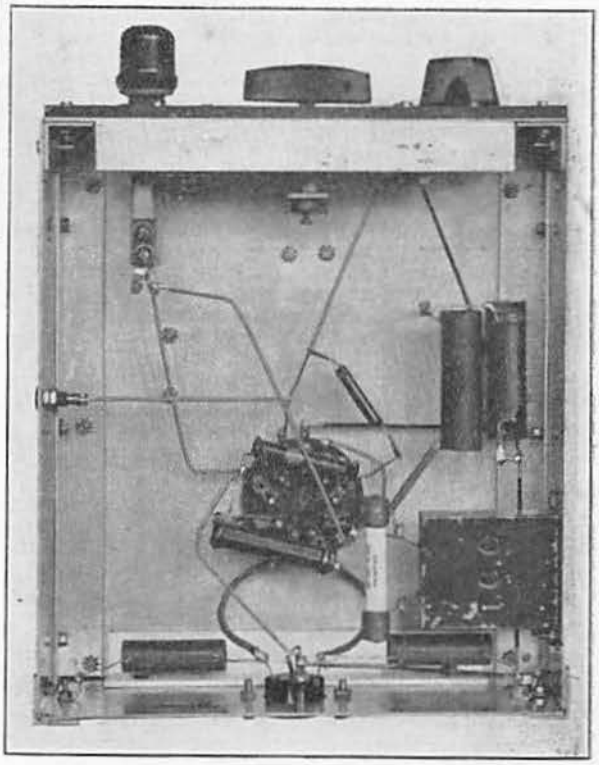


FIG. 4.
A view of the under baseboard wiring showing the arrangement of components.

SPECIAL VK-G TESTS

ON 3.5 mc/s

JANUARY 18th to 26th, 1936

1800 to 2000 G.M.T.

PROPAGATION TO EUROPE & SOUTH AMERICA.

By E. H. Conklin (W9FM).

OF interest to those who enjoy DX contacts on any band from 3.5 to 28 mc. is the investigation made by C. R. Burrows and E. J. Howard of propagation over the North Atlantic * and to South America†.

Transmissions from Deal, New Jersey, were measured at New Southgate, London, England, from June, 1926, to August, 1929. Generally, frequencies were rotated throughout a 24 hour period at intervals of one week. The standard aerial was a half wave vertical, inductively loaded, with one kilowatt radiated. When simple directive aerials were used, a correction factor determined by actual experiment was applied. Table 1 shows the signal level in decibels above 1 microvolt per metre in our bands, by seasons, so grouped that the middle of each quarter represented is a solstice. Spring and autumn are omitted for brevity. Winter is taken as from November 5 to February 5, centred on December 21.

Transatlantic Conditions.

The table shows the poor early morning conditions due to ordinary skip—insufficient ionization to cause the necessary refraction. It also shows the poor daytime conditions on low frequencies due to excessive absorption which might be the combined result of the ionic gradient and atmospheric density. The conditions as shown represent those for several years near a sun spot maximum, but probably represent average conditions, the " disturbed " days having been eliminated. The occurrence of magnetic storms and the passage of large spots across the central meridian of the sun were used as guides in discarding " disturbed " days.

Summer 14 mc. conditions resulted in poor signal strength in the morning, but communication was possible throughout the day. This is probably due to the far northerly path, a large portion being in daylight or twilight. Although it may be dark on the earth's surface for part of the distance, the signal passes through the upper strata where there may still be sunlight, since points just a few degrees north have daylight throughout the 24 hours. Autumn and spring conditions were between those shown, signals failing in the morning, sometimes swinging in quite loud around 6 to 7 a.m., showing a tendency toward mid-day absorption, and reaching the peak in mid-afternoon. (U.S.A. times.—Ed.)

The highest frequency used, near 28 mc., was received only during the period of total daylight, the best signal strength occurring in winter with lower levels in spring and autumn and no reception at all during the summer. This channel was used only through one summer and one winter, so results are not as representative as on the other frequencies, and the variation shown cannot be taken as conclusive. (Some transatlantic contacts were established during the summer of 1935.) The results, however, agree with those on 18 mc. where the data covers several years. This seasonal effect is due more to summer absorption than to failure of the signal to return to earth. Even on 28 mc., therefore, summer skip may be *too short* for good transatlantic work.

Transmission to South America.

Table 2 shows the conditions on the path to South America, which are very nearly the same on the average for any season, the day-to-day variations from other causes being larger. The 14 mc. band is between the best day and best night frequencies, sometimes showing the characteristics of one or the other ; day-time absorption and night-time skip both having an effect. This explains the commonly observed phenomenon of hearing South Americans in the early morning before any other signals are audible, and then hearing nothing more from that continent until evening.

Some tendencies are averaged out in the table. The daytime absorption can be present even on 28 mc., causing a mid-day dip in signal strength. Another is the slightly higher field on the lower frequencies just after they swing in and before they drop out. On several of the test days the best strength was obtained on 28 mc. rather than a lower frequency. Day-to-day changes were very much less on the lowest frequency than on the highest, and transmission was not as adversely affected during periods of solar activity as over the North Atlantic.

A few tests were conducted on 31 and 36 mc. The 31 mc. frequency was received on *all* of the test days at some time between 10 a.m. and 3 p.m. eastern time. Strength was sometimes as high as the 28 mc. maximum. Daily changes as to time of reception, however, were great. 36 mc. was not received during the test.

28 mc. Application.

Transmission to South America was more consistent than to Europe, possibly for several reasons. The distance is greater, the summer absorption is never a maximum for the whole path, and the whole path receives sunlight during a longer part of the day. The data show that the longer winter skip, with less absorption, favours winter transmission to Europe even though during that season short two-way work on either continent may be impossible. The latter fact makes for an absence of stations on the air when European work should be at its best. The best time for European contacts seems to be 9 a.m. to 1 p.m. eastern time, although it may be possible from 7 a.m. to 3 p.m. While the signal level is not as great as on 14 mc. the absence of atmospheric noise permits communication.

South American signals may be heard from 7 a.m. to 9 p.m., sometimes staying in the whole 14 hours with fine strength. Signals during the earlier part, however, may be missing when absorption is bad, causing a shortening of the communication period to 1 p.m. to 5 p.m. with the best level at 3 p.m. The absence of a clearly defined seasonal effect shows that year-around daily communication is quite possible.

The lower signal strength often measured on 28 mc. may be due to the type of transmitting and

*Institute of Radio Engineers *Proceedings*, September, 1931.
† Institute of Radio Engineers *Proceedings*, January, 1933.
‡ For an investigation of angle of reception, see " Some Effects of Topography and Ground on Short-wave Reception," by Potter and Friis, in I.R.E. Proceedings for April, 1932.

receiving antennas used. The transmitting antenna best for this high frequency may be one concentrating most power near the horizontal plane, Reception, although involving a higher angle, probably still is best for antennas with low angle polar characteristics in the vertical plane‡. High antennas, with some form of "stacking," are likely to prove best.

	A.M. E.S.T.							P.M. E.S.T.					
	0	2	4	6	8	10	12	2	4	6	8	10	12
Summer :													
28 mc.	—	—	—	—	—	—	—	—	—	—	—	—	—
14 mc.	+5	—5	—10	—15	—15	—15	—10	—	5	0	+5	+10	+15	+5
7 mc.	+15	—5	—	—	—	—	—	—		—15	0	+20	+20	+20
Winter :													
28 mc.	—	—	—	—	—10	—5	—5	—	—	—	—	—	—	—
14 mc.	—	—	—	—5	+10	+10	+10	+5	0	—	—	—	—	—
7 mc.	+15	+10	+5	—10	—	—	—15	—5	+10	+15	+15	+15	+15	+10

Table 1.—Transatlantic propagation.

	A.M. E.S.T.							P.M. E.S.T.					
	0	2	4	6	8	10	12	2	4	6	8	10	12
28 mc.	—	—	—	—	—10	—10	—10	—5	0	—10	—	—	—
14 mc.	—5	—10	—10	—5	—15	—	—	—	—5	+10	+5	0	—5
7 mc.	+5	+10	+15	—5	—	—	—	—	—10	+5	+10	+5	0

Table 2.—Transmission to South America, for any season.

The blank spaces in the tables indicate times when the signal could be heard below the lowest measureable limit, —20 db, or when the signal was not heard. No attempt is made to show when weak signals below —20 db were audible.

THE TEN METRE BAND DURING NOVEMBER

By E. H. Swain (G2HG).

IT is almost an impossibility to write an account of the prevailing conditions on ten metres and do justice to the subject.

At this time last year the mere mention of anyone hearing an American station on the band would have been "head-line news." The present position may best be summarised by quoting from one of the letters received this month: "I have not touched 28 mc. much for a couple of years, but on reading your notes in the Bull., thought I would have a shot this week-end, and did I get a surprise? I should say so! with W's ten a penny. At times it knocked 14 mc. into a cocked hat!"

Everyone seems to have been striving for the first G-ZL QSO, but no actual report of such a contact is to hand yet. G6LK heard ZL3AJ and called him, but is uncertain whether the New Zealander answered him owing to car QRM.

The Australians are coming through practically every morning, and on most Sundays have been audible until mid-day. G6WT in South Devon has heard them as late as 14.00 G.M.T., and G6WY reports hearing an odd one in the late afternoon.

The calls audible have been: VK2LZ, 2NO, 2RX, 3BD, 3BQ, 3YL, 3YP, 4BB, 4EI, 4CK, 5HG, 5WJ, 6BR, and 6SA. In addition, harmonics of VK's working on 14 mc. have been heard.

G6DH mentions that he worked VK3BQ and received an R8 report on his phone. This is believed to be the first G telephony contact on 28 mc. with Australia.

Asia is the stumbling block for W.A.C. and W.B.E. as very few Asians have been logged during November. BRS1847 heard J2HJ calling CQ ten on the 9th at 14.00 G.M.T., and G6WT received VU2LJ on the 17th and AU9TX on the 11th.

U9AV was generally audible on the morning of the 24th, but turned out to be a harmonic from 14 mc.

South African stations are coming through consistently, ZS1H, ZU6P, and ZT6K being the usual ones heard. G6YI. has logged ZU5B and ZS2J in addition.

Southern Rhodesia is represented by ZE1JU, but no contacts between G and ZE have been reported, although this station has been heard in England.

SU1RO and 1SG appear to be the only Egyptian stations working on ten at the moment. SU1RO has sent in an interesting letter which shows that the conditions he is experiencing are similar to our own.

There are so many North American stations active on 28 mc. that QRM is becoming quite a serious problem, particularly on the low-frequency end of the band. Practically everyone is gathered at this end, but there are already signs that the stations are spreading themselves out. The Americans commence coming through about 13.00 G.M.T. and finally fade out about 18.00. All American districts are audible and workable.

G6NF worked W9ABP, alias "One Watt Willie,"

of Bethel, Kansas. The latter was using a TNT circuit with 135 volts to a 2-volt valve. His signals were received at NF's QSA5 R5/3.

As an example of the use of 28 mc. for ultra-QRP working, W9ABP mentioned that with this rig he has worked all continents on 28 mc., except Asia. This includes all W and VE districts, X1 and 2, VK2 and 3, LU and ZU.

W9ABP asks if G stations will look out for him and give him a call if he gets across.

All Canadian districts, with the exception of VE4, have been heard, and a number of Canadian QSO's are reported. The only VE5 heard is believed to be VE5PT, by G6WT on November 17 about 17.15 G.M.T.

The first QSO between England and Jamaica was made on November 20 at 13.30 G.M.T., when G5OJ worked VP5PZ. Several G's have since contacted this station. G6DH mentions that VP5AC is also active, and that he worked this station on the 24th. XIAY, OA4J, LU1EP, LU9AX, LU9BV, CO6OM, K5AC, and CX1CG are also getting across from this part of the world.

Conditions generally throughout England appear to be similar, but Scotland has been experiencing quite a bad time. As examples, G6ZV mentions that on the day G2YL WAC'd, he heard absolutely nothing. Again, on November 3, he only heard a weak W4, and although conditions in the South were rather poor on this day, yet quite a number of DX stations were audible. On the 9th conditions were more or less similar to our own, but on the 10th he heard nothing after 9 hours' listening, which certainly did not correspond to the conditions in the South. The 17th and 23rd were poor in Glasgow and excellent over most of England.

While it is evident that conditions in the Southern part of England are rather better than in the North, the Scottish stations are the only ones to report really poor conditions.

G5LR is using a 1-valve CC transmitter for 28 mc., consisting of a 14 mc. crystal in a tri-tet circuit and an input of 9 watts.

I would like to thank everyone who sent in reports this month. It has been impossible for me to answer each letter, owing to the large number received.

Late News.

During a recent 14 mc. QSO with G6YL, ZL3AJ advised that G5SY, 6DH and 6ZH were heard by him on November 24. On the same day he worked F8ZO at 1000 G.M.T. This is believed to be the first European-New Zealand QSO on 28 mc. ZL3AJ is working on 28,100 kc.

Special Note.

Mr. E. H. Swain (G2HG), who has so successfully compiled these notes for the past few months, finds himself unable to continue. We desire to record our thanks to Mr. Swain for his assistance, and have pleasure in announcing that Miss Nelly Corry (G2YL) has offered to take over this important work.

All items for inclusion in these notes must reach Miss Corry by the 28th of each month.

CORRESPONDENCE.

ELECTRICAL SYMBOLS AND ABBREVIATIONS

The Editor, T. & R. Bulletin.

Dear Sir,—With reference to the interesting and informative article, entitled, "Electrical Abbreviations and Symbols," published on page 135 of the October Bulletin, may I offer the following corrections of printer's omissions?

In column 2 the first symbol should, of course, have been "Ohm . . . Ω (the Greek capital omega); also in column 2, in the last symbol for "Imaginary Quantity," the horizontal line over the "—1" should have been continued to form a square-root sign, thus making "$\sqrt{-1}=j$."

Also, as it is the practice to give the symbols of certain units capital letters when they are named after noted technicians or scientists, would it not be more consistent to write the symbol for the decibel thus—dB? This form is, of course, in use, but not universally.

Again, why do we not adopt the recommendation that the word Hertz (Hz) be used to represent one cycle per second, when referring to frequencies in communication engineering, and the common form of cycle (c.p.s.) for electrical power-frequency engineering?

It is well known that there are many other anomalies in the nomenclature and symbolisation of radio and allied engineering, and, I consider, that they should be standardised by an international consensus of technical opinion.

We all appreciate the many difficulties that beset this task at its outset, and it really seems that we have progressed (*sic*) too far to make drastic alterations now, but surely scientific men should not have allowed such conditions to arise, as the policy of vacillation and inconsistency is the prerogative of politicians!

Yours sincerely,
D. Aldous, A.B.R.I. (BRS1006).
290, Horns Road,
Ilford, Essex.

The Editor, T. & R. Bulletin.

Dear Sir,—I have to thank Mr. Aldous for pointing out the two printer's omissions in the article under the above title in the October Bulletin. These managed to creep in in spite of carefully checking both galley and final proofs.

There has always been some controversy about the abbreviation for the decibel. The only reason for choosing the "db" form is because that is the one employed by the introducers of the symbol.

The writer appreciates the widespread discrepancies which exist in this matter of symbolisation, and when it was decided to make some recommendations for the Bulletin the only reasonable course was to take the symbols already recognised by the I.E.C.

Yours sincerely,
The Author.

EDITORIAL NOTICE

Members are reminded that all letters concerning Bulletin matters should be addressed to The Editor, and not to Mr. H. Bevan Swift or other officer by name.

STATION DESCRIPTION No. 45

By Septimus.

AMATEUR Radio Station G2YL came into being in October, 1932, the owner and operator having graduated from BRS776 to 2BRB, and served six months as second operator at G5LA. Many troubles were encountered at the start, so that 2YL very soon obtained a grounding in how many defects are possible, even when the circuit is C.C.!

The transmitter at present in use comprises C.O., F.D., B.A., P.A. on 7 mc.; C.O., F.D., F.D., P.A., on 14 mc.; and C.O., F.D., F.D., F.D., on 28 mc. The P.A. is driven in all cases, and both H.T. and L.T. supplies are obtained from A.C. mains. Bread-board design has been adhered to the whole time, because of its accessibility. The power supplies, key filter circuit, mike amplifier, and modulator all occupy the lower stage of the bench, and the valves and grids are fed through the meter panel at the back, both for anode H.T., and G.B. Valve-holders, grid-coupling condensers, tuning condensers, and inductances are mounted well off the baseboard to minimise losses as far as possible. Those who wonder where r.f. goes to when it disappears from the drive might do well to note this point.

Keying is by remote control, a relay being used to break the circuit of the centre-tap of the filament transformer of the third stage to —H.T. From 1932 to 1934, the receiver was an all A.C. 1.V.2. of unconventional design, which gave excellent results until the QRM from 5LA and 6CW got so bad that all work had to be done while they were at business! In 1935 an FBXA was installed, and this has settled the QRM question so far.

The antenna in use at present is a Zepp-fed 20 metre full-wave Hertz with 49 ft. feeders spaced 7 ins. apart by glass tube spreaders. Each feeder is tuned with a 300 $\mu\mu$F condenser, and the current measured by thermo-couple ammeters. The direction is N.N.E.—S.S.W., with the free end N.N.E. 45 ft. high, and the fed end 40 ft. With 10 watts input, VK, ZL and ZS were worked on 14 mc., and ZS on 7 mc. fairly easily, but difficulty was experienced in working VE and W, in fact VE was the last contact needed for W.B.E. However, W.A.C. and W.B.E. were accomplished within six months of a radiating permit being obtained.

The visitor to 2YL's shack will be struck by its neatness and roominess. The transmitter is ranged along the further wall to the left as one enters; to the right of this is a window through which the feeders are taken, and, further on, the operating table. On this table are the receiver, key and switches for transmitter modulator and receiver. The wall behind is full of cards which show that rag-chewing is enjoyed as well as DX working. The log is a work of art. Every call sent out is fully logged, everything heard that is interesting is logged, and in the case of QSO's, every word received is copied straight into the log, even if it occupies over a page. No dust ever seems to appear on the apparatus, and all the copper tube inductances are kept polished. A card index is kept which shows interesting details of each QSO.

G2YL has been licensed for 50 watts since November, 1933, and to date she has worked 76 countries on 7 and 14 mc. and 24 countries on 28 mc. She has always been particularly attracted by the mysterious behaviour of the waves of the upper frequencies, and an examination of her log shows the enormous amount of time spent on 28 mc. during the last twelve months. Except for enforced absences, she has devoted an average of four hours per day on the key and listening on this band since October 1, 1934, and her recent achievements have been really well deserved. In consequence of this, she has collected a large amount of data on conditions on 28 mc., especially during 1935. Up to November 9 she had had 347 contacts on this band this year.

G2YL gets more kick out of working DX on any band than out of anything else, but she also enjoys a rag-chew at any time. She is a Ham first, last and always, and is a great asset to No. 7 District. Any amateur who visits her can be assured of a warm welcome.

Western DX with a G2BI Aerial.

By R. Jardine (G6QX).

FROM June 1 to August 1 the writer was QSO W6 85 times and W7 36 times, using a 2BI Windom full-wave aerial on 14,360 kc., 5° North due East and West. This aerial was theoretically expected to be very poor for W6, but actually conforms to the radiation angles given for various lengths of horizontal doublets in April, 1935, *QST*, page 25, where the radiation angle for a full-wave aerial is given as 55° to the line of the aerial.

Two elastic bands stretched round an 8in. globe at 55° to the line of aerial, give radiation lines which have been proved by practice to be exactly correct. In fact, were there no restrictions on the length of aerial that could be used, maximum radiation or beam results could be had from any existing amateur location by following the angles given in *QST*, which are as follows:—

Half wave	...	...	90°	to the line of aerial	
Full wave	...	...	55°	,,	,, ,,
2 wave	...	...	36°	,,	,, ,,
5 ,,	...	...	22°	,,	,, ,,
8 ,,	...	...	18°	,,	,, ,,

The use of a globe is absolutely essential in planning these angles, as the ordinary rectangular map of the world fails to give the actual disposition of the various countries to which it is desired to transmit.

The receiver used in these tests was an 0-V-Pentode Reinartz circuit developed by the late Mr. H. L. Garfath (G2BM), and the dial was spread to read from 14,200 to 14,400 kc. only, *i.e.*, from the H.F. end to the middle of the 14 mc. band.

The input was 130 watts through a coupled tuned aerial tank, as mentioned in the High Voltage article, January, 1935, which method, as pointed out in the Society's High Voltage recommendations, is specified on the G.P.O. licence form, and is in true fact a safety precaution of 100 per cent. value to the amateur.

SOME 56 MC. WORK IN HONG-KONG

By C. R. Emary (VS6AX).

A FEW months ago Hong Kong was bitten by the 56 mc. "bug," and the Editor has asked for an article.

This is absolutely non-technical and no new data is to hand, being merely a summary of the 56 mc. activities in VS6.

The instigator was George Merriman (VS6AH), who built the sets. Two were constructed as in Fig. 1 and named "The Twins."

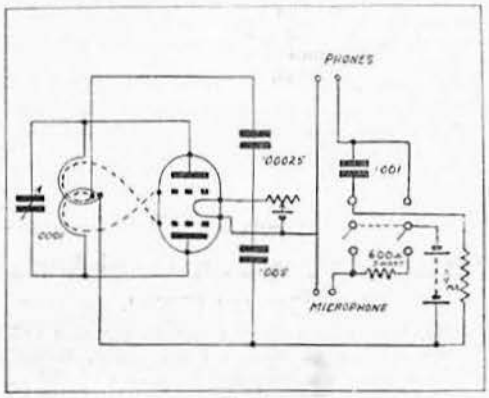


Fig. 1.

The tube employed was a type 19—an American duo-triode. The "mike" and receiver were the ordinary cradle type telephone handset. Power was derived from a 120-volt dry battery and two 1½-volt dry batteries in series with a suitable resistance for the 2-volt filaments. Power was approximately ¼ watt.

VS6AH carried out some experiments around the island—one set at his shack and one in his car. A frame antenna was used in the car with very good results. Hills made a big difference to signal strength.

VS6AX then borrowed one of the sets and rigged it up in his shack, using 4 ft. of wire for an antenna. Results were quite good, although speech was mushy, due to lack of an earth. Various 7 mc. aerials were then used and speech came up to R6—the aerials being "end on." 6AH then used a "broadside on" aerial to 6AX, and speech increased to R9. This was over a distance of about 2,000 yards.

Next 6AX borrowed both sets and experimented over a distance of about 500 yards. Best signals were obtained with a 2½-metre wire "broadside" to the home station and at an angle of 30 degrees to the ground with an earth mat end-on to the home station but pointing away. The use of a reflector at the home station made an appreciable difference to signals.

VS6AS now borrowed a set and established communication with AX from his shack—a distance of about three miles. Speech was R4 and mushy at 6AS, due to no earth, but AX reported a good R6, 7 mc. aerials being used. A lot of trouble was experienced at both stations from harmonics of the high-power naval stations. Frequencies were changed by 6AS and AX, no difficulty being experienced in "lining up" the sets again.

6AS and AX next took the sets out to a loca volunteer camp and the following interesting experiment was conducted. 6AX stayed at the home station using about 30 ft. of wire strung up among some trees. 6AS used the other set in four different positions, using a 5-ft. copper rod for antenna and an earth pin.

The four positions are shown in Fig. 2.

In position 1 speech was a good R8, but completely faded in position 2—about 500 yards from home. At position 3—another 150 yards—signals came up to R3-4—perfectly clear. Position 4 is 1,000 yards from home and signals were R8 again. Some non-amateur friends were put on the sets and found them very easy to operate—one might say "foolproof." Finally, the sets were used on an official scheme for passing "live" traffic. They behaved remarkably well and no delays ensued. 6AS carried his in full "fighting" kit—the sets being *very* portable.

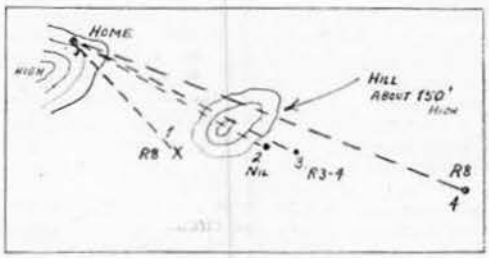


Fig. 2.

An attempt was made to establish contact from 6AQ to 6AX, but this failed owing, probably, to distance and land features, coupled with low power.

"The Twins" are now in the Dutch East Indies, having been taken over by a member who spends much time in the jungle.

56 mc., everyone agrees, is very "thrilling," and much more interesting than 7 mc. The writer has been an operator for nine years, but his biggest thrill was his first 56 mc. QSO.

All the praise—if any is forthcoming—is due to 6AH, who built the sets, but George is too busy on 28 mc. to bother—maybe another craze—who knows!

(*Continued from next page.*)

oneself of the correctness or otherwise of the final adjustment—providing, of course, the station is using low power.

The coupler has been found a great help, not only in increasing signal strength at a distance on all bands, but in reducing local strength, abolishing key clicks and B.C.I. interference. Further, its use has produced a T9 note on all occasions, when formerly chirps were reported due to bad regulation in the power supply.

ADJUSTING THE COLLINS COUPLER

By W. H. Allen (G2UJ).

HAVING read the interesting and informative article on the Collins Coupler contributed by Mr. McLean Wilford (G2WD), in the April issue of the Bulletin, the writer decided to construct such a device for work on the 1.7, 7 and 14 mc. bands. As a voltage-fed Hertz aerial is used, a hot-wire ammeter at the transmitter end is useless for indicating aerial current, further, an objection is held to having lamps in the aerial to indicate the correct tuning point. G2UJ is a QRP station, and any device which tends to decrease the efficiency of an already rather badly screened aerial is not looked upon with favour.

The writer had some initial difficulties in adjusting the Coupler, but after experience had been gained, one or two hints were picked up which may be of some interest to operators of other QRP stations. The two variable condensers in the Coupler will be referred to as "A" and "B"—"A" being the one nearest the transmitter tank coil.

If the circuit is analysed, it will be seen that it is somewhat analogous to the "bottom-capacity-coupled" band-pass circuit of broadcast set design, with condenser "B" as the coupling condenser, and which functions in the same way, viz., an *increase* of capacity at "B" *decreases* the effective coupling of the aerial and *vice versa*. It will be found quite simple to tune the transmitter with a milliammeter in the anode circuit of the P.A. valve. First, tune the P.A. tank circuit to exact resonance without the coupling network connected, and note the feed current. Next connect the coupler and set condenser "B" at about ¾ of full capacity and rotate "A" to bring the circuit into resonance. Note the current reading, and if it is not as high as required decrease "B" and again bring "A" into resonance. This can be continued until the required input to the P.A. is being taken, but if an attempt is made to couple the aerial too tightly, a double hump effect will be noticed and the milliammeter will give a minimum reading at two points. This should not be permitted, and to prevent it occurring "B" must be increased in capacity until the minimum reading on the milliammeter is sharply defined. A bulb and loop are also useful for checking, as maximum brightness indicates exact resonance.

An effect which has been noticed and which cannot be accounted for at the moment occurs on 14 mc. It is possible to find an adjustment of the coupler by the method outlined above, which results in plenty of R.F. in the coupler coil, but, no excitation to the aerial. (If the coupling coil is too large it tends to self-resonate, and becomes independent of the low impedance connected to its ends.—G6CJ.) This is caused by using too many turns in the coupler coil, and it will be found that the aerial may be taken off or put on without affecting the milliammeter reading! If the coupler is correctly adjusted, touching the aerial will alter the reading of the P.A. milliammeter or reduce the glow in the bulb, and this may be used as a convenient, if not very scientific, method of satisfying

(*Continued at foot of previous page.*)

THAMES VALLEY SOCIETY HOLD 5-METRE FIELD-DAY

By J. N. Roe (G2VV).

On Sunday, September 8, 1935, Epsom Downs was full of "Hams" and not "horses"! The occasion was our first attempt at 5-metre field work, and keen interest was shown by all who attended. G5VB was our main fixed station at Burgh Heath (near Tattenham Corner) and G2KI, G6RS and G2VV were the portable stations.

The programme commenced at 10.15, when all met at Tattenham to check wavelengths and test out gear (have you ever heard 2 dozen super-regen. receivers all working in a space of about 6 yards?). Everything was "all set" by 11 a.m., and the portable stations moved off in different directions. G5VB called each portable station, in turn, at 20-minute intervals.

G6RS and G2VV contacted, each on the Downs "somewhere"; G2VV worked G5VB from the side of the Grand Stand. G2VV was heard in Chipstead when located on Headley Downs, and G2YK also reported hearing G2VV in Richmond Park when the station was on Epsom Downs.

We heard nothing of G2KI all day until 4 p.m., when he called G2VV, and apparently great things had been happening to him and G2LA (in whose car G2KI was installed). As far as we could gather they were driving through Dorking when suddenly clouds of smoke appeared from the rear of G2LA's "Hornet," and they smelt "burning R.F." Quick action on the part of Fireman Spencer (G2KI) saved the complete station from ashes. The batteries had shorted on to the chassis of the car, and hence the firework display. After replacing about six fixed condensers, G2KI got on the air again at 4 p.m.

G6RS and his "gang" stopped at "The Blue Ball" at lunch time to prove that "5 metres takes it out of a man, but beer puts it back!" We gather that the "Blue Ball" is near Walton-on-the-Hill, and during the activities there the party received a pleasant surprise when G2YL came along to see how things were going.

At 5 p.m. all stations met again at Tattenham Corner, when results were compared and group photographs taken. The party then proceeded to a rendezvous in Epsom and spent two very enjoyable hours eating and discussing 5-metre problems.

Although no great DX was worked during the day, we all learned many things which will be of assistance at future field days. A brief summary

(*Continued on page* 250.)

BOOK REVIEWS

THE RADIO HANDBOOK. By the Technical Staff of *Radio*. 296 pages and hundreds of illustrations. Published by the Publishers of *Radio*, Pacific Building, San Francisco, U.S.A. Price 1 dollar.

The appearance of another Handbook for amateurs and experimenters is bound to arouse considerable interest, especially when it is compiled by the editorial staff of a magazine of the standing of *Radio*. In the preface the compilers mention that certain sections have been allocated to specialists on that particular subject; for example, Clayton F. Bane writes on receivers, Chas. Perrine (W6CUH) on transmitter efficiency, W. W. Smith on piezo-electric crystals, Frank C. Jones on antennæ and ultra-high frequency work, etc. Each section of the book is therefore thoroughly and authoritatively treated, and there is little overlapping in description.

The book is extraordinarily well illustrated, and the circuits almost invariably carry the values shown very clearly on each component. There are hundreds of illustrations and tables.

The compilers say that the book represents the answers to questions which have been asked during the past two years, and they have therefore an excellent experience of the difficulties which the ordinary amateur meets in his work. Not only this, but the gear described has all stood the test of actual operation, and it is apparent everywhere that the writers are really practical men. In fact, it is about the most practical radio publication that I have yet seen, and at the same time principles underlying the various sections are not neglected, but explained in plain language.

A short section on Fundamentals of Electricity builds up circuit theory with the electron as a foundation, and in this section one here and there feels the influence of Terman's methods, which, incidentally, is all to the good.

The next chapter deals with Vacuum Tubes, and describes the various functions and modes of operation. A diagram and explanation on page 22 describing grid detection would appear to be a better description of plate detection utilizing the upper band, but grid detection is more satisfactorily explained in the next chapter, which analyses the receiver. In this chapter several receivers are completely described with minute detail, and ranging from a simple two-valve to a very workmanlike SSS with a quartz filter and RF amplifier. There are also tables of characteristics and socket diagrams for American valves, and a number of circuit diagrams of the better known commercial short-wave receivers.

Transmitting circuits are analysed generally in the first place, and then in greater detail with suitable examples of the various practical points raised. The crystal oscillator, and its more up-to-date elaborations in the form of "tri-tet," "siamese," "les-tet" and "Jones" exciters, are explained in a very direct and useful way. The Jones exciter is claimed to be much better than the tri-tet, especially for the multiple frequencies.

A number of transmitters are described with full data as to coils sizes, tuning and running conditions; in this section I must mention the grinding of quartz crystals, link coupling, amplifier efficiency and grid bias as well meriting the attention of amateurs.

Radio-telephony is very fully covered, ranging from crystal microphones to controlled carrier modulation, and again actual amateur gear of all sorts is described and not merely the circuits.

Aerials and coupling schemes are dealt with very comprehensively, especially with regard to directional effects; the latter are particularly usefully applied to ultra-short wave work, which is given a very liberal portion of the book.

A large variety of 5 and ¾-metre transmitters, receivers and transceivers are described, and it is interesting to note the frequency with which the Flewelling method of super-regeneration appears in transceivers. This section should be of great interest and direct usefulness to ultra-short wave fans.

Filters, transformers, power packs, cathode-ray oscillographs—all are there, and many more.

There are a few little flaws which are almost bound to occur in a first edition, and the paper is rather poor, but you cannot have a room with a fire *all* round it.

I am enthusiastic about this book, and I think it will find a place on the shelves of many amateurs, no matter how many other handbooks they may happen to have. It is very good value indeed at a dollar, and a phrase in the preface sums the whole attitude of the compilers up very well, ". . . how to get the best results at the least cost."

T. P. A.

[This Handbook is available from Headquarters, price 4s. 6d., post free.—ED.]

PRACTICAL RADIO COMMUNICATION. By A. R. Nilson and J. L. Hornung. First edition. 754 pages, 434 illustrations, and numerous tables. Published by McGraw-Hill Publishing Co., Ltd., London. Price 30s. net.

Reviewing this book has been a very pleasant job. Firstly, because the appearance is so attractive; and secondly, because the subject matter is so interesting, practical and detailed. The rounded edges of the pages, the exceptionally well reproduced diagrams, the clean type-face, and the fact that the book lies open at any page, all help to give pleasure to the reader. It is beautifully produced.

The authors have realised that the operator-technician of to-day requires a much better knowledge of the art than is necessary for an operator's licence. The same applies on this side of the Atlantic, and it must be realised that the licence requirements now bear little relationship to the work of many technicians who are responsible for the maintenance and operation of such complex apparatus as the modern broadcast station, aircraft navigational gear, and the like.

The book, therefore, is a very successful attempt to provide in one volume much of the information necessary to the well-qualified operator in whatever field of radio activity his duties lie, and the whole work is no more mathematical than is, for example, the "Amateur Handbook." The explanations clearly show that the authors have a very highly developed gift for teaching.

The first six chapters deal with principles, starting from the electron and building up the theory of direct currents and circuits, magnetism, alternating currents up to three-phase circuits, valves, amplifiers and oscillators, transmitting circuits including ultra-high frequencies, receiving circuits, and, finally, aerials and wave-propagation, with a description of the principles of beam aerials. These first 308 pages, although mainly concerned with principles, are thoroughly practical in their treatment.

The authors have courageously upset all the little " rules " regarding current flow. They have adopted the electron drift as the direction of flow of a current, instead of the conventional and opposite direction. This is consistent throughout the book, and while logical and helpful to the beginner, it is a little uncomfortable for the more experienced reader to find all his " left-hand rules " becoming " right-hand " rules.

A little inexactitude of phraseology occurs here and there, mostly justified in avoiding confusion in the reader's mind, but the advantage of describing a growing and decaying magnetic field as a " moving " field is difficult to see.

The authors, like many others, in describing the basic Heising modulation principle adopt the " constant-current " explanation. This explanation, in my opinion, is illogical. The careful reader immediately reasons : " If the current through the choke is to be assumed constant, how can the plate potential variation be explained ? " It is my experience that it is more satisfactory, and *easier* to explain this system on the basis of that small but very vital variation which takes place in the current during modulation. The " constant-current " idea has been with us for a long time. Why ?

The remaining nine chapters deal with " practice." There is an exceptionally interesting chapter on " Studio Acoustics and Apparatus," containing a great deal of information not usually accessible to the general reader. The same is true of the chapter on " Control-room Equipment and Operation," dealing with such things as mixing, equalising, programme control, etc.

Broadcast transmitters and communication transmitters are treated in separate chapters, and many detailed but simplified diagrams are given of modern commercial apparatus.

General purpose, marine, aircraft and police receivers are described very completely, and include ultra-short wave receivers.

The remaining chapters cover " Radio Aids to Navigation," " Rectifier Units," " Dynamo-electric Machinery and Meters," and " Storage Batteries." There are two appendices, one giving many tables of valve characteristics and connections (American valves), and the other giving codes and abbreviations.

Though this book is in the high-price class, it is rather more than just a radio text-book ; it should be considered as a " course " in radio communication work, and I consider the book very good value, of very definite usefulness to amateurs, and to be recommended very highly.

T. P. A.

Low-Power Modulation

The following simple and inexpensive system of modulation, which does not appear to be generally known, is in use on a transmitter utilising a 59 as a screen-grid C.O. (*i.e.*, the suppressor and screening grids are commoned, with about 120v.+ on them, with 275v. on the plate). The speech amplifier and modulator consists of an HL210, transformer coupled to an *Osram* L1'2, which is choke-fed into the " screen-grid " of the C.O. It has been found necessary to very slightly detune the C.O. tank, and all reports obtained indicate very deep modulation and very good quality, modulation reports varying from 70 to 100 per cent. When using the 59 as a tri-tet, modulation is, if anything, too deep, although no radiating tests have been made on that circuit from this station.

G2QY.

Real DX on 3.5 Mc.

For the first time to our knowledge, it has been possible to work Australian stations from England on 3.5, 7, 14 and 28 mc. within a period of 24 hours.

During the 3.5 mc. contest G6RB and G5KG were in contact with VK4EI, whilst the former also worked VK2LZ. During the same week-end VK3EG heard G6NJ and G6RV. In regard to the work done by Mr. Slack (G5KG), we must place on record that he used an input of only 10 watts. His signals were reported QSA 3/4 R4 T9. G5KG was again QSO VK4EI at 19.30 G.M.T., Monday, November 25.

Folkestone Radio Amateurs

We have been informed by Mr. Chapman, G2IC, that the call sign G2FA has been assigned to the above club, whose headquarters are at The Valiant Sailor, Folkestone. The station has been licensed for work on all bands, and QSL's can be sent either *via* R.S.G.B., or to Mr. G. E. Jones, G6XB, 71, Sandgate Road, Folkestone.

G2XG

Mr. J. Davie, 75, Beresford Road, Chingford, E.4, asks us to mention that he is now the holder of the call sign G2XG. Some confusion has arisen because the previous holder's name and address still appear in the Radio Amateur Call Book, although the call was cancelled nearly three years ago.

3.5 Mc. Tests

Mr. I. Miller, VK3EG, our representative in Australia, informs us that he will be working on 3500 kc. exactly during our DX tests this month. He considers the best periods for VK-G contacts are between 17.00 and 20.00 G.M.T. During the November 3.5 mc. contest, G6NJ and 6RV were heard by VK3EG.

Philatelists

Mr. M. Williams, G6PP, 7, Woodberry Down, Finsbury Park, London, Hon. Secretary of the R.S.G.B. Philatelic Section, asks us to mention that the new season exchange booklets are now in circulation. Those who are interested in philately are invited to join this section, which now has nearly two dozen members.

SOLILOQUIES FROM THE SHACK.

By Uncle Tom.

(In which the R.S.G.B.'s one and only performing flea continues to hop around in search of trouble).

GOOD mornings, dear, *dear* o.b.'s. As you extract another piece of toast from the rack, and dribble the marmalade over the centre of this page, breathe a sigh for your pore old Uncle. Month after month he has to do this. If it isn't funny, he's accused of being out of form. If it *is* (which doesn't happen very often, except unintentionally) someone writes and points out that the Bulletin is meant to be a journal for serious experimenters.

Serious experimenters, eh? 'Ark at *'er!* Still, we'll leave it at that, seeing that it's a painful subject.

Fan-mail this month provides me with enough copy to fill this page without the exertion of cerebral energy. Listen unto this: "Dear Uncle Tom, As searchers after truth (among other things), we thought you would be interested to hear that we have, after months of extensive and costly research, made a tremendous discovery—A Foolproof Method of Secret Communication. . . ."

Here you are in one—what the amateur has been looking for for years. And what *is* this epoch-making discovery? Let me quote again: "Use the 56-mc. band—Nature's Own Hush-Hush Frequency. The only report we have ever had was from a BCL who lost his Church Service on a crystal-set. The only thing we ever *Heard* was Side-Tone. Etc,. etc."

There you are, brother hams. I commend it to the notice of those who have "returned to their winter holes on 7 and 14 mc."

Another one. "Dear Uncle Tom: Heard last night—two hams on the 'top band' (foul expression), discussing the Guinness Brewery in Dublin, and woefully comparing the Irish 4d. per pint with the English 9d. This sort of thing doesn't do ham radio much good. What d'you think?" Sorry, but I just can't say what I think, o.m.; but if you'd care to make an appointment in person, in a nice quiet place, I'll tell you. And I'll even forgive your commercial receiver for giving me the call-signs of these two "hams."

"Little Willie," the inventor of the Spruce aerial, suggests, amongst many other things not printable, that O.B. means "old basket." Other bright spots in his letter include the tale of a man who still measures his modulation on a milliammeter. 20 milliamps kick means full modulation. And there is the tale of a well-known member of Council who . . . (No, I won't.)

A little nephew from Ireland accuses me of making him crawl under the sofa *twice*—once when I was rude about people who said that this was the first page they turned to, and again when I said that no one lamented my absence from the August Bull. He had written me half a letter on the latter subject, but didn't post it. Now it's arrived, with explanations.

Incidentally, as a rival to the Old School Tie idea he wants a pair of R.S.G.B. braces. Can anyone oblige with a design and samples? His present ones are hors-de-combat (French) as a result of prolonged laughter.

One of my Intrepid Bird-Men nephews from Cranwell wants me to spout again on the subject of increasing inter-G-station working. He suggests that the ideal arrangement would be a Headquarters Station working at certain times on 3.5 mc. Also he backs up my suggestion that each district should keep it's N.F.D. "A" transmitter intact and use it as a "District Headquarters" station. This station could take on the job of providing slow Morse practice for each district, as well as being used by the D.R. for keeping things together.

Good scheme, that, even if it sounds a little American. Why shouldn't we take it up? It's not contravening licence conditions in any way, so far as I can see.

Now a less pleasant letter—in fact, a man-sized grouse. This one comes from abroad, and the writer is bewailing the absolute lack of co-operation in any shape or form. He has circularised the "gang"; he has offered to get out British short-wave components for them; he has compiled "Conditions Charts" with the assistance (for the *first* time) of two out of fifteen active men—and *hey* didn't turn up the second time.

We've had all that sort of thing at home, but I did think it was being cured by live D.R.'s at last. I wonder! But I hope the particular gang to whom this applies will recognise themselves and think deeply as a result thereof.

Oh, here's a good one for you. "Spitch," of course, is now a household word, accepted throughout the realm of the B.E.R.U. (Play the game, you cads.) But I have often wanted a suitable term for describing the so-called music put out by the spitch-friends who buy a portable gramophone and stick the mike inside it. Now it's supplied, fresh from Cornwall (but, alas, without the cream. Cornish readers please note.) Here it is, in all its simplicity and beauty—Moositch! Could that be improved upon? No.

Other items on this month's agenda include a mental note that I must deliver a few well-chosen words to those awful 'phone-merchants who, after a diet of talkies and B.B.C. English, well shaken up in a bowl and swallowed whole, try to imitate the Americans in their contacts.

What's wrong with "G6 Blank Blank over," or "signing off"? Why all this "Over and By," "Come in, Please" (don't knock, Clarence), and "Coming back," and "What say, old timer?" I never heard such a lot of childishness as goes on among some of the 7 mc. and 3.5 mc. 'phone-hounds.

But, wonder of wonders, when one progresses a step further and adds to the whole bunch an acquired synthetic American accent, why then, surely one is "jest plumb cuckoo"? Or is one? I dunno.

What I do know is that I would rather hear some honest-to-goodness bad grammar with a Cockney twang about it than some of these super-slick, quasi-wise-cracking pseudo-Americans. To all the latter I say, with deep feeling, "Gertcha"!

VALVE REVIEWS.

OSRAM X41 and X31

THE Osram X41 and X31 valves are triode hexodes specially designed for use as a mixer, first detector or frequency changer in a super-heterodyne receiver. The operation is similar to that of a heptode, but is capable of providing efficient frequency changing at high frequencies, as in short-wave receivers. The valves are fitted with a 7-pin base, a push-on type top cap, and the bulb is metallised in the case of the X31 and plain for the X41.

The samples submitted for test were an X31 which has a 13-volt heater suitable for use in A.C.-D.C. receivers, car or portable receivers (run from a 12-volt car battery), and an X41, which has a 4-volt heater for normal A.C. receivers. Both the valves have almost identical performance.

The triode hexode valve comprises a triode and a hexode mounted on a common cathode, but each having its own electron stream. The hexode comprises in order, a cathode, a control grid No. 1, a screen No. 2, an oscillator grid No. 3, a screen No. 4, and the anode. The two screens Nos. 2 and 4 are strapped together, and the oscillator grid. No. 3 is connected to the triode grid internally. The control grid No. 1 has vari-mu characteristics so that A.V.C. can be applied.

Characteristics.	*Makers.*		*Measured Sample.*	
	X31	X41	X31	X41
Heater volts	13.0	4.0	12.5	4.0
Heater current (amps.)	0.3	1.2	0.3	1.20
Anode volts (max.) ...	250		—	
Screen volts (max.) ...	80		—	
Oscillator volts (max.)	150		—	
Control grid volts ...	—1.5		—	
Oscillator grid volts (peak)	12		—	—
Conversion conductance ma./v.	550		not measured.	
Conversion impedance megohms	2		—	2.2
Total cathode current ...	5.4		not measured.	
Triode amplification factor	—		14.0*	15*
Triode mutual conductance	1.8‡		1.05*	1.45*
Hexode mutual conductance, No. 1 grid ...	—		2.5	2.6†
Auto bias resistance, ohms.	200		200	200

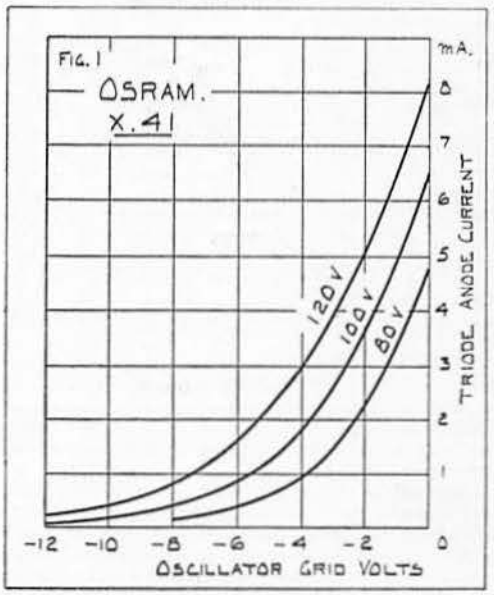
* Measured at 120 volts —3 volts grid.
† Measured at 250 volts, 80 volts screen —1.5 grid.
‡ Measured at 100 volts and 0 volts grid.

Fig. 1 shows the anode current grid voltage curves for the triode, and Fig. 2 shows the anode current of the hexode plotted against the oscillator grid voltage. A curve was taken of the hexode, using the control grid, and this was found to have the usual type of vari-mu characteristic, cut-off being at about —35 volts. Both valves had similar characteristics.

As the valves are suitable for use on short waves, the inter-electrode capacities were measured, and the figures for the X31 are as below :—

Control grid (input capacity) ...	...	7.0 μμF
Anode hexode (output capacity)	...	21.0 ,,
Oscillator grid—anode	...	3.5 ,,
Oscillator grid—cathode	...	16.0 ,,
Oscillator grid—control grid	...	0.2 ,,
Control grid—anode hexode	...	0.05 ,,
Oscillator anode—earth	...	9.0 ,,

The valves were checked for general operation in two receivers having slightly different circuit conditions with the following results :—

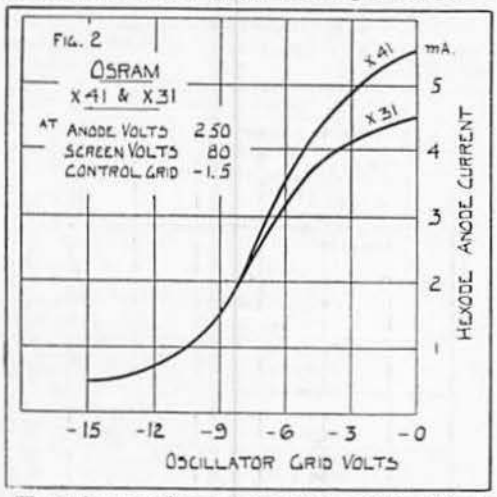


The X41 in No. 1 receiver gave a conversion gain of +2 db on a pentagrid and +3db on an octode, and in No. 2 receiver gave a gain of +5 db on a pentagrid and +4 db on an octode. The X31 gave a conversion gain generally slightly less than that of the X41, but the figures in both receivers were of a similar order.

The triode hexode valve has a number of advantages over a heptode, amongst them being the almost complete absence of interaction between triode and hexode sections, higher triode mutual conductance and higher conversion gain due to its higher impedance. The fact that the triode mutual conductance is higher means that satisfactory oscillation can be obtained above 20 mc/s., and in fact these valves can be used with success on 56 mc/s.

The makers advise that the oscillator circuit be so arranged that the anode coil of the triode is tuned, the reaction winding being in the grid, this is of course the opposite of the method used for heptodes. Also the triode anode H.T. supply should be obtained by dropping the voltage *via* a 50-100,000 ohm. resistance from the 250 volt supply rather than use a potential divider. This is in order to keep the oscillator peak voltage more constant. Using a grid leak of 50,000 ohms., the grid current should be about 0.2 m.a., thus giving a peak

voltage of about 10-12 volts (1.2× grid current bias). The screen voltage should preferably be obtained from the usual potential divider, and be about 70-80 volts. The coils for the oscillator need not be large, about 1 in. to 1¼ ins. tube being suitable; for the broadcast band there should be about three times the turns in the plate than in the grid circuit, and fairly closely coupled, and for the 20 mc/s band the turns in each coil should be nearly alike, and on the same former Hartley fashion, and the turns preferably spaced about ½ diameter.



The valves can be recommended as " the thing to use " in a modern short-wave superhet or for 56 mc. work and television.

Note.—It is regretted that in the 1935 Guide the circuit of the triode hexode is shown with the oscillator grid circuit tuned instead of the anode. This, although satisfactory, can be improved by tuning the anode circuit, and should be done where possible. Unfortunately, the information on this point was not available at the time the Guide was being produced. D. N. C.

DX Forecasts (No. 1.)

DECEMBER 15—JANUARY 15.

G.M.T.	14 mc.	7 mc.	3.5 mc.
0400		W1 : VE : PY	W.VE
0600			W.VE
0700		ZL	W.VE
0900	ZL ; PY		
1000	VK ; ZL ; CX		
1100	VK ; ZL		
1200	VK		
1300	VK ; ZD		
1500	ZT		
1600	ZT	KA1 ; ZL	
1700		VK ; ZL ; PK1	
1800		VK ; ZL	
1900		VK ; ZL ; FB8	

Stray.

G2KB informs us that he has returned to England from the States, and hopes to be on the air again within the next few weeks.

Town Representatives, 1936

Up to the time of going to press nominations had been received on behalf of the following members :—

DISTRICT 1.
- Liverpool, Mr. H. D. Bramwell, G2RF.
- Southport, Mr. W. Johnson, G2IN.

DISTRICT 2.
- Sheffield, Mr. A. Pemberton, G2JY.

DISTRICT 4.
- Derby, Mr. R. H. Streete, G2SD.
- Kettering, Mr. R. J. Pankhurst, G5YF.
- Leicester, Mr. W. M. Vendy, G6VD.
- Mansfield, Mr. G. W. Slack, G5KG.
- Nottingham, Mr. J. Lees, G2IO.
- Peterborough, Mr. W. Carter, G2NJ.

DISTRICT 5.
- Bristol, Mr. A. E. Brookes, G6VK.
- Gloucester, Mr. L. O. Rogers, G2HX.
- Oxford, Mr. H. J. Long, G5LO.

DISTRICT 6.
- Taunton, Dr. A. Iles, BRS190.

DISTRICT 7.
- Guildford, Mr. W. B. Gilhespy, G6GS.
- Portsmouth, Mr. L. E. Newnham, G6NZ.
- Reading. Mr. A. E. Lambourne, G5AO.
- Weybridge, Mr. R. J. Denny, G6NK.

DISTRICT 10.
- Cardiff, Mr. H. H. Phillips, BRS1949.
- Swansea, To be elected.

DISTRICT 14.
- Southend, Mr. Max Buckwell, G5UK. (Deputy, Mr. C. J. Greenaway, G2LC.)

DISTRICT 15.
- Hayes, Mr. E. Le Cheminant, 2BCN.

DISTRICT 16.
- Gillingham, Chatham and Rochester. Mr. S. A. Howell, G5FN.

DISTRICT 17.
- Boston, Mr. G. Hutson, G6GH.
- Cranwell, Mr. W. E. Dunn, G2LR.

Messrs. Dell, G2UL, and Phillips, G5PH, have been nominated for the post of Swansea T.R. Members living in this town, or within a radius of 10 miles, are requested to record a vote on the ballot form which appears in this issue, on behalf of one of these nominees.

Ten Metre Notes

Apropos the editorial comments in the last issue of the BULLETIN, Miss B. M. Dunn, G6YL, reports that since May she has been transmitting on a frequency of 29296 kcs. Using an input of 9 watts, Miss Dunn has worked SU, LU, ZB, OE, ON, OK, F, FA, HB, I, D, YM, and G, whilst South Africa has been worked with 10 watts.

Stray

Mr. P. Seymour, BERS25, wishes to thank those who wrote regarding a reception contest. He hopes that the 30 odd members who promised their support will not fail him during the tests which have been arranged to take place in January.

RESEARCH AND EXPERIMENTAL SECTION

MANAGER :

H. C. Page (G6PA), Plumford Farm, Ospringe, near Faversham, Kent.

ASSISTANT MANAGER :

J. C. Elmer (G2GD), "Aethelmar," Seabrook Road, Hythe, Kent.

GROUP MANAGERS :

No. 1 : 1.7 and 3.5 MC. WORK

No. 2 : 56 MC. WORK
J. N. Walker (G5JU), 4, Frenchay Road, Downend, Bristol, and A. J. Forsyth (G6FO), "Westview," Appledore, near Bideford, North Devon.

No. 3 : ARTIFICIAL AERIALS
L. E. H. Scholefield (G5SO), 2, Balmoral Road, St. Anne's-on-Sea, Lancs.

No. 4 : ATMOSPHERE AND PROPAGATION
J. C. Elmer (G2GD), "Aethelmar," Seabrook Road, Hythe, Kent.

No. 6 : CONTEMPORARY LITERATURE
Dr. R. A. Fereday (G6FY), 16, The Vineyard, Richmond, Surrey.

No. 7 : RECEIVER DESIGN
R. W. Newton (G5NQ), 94, Parkhill Road, Hampstead, N.W.3.

No. 8 : TRANSMITTER DESIGN
G. McLean Wilford (G2WD), 33, Bibury Road, Hall Green Birmingham.

No. 9 : AERIAL DESIGN
F. Charman (G6CJ), Orchard Cottage, Stoke Poges, Bucks.

No. 10 : VALVE RESEARCH
D. N. Corfield (G5CD), 10, Holders Hill Gardens, Hendon, N.W.4

No. 11 : 28 MC. WORK
W. A. Clark (G5FV), "Lynton," Hull Road, Keyingham, Hull, Yorks.

No. 12 : AUXILIARY EQUIPMENT
A. O. Milne (G2MI), "Southcot," Larkfield, Kent.

NO doubt most members of R.E.S. are wondering just what was the purpose of the circular and questionnaire which they were recently asked to complete. R.E.S. has grown to such an extent that we have been compelled to consider ways and means of making its organisation more effective. Prior to the issue of the questionnaire there were over four hundred names on our books, a number at least double that which our old Contact Bureau had to deal with, and in consequence it became necessary to make some adjustments.

We take this opportunity of thanking those members who have been good enough to fill in the forms sent them. We have not, as yet, had time to analyse them fully, but a hasty survey has shown that they will prove of very great value, and help to us in our efforts to make the wheels of R.E.S. run smoothly.

At the present time about 150 people have replied to the questionnaire, and the last date of possible reply is well past. However, in case there may still be one or two who have overlooked the matter, and would still like to retain their membership of R.E.S., we will accept their forms if they reach us by December 20. After that date all members who have failed to reply will be struck off our registers, and, should they wish to rejoin must complete the usual application form.

56mc

Acting in accordance with our previously expressed intentions, we present another article on 56 mc. Transmitter Design, this time from the pen of a well-known 56 mc. worker, to wit, G2IC, of Folkestone. Mr. Chapman requires little introduction, and therefore we would commend to members' careful consideration the design he has developed. Whilst we do not consider that this is as satisfactory as crystal control, we feel it is a step in the right direction, and one which those who do not wish to go to the expense of crystal control might do well to follow.

Aerials

We are also able to publish this month an article on the subject of Aerial Design prepared by G6CJ, our Aerial Design Manager. The study of aerials is one of importance to both transmitting and receiving amateur alike, and Mr. Charman's article deals with an aspect of the question which should prove of use to everyone, no matter what frequency they may be interested in.

* * *

This issue brings to a close our work for 1935, and we should like to take this opportunity of wishing all members success and happiness in the coming year. In particular, we desire to thank those who have helped with the organisation and work of the Sections, and especially G5HF, G2GB and BRS1739, who have acted in the capacity of secretaries to the R.E.S. Manager during the past year.

G6PA.
G2GD.

Reflectors and Directors

By F. Charman (G6CJ).

SOME experiments recently carried out with a reflector system have shown that a considerable improvement in long-distance performance can be obtained fairly cheaply. Consider for a moment a horizontal half-wave aerial. This normally radiates in a broad direction at right-angles to the wire with an angle to the horizon which is determined by its height. When the height is half-wave the angle to the horizon is not adequately low for good long-distance work, but when the height is one wavelength it is excellent, being of the order of 15°. Now very few of us are fortunate enough to be able to place the wire a wavelength high, even on 14 mc., and on 7 mc. even half-wave is difficult. The lack of height can be overcome to a certain extent by the use of a full-wave aerial, which, being more directive of itself, is not affected so much by the ground; in this case half a wave high is fairly good, but the wave now goes off, not at right-angles to the wire, but roughly at 45° directions.

Now suppose that behind our horizontal dipole we can place a wire which is in resonance. At a quarter-wave spacing it will be seen, allowing a

phase reversal for reflection, that the wave reflected back toward the dipole will be in phase with the next radiated cycle and will add in this direction; also in the opposite direction the two waves, the direct and the re-radiated, will be in opposition and tend to cancel. The system has become more directive and will, in addition to sending twice as much energy one way, also give lower angle propagation.

The extra signal strength to be expected from doubled power is only 1.4, and is hardly perceptible, but the lower angle will allow of a long journey with less reflections between earth and F layer, and this will result in a reduction of attenuation which may be worth a hundredfold increase in power, and probably also a reduction in fading.

The experimental reflector was first tried on 14 mc. Theory showed that as there was a reactive coupling as well as resistive, the reflector might have to be longer than the usual 33 ft., and 35 ft. was found to give best results. The radiation resistance of the radiator was increased somewhat by its presence, which means bringing the feeder tap or taps nearer the centre. The system was first faced west. Results were frankly astonishing. Signals in W6 rose from one to two points, and instead of getting through occasionally, stations were worked every time, and G6CJ became one of the best European signals over there. In Australia in the mornings signals went up two points and lasted out longer than any others. Reports of this type were received when enquiries were made about how signals compared with other Europeans: "Well, OM, the others all faded out half an hour ago; you surprised me!"

This was very encouraging, and the next thing was to make it easy to reverse direction. This was done by shortening the free wire to 31 ft. This has the effect of trying to advance the phase of the re-radiated wave and so "leading" the wave that way. Results were as before. An additional advantage of the system was that the local signals around the countryside dropped, the energy usually wasted in this was was being sent in its proper direction.

Tests were made "turning over," *i.e.*, altering the length, and the general result was a drop of about four points, signals becoming thin and unsteady. The same result was noted on reception. DX signals in the right direction came up; those from the opposite way became tiny and fluctuating. On medium distances of 2,000 to 3,000 miles no appreciable change was noted, as there was sufficient high angle radiation off the back to get through, though it was suspected that it was a little harder to contact U.S.A. in a reverse direction.

So far, so good. 7 mc. was not so easy. For a start, the greatest spacing that could be used was 16 ft., with the result that the coupling between the two wires was great and the free wire was still directing when it was 68 ft. long. Changes in the length produced such vast changes in the impedance of the radiator that it was no longer possible to "turn over" by altering the length, as the feeders were violently wrong one way or the other. So the change-over had to be physical and the feeders had to be arranged to allow for this. The radiation resistance of the radiator went right down low, and thus results were different in different parts of the band. The final system had a 66-ft. wire acting as a director. Results with this were satisfactory, though it was necessary to remain within about 50 kc. of the right part of the band. In New Zealand signals normally got through under good conditions. With the director they were up two points and break-in work became possible.

Finally, the two aerials were used in the recent VK/ZL contest with extremely successful results.

The 14 mc. version has been tried at a second station. This station previously had never reached out further than about 2,000 miles, and WAC/WBE seemed infinitely remote. The result of using a reflector/director was a KA contact, and WAC/WBE became a weekly occurrence. Signals shorter than 2,000 miles vanished.

Practical Details.

Turning to the practical side, the systems have so far been supported from one pair of poles by using 16-ft. spreaders. It is necessary to find the correct suspension point to allow for the weight of the feeders on one side, and the corners can be held back by cords to give stability. One and a quarter inch square pine will hold up a pair of 33-ft. wires, but it should be suspended from the middle as well as the ends in a sort of triangle. If full height is desired, 2 ins. × 1 in. may be used without the end triangle, but a rather stout halyard is necessary. Thirty-five feet spreaders have been tried and found unpractical.

A word of warning must be given regarding field strength measurements made with directive systems. In the horizontal system field strength measurements made locally mean practically nothing. The reflections from the ground at angles widely different from the direct ray completely spoil any attempts to find the directive properties of the system. If it is desired to carry out tests of this nature to determine the correct adjustment of the free wire, then the whole system must be made vertical and free from local reflecting objects. For convenience the design may be carried out on a scale model on 28 or 56 mc., but the wire diameter should also be scaled down.

It should also be pointed out that when a full-wave aerial is used it will be necessary to stagger the free wire so as to emphasise one of the 45° lobes which this type of system radiates. The other lobes will be reduced and the system would be similar to that described by the R.C.A. Engineers in *Proc. I.R.E.*, 1932.

The writer wishes to register thanks to his fellow-experimenter, 2ASP, for his enthusiastic assistance in connection with this experimental work.

Crystal Frequencies

The crystal frequencies published below may prove useful to London and Home Counties members desirous of calibrating frequency meters.

In each case the station heard has been checked on several transmissions by one or more members of the Band Monitoring Group:

*G6WY	14096	*G6NJ	14328
G2IM	14288	*G6CL	14370
*G6NF	14300	G5GQ	14388

Stations marked with an asterisk are known to use crystals at the other end of the band on occasions.

C.W. COMMUNICATION ON 56 MC.

By G. A. Chapman (G2IC).

IN common with most serious experimenters on the higher frequencies, the writer has always been of the opinion that no useful research work can be carried out on these wavebands until the super-regenerative receiver has been completely abandoned.

Practical experience has shown that, when dealing with ultra short waves, it is best to have no theories because most of them are probably wrong! Many people have long held that there is no reflected wave on 56 mc., which means that there probably is, and the time has come when we should cease "round-town" QSO's and get down to some serious work.

G5LB has already given us an excellent lead with crystal control, and some may think that the transmitter about to be described is already out of date, but it was well under way by the time 5LB's news came through and the construction was therefore completed. The work involved has been well repaid by the results obtained, and in addition it can easily be built by most amateurs by adding a little to the gear which they are already using.

Circuit and Construction.

The circuit is a push-pull long-lines oscillator with a push-pull amplifier loose-coupled to it. See Fig. 1.

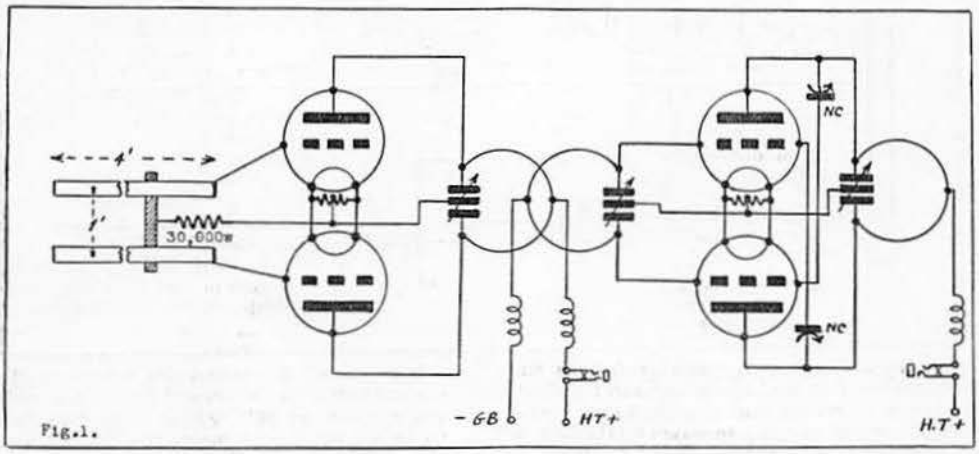


Fig.1.

It is only within the last month or so that we have had final proof that, given suitable atmospheric conditions, the 28 mc. band is as good as any for DX work, and the noise level on this frequency is much lower than on the 7 and 14 mc. bands, giving the signals a better QSA value.

Many strong DX signals have been heard on 28 mc., but very few of them would have cut a quench as used on the average 56 mc. super-regenerative receiver, which means that we should have not made these 28 mc. records if it had not been possible to use C.W. and standard regenerative recievers. The super-regenerative receiver in service at G2ICf or the past two years has a separate quenching valve, with a 50,000-ohm variable resistance across the grid coil of that valve so that it is possible to cut out the quenching oscillator and use the receiver as a straight regenerative detector with one stage of low frequency amplification. One has only to cut out the quench to find that the carrier wave emitted by the average self-excited transmitter sounds pretty rough. Admittedly the receiver itself is not very stable, but it is possible to check the quality of one's own carrier by listening to the overtone on the ordinary station receiver tuned to 7 or 14 mc.

This brings us down to the fact that the first thing to do is to produce a transmitter capable of putting out a stable signal, and the second is to make a receiver capable of receiving that signal.

The whole outfit is built baseboard fashion on a plank of ½-in. wood 3 ft. long, 6 in. wide, and is supported on two 2 in. × 1 in. battens, these being about a foot long to prevent the whole from falling over when the "organ pipes" are mounted.

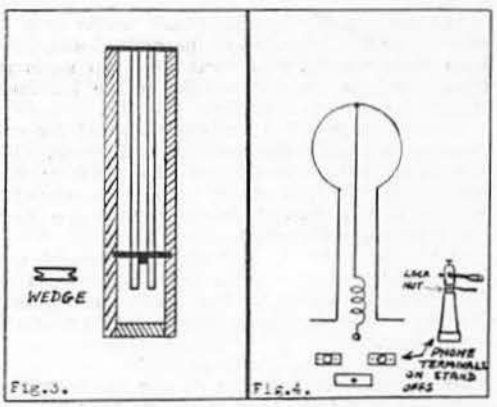


Fig.3. Fig.4.

In mounting the long lines, every effort has been made to ensure that they shall be free from vibration. They are supported in a frame consisting of two pieces of 2 in. × 1 in., four feet two inches long, with an ebonite plate 5 in. × 2 in. at

the top, a block 3 in. × 2 in. × 1 in. at the bottom and another piece of ebonite 3½ in. × 2 in., sliding into two slots 4½ in. up. It is necessary to have clearance holes in the bottom plate, and to prevent rattle a tightly-fitting wedge is pushed up under the bottom plate between the two rods which are of ⅜-in. copper tube. (Fig. 3.)

The method adopted for mounting the grid coil of the amplifier stage is as follows.

Three small stand-off insulators are used, two of which are placed side by side, and two telephone-type terminals are mounted at the top with the

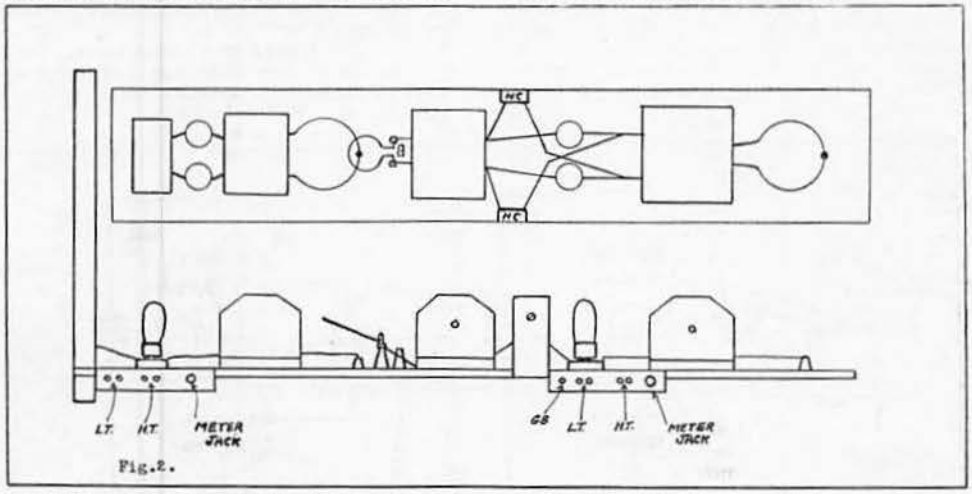


Fig.2.

holes sideways. The ends of the single-turn coil are bent as shown in the sketch, and the terminals form a hinge to enable the coupling to be varied over 90 degrees or more. The other stand-off is mounted behind the other two to form a triangle, and the centre tap lead from the coil is connected to this point. (Fig. 4.)

A spiral is wound in the lead to form a spring, the tension of which keeps the lead taught and prevents vibration, which would occur if it were slack.

The centres of the single-turn anode coils are soldered to lugs mounted on 1-in. stand-offs, which keep them steady, and the centre tap wires run from the lugs through a hole in the baseboard straight to the meter jack *via* a choke.

A separate terminal strip is provided for each stage and on this is mounted the meter jack. This method of construction keeps all leads very short and permits the trial of any type of four-pin valve in the two stages. "Humdingers" are fitted across all valve filaments.

The split stator tuning condensers used were *Radiophone* and the neutralising condensers are *J.B.* midgets double spaced, with the spindles slotted to allow them to be adjusted with a wooden screwdriver.

Adjustment.

To commence, the grids of the oscillators are clipped to the bottom ends of the rods and the shorting clip placed about a third of the way up from the lower end. Two LP2's are used as oscillators.

The batteries are then connected up and the plate coil tuned to resonance, the position of the shorting clip being adjusted until the circuit resonates at the required frequency.

The grid coil of the amplifier stage, which is kept at an angle of about 70 degrees from the plate coil of the oscillator, is then tuned to resonance as indicated by a rise in plate current in the oscillator stage and the amplifier is then neutralised by adjusting the plate condenser and watching the milliammeter in the oscillator plate circuit.

The amplifier valves used for battery tests were *Radio Record* P2's, and with 150 volts on the plate the grid bias was about 45 volts.

For the initial tests, which were carried out in conjunction with G6XB and 2AZM, the aerial used was a half-wave 96½ in. long, tapped on about half an inch from the centre of the PA coil and slung across the room in a convenient spot.

It was found, by listening on the receiver in the room, that coupling between the two stages and between the PA and the aerial had to be kept very

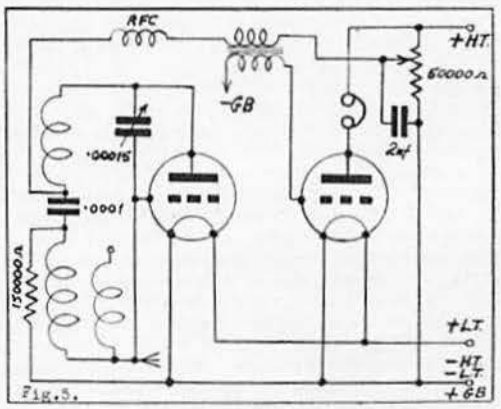


Fig.3.

loose as there was a tendency for the transmitter to put out several carriers. The coupling of the grid coil was in practice kept at an angle of about 110 degrees.

Results.

The 28 mc. overtone was listened to on the

(*Continued on page* 250.)

NEWS AND VIEWS FROM 53.

IMPORTANT NOTICE

1.7 MC. CONTEST.

In order to assist members who are unable to operate their stations during Saturday afternoons, it has been decided to change the hours of the 1.7 mc. contest. The event will, therefore, commence at 23.00 G.M.T., Saturday, January 11, and continue until 12.00 G.M.T., Sunday, January 12, recommencing at 15.00 G.M.T., and concluding at 20.00 G.M.T. the same day.

Receiving Contest

Council have decided to organise a reception contest in conjunction with the 1.7 mc. Transmitting Contest. It is hoped that those who intimated to Mr. P. Seymour that they would support such an event, if arranged, will keep their promises.

Rules for 1.7 *MC. Receiving Contest.*

1. The contest will commence at 23.00 G.M.T,. Saturday, January 11, and will continue until 12.00 G.M.T., January 12, recommencing again at 15.00 G.M.T., and concluding at 20.00 G.M.T. that day. (This gives an operating period of 18 hours.)

2. The Contest is open to all fully paid-up non-transmitting members resident in the British Isles on the above dates.

3. One point will be scored for each complete QSO recorded.

4. The call signs of the two stations heard in contact, together with the report each gives to the other (QRK, QSA and Tone) must be entered on the log sheet.

5. No points will be scored for Test or CQ calls heard or for incompletely recorded contacts.

6. Entries will only be accepted on official log sheets, which can be obtained free of charge from Headquarters prior to the commencement of the contest. Entry forms must be returned within 14 days of the conclusion of the contest.

7. Only one person will be permitted to operate a station during the contest.

8. Leading stations will be awarded a certificate of merit. If sufficient entries are received, Council may award a challenge trophy to the winner.

9. Council have the right to alter or amend the rules at any time prior to the commencement of the Contest, and their decision will be final in all cases of dispute.

Second International 28 Mc. Contest

Acting on suggestions received from members, Council have decided to organise a second International 28 mc. Contest. This event will commence on Janaary 1, 1936, and will conclude on December 31, 1936. The contest will be open to licensed radio amateurs in all parts of the world, and the person scoring the highest number of points in accordance with the rules will be awarded a special trophy. Certificates of merit will be awarded to the first ten stations in the final list.

Contest Rules.

1. The contest is open to all licensed radio amateurs.

2. The contest will commence at 00.01 G.M.T., January 1, 1936, and will conclude at 24.00 G.M.T., December 31, 1936.

3. Licensed power must not be exceeded.

4. Contacts may be established at any hour and on any day during the contest period.

5. One point will be scored for each completed 100 miles of contact with a specific station (*e.g.*, contact with a station 99 miles away scores no points, contact with a station 658 miles away scores 6 points). All distances will be measured by great circle line between stations.

6. In computing his or her final score, a competitor may claim points for each different station worked once during each calendar month.

7. Proof of contact in writing may be required by the R.S.G.B. Tests and Awards Committee.

8. The decision of the President of the R.S.G.B., will be final in all cases of dispute.

9. Entries must reach the Secretary, R.S.G.B., 53, Victoria Street, London, S.W.1, not later than February 28, 1937.

28 Mc. Awards

Council have much pleasure in announcing that the following awards have been made to members in connection with recent work on the 28 mc. band.

Powditch Transmitting Trophy.—Awarded to Miss Nelly Corry (G2YL), in recognition of the fact that she scored the highest number of points amongst the British Isles stations who entered for the First 28 mc. International Contest.

Certificates of Merit.—To Mr. E. J. Laker (G6LK) and Mr. W. E. C. Bischoff (VK2LZ), in recognition of the first two-way contact between Great Britain and Australia on 28 mc.

To Mr. Roy Belstead (VK4EI) and Msr. J. Mahieu (ON4AU), in recognition of the first two-way contact between Australia and Europe.

W.B.E. Certificates.—Council have also decided to award a specially endorsed W.B.E. certificate to those members who establish contact on 28 mc. with British Empire Stations in the five continents of the world. The rules governing the issuance of these certificates will be the same as those in operation for claims on other frequencies.

Cairo Committee

In preparation for the International Tele-Communication Convention which is to be held in Cairo during 1938, Council have appointed a small committee to study all amateur radio matters which are likely to be discussed at that meeting. The Cairo Committee will work in the closest possible manner with the I.A.R.U., and the Cairo Committees appointed by other national societies.

The names of those serving on the R.S.G.B. Cairo Committee are : Mr. Arthur E. Watts, G.6UN (President), Mr. V. M. Desmond, G5VM (Representative West Midlands District), Mr. J. D. Chisholm, G2CX (QSL Manager), and Mr. J. Clarricoats, G6CL (Secretary).

The Committee have power to co-opt other members if considered desirable.

56 MC. Tests from Southport

Mr. W. Johnson, G2IN, informs us that the Southport group intend to carry out a further series of 56 mc. tests, with a view to establishing long distance contacts.

The tests will commence at 09.00 G.M.T. Sunday, January 26, and will continue until 16.00 G.M.T. The call G2INP will be used, and it is hoped that as many members as possible will endeavour to listen for transmissions from this station. The co-operation of European and North American stations is especially solicited. Amateurs willing to arrange schedules are asked to communicate with G2IN at 6, Denmark Road, Southport, Lancashire.

New D.R. for North Wales

We have pleasure in announcing that Mr. David Mitchell (G2II), " The Flagstaff," Colwyn Bay, has been appointed Representative for District 11, North Wales, in succession to Mr. Vaughan Williams (G6IW), who has been compelled to resign for business reasons. Our thanks are extended to Mr. Williams for his past help.

The New A.R.R.L. Handbook

We have been advised by the A.R.R.L. that the new edition of their popular handbook has been increased in size to nearly 500 pages. The whole of the earlier editorial matter has been revised, and five new chapters have been added.

Due to the increase in size, freightage and postage charges have increased, as the handbook now weighs nearly two pounds. This has resulted in the Overseas selling price being increased to $1.15, which, with increased postal charges from headquarters, means that our price has to be raised from 4*s.* 6*d.* *to* 5*s.* *in the case of members*, and from 5*s.* *to* 5*s.* 6*d.* *in the case of non-members*. Both prices will be reduced by 6d. if copies are purchased direct from headquarters.

We hope to review a copy of this new edition at an early date.

B.E.R.U. Junior Contest.

Members possessing 10-watt permits who wish to be recommended for the use of 25 watts during the B.E.R.U. contests in February, are requested to make application to the Secretary not later than January 11, 1936.

No application can be considered after the above date.

BOOKS RECEIVED

University Tutorial Press, Ltd., High Street, New Oxford Street, have sent us a copy of the third edition of " Wireless, its Principles and Practice," by R. W. Hutchinson, M.Sc. This popular textbook has been enlarged since the second edition was reviewed, and in particular the sections dealing with Television and Telecinematography. Written in simple language, the book assumes no previous knowledge of electrical matters, and the reader is led by easy stages right through from elementary theory to multi-valve receivers and the essentials to television.

The new edition contains 309 pages and 224 illustrations. The publishers' price is 3s. 6d.

TRADE NOTICE.

Messrs. Sidney S. Bird & Sons, manufacturers of Cyldon condensers, have notified us that their new address is Cyldon Factory, Cambridge Arterial Road, Enfield, Middlesex. Telephone: Enfield 2071-2.

QSL Section.

By J. D. Chisholm (G2CX).

As was to be expected, the announcement of the Society's policy with regard to report cards, given in our last notes, has resulted in a considerable number of queries, and it is with the object of clarifying the position that these paragraphs are written.

There seems to be some apprehension amongst B.R.S. members that the section will no longer accept cards from European transmitters addressed to them. This is not the case, and the new restrictions will only apply to cards sent for distribution to European stations by our B.R.S. membership. The corollary of this is, of course, that transmitters anywhere can continue to reply to Listeners' Reports *via* the QSL Section. Fears that transmitters will be less likely to reply if this has to be done by post are therefore groundless.

Another point that seems to require emphasis is that the ban applies only to cards from listeners addressed to *stations situated in Europe*.

Calibration Section.

By A. D. Gay, (G6NF.)

Standard Frequency Transmissions.

It appears that there is very little value in the monthly Standard Frequency transmissions on 3,525, 3,625 and 3,725 kcs. This may be due to the fact that those amateurs who like to maintain an accurate frequency meter possess 100 kc. bars. We are, therefore, wondering whether a transmission on 3,600 kc. once a month would be of greater service to our members.

The Standard Frequency transmissions each Tuesday and Friday from WWV are regularly received over here and the writer has observed that they come through at a good R7 on most occasions. These transmissions are of the utmost value in checking 100 kc. apparatus, and in view of their frequent occurrence our own transmissions may be considered redundant.

If any of our members would like a transmission each month on 3,600 kc. from G6NF perhaps they will send him a P.C. In order to maintain a high degree of accuracy, please remember that these transmissions require the expenditure of an appreciable amount of both time and money, and unless reports are regularly received they will not be continued.

In the United States thousands of reports are sent to WIXP and W9XAN, and we should have been content with only 20 to indicate that our service was being utilised, but to operate it month after month without any sign of interest on the part of our members must result in the service being withdrawn.

Calibration Service.

The particulars of the R.S.G.B. crystal and frequency meter calibration service are published in " A Guide to Amateur Radio." If you wish to avoid delay in returning your crystal, please post it to the proper address and adhere to the instructions, which are clearly printed in this publication, particularly regarding the postage.

Whenever possible, crystals are always returned the same day as received, but if these instructions are not followed unavoidable delay may take place.

R.S.G.B. Slow Morse Practices

A list containing dates, times and frequencies of the stations sending slow Morse for the benefit of those members wishing to learn or improve their code will be found below. As usual, test matter will be taken from recent issues of the T. & R. BULLETIN. The page number and month of issue will be given at the end of each test—by telephony. It is emphasised that reports will be appreciated and are desired in order to ascertain range of transmission and numbers utilising the service. If, however, replies are desired, stamps should be sent. Sending stations are complaining that reports received are few and far between; will those members utilising the service therefore report periodically, in order to encourage those who are giving up valuable time for their benefit? Stations willing to assist, particularly from those districts without a service, are invited to communicate with Mr. T. A. St. Johnston (G6UT), 28, Douglas Road, Chingford, E.4. Telephone: Silverthorn 2285. No tests have been arranged on January 11-12, the dates reserved for the 1.7 mc. transmitting contest.

SCHEDULE OF SLOW MORSE TRANSMISSIONS.

Date, 1935.			G.M.T.	Kcs.		Station.
Dec.	21	Saturday	22.45	1930	...	G5OD
,,	22	Sunday	09.00	1860	...	G6QM
,,	22	,,	09.30	1785	...	G5BK
,,	22	,,	11.00	7104	...	G6PJ
,,	22	,,	12.00	7149	...	G5GC
,,	28	Saturday	22.45	1930	...	G5OD
,,	29	Sunday	09.00	1860	...	G6QM
,,	29	,,	09.30	1785	...	G5BK
,,	29	,,	11.00	7104	...	G6PJ
,,	29	,,	12.00	7149	...	G5GC
1936.						
Jan.	2	Thursday	23.00	1990	...	G6AU
,,	4	Saturday	22.45	1930	...	G5OD
,,	5	Sunday	09.00	1860	...	G6QM
,,	5	,,	09.30	1785	...	G5BK
,,	5	,,	11.00	7104	...	G6PJ
,,	5	,,	12.00	7149	...	G5GC
,,	9	Thursday	23.00	1990	...	G6AU
,,	16	,,	23.00	1990	...	G6AU
,,	18	Saturday	22.45	1930	...	G5OD
,,	19	Sunday	09.00	1860	...	G6QM
,,	19	,,	09.30	1785	...	G5BK
,,	19	,,	11.00	7104	...	G6PJ
,,	19	,,	12.00	7149	...	G5GC

QRA Section.

Manager: M. WILLIAMS (G6PP).

NEW QRA's.

G2BL.—P. B. BURNETT, 60, Friern Barnet Lane, London, N.11.
G2DR and G5QR.—S. R. WRIGHT, 24, Collingham Gardens, London, S.W.5.
G2FA.—FOLKESTONE RADIO AMATEURS Hon. Secretary, G. E. Jones (G6XB), 71, Sandgate Road, Folkestone, Kent.
G2GN.—E. D. GRIESS, 37, Parker's Road, Sheffield, Yorks.
G2IH.—I. LE D. HUGHES, 164A, Church Road, Hove, 3, Sussex.
G2LC.—C. J. GREENAWAY, 24, Percy Road, Leigh-on-Sea, Essex.
G2NS.—N. P. SPOONER, 17, Swanmore Road, Boscombe, Bournemouth, Hants.
G2SB.—J. BAKER, c/o Border, 16, Spencer Street, Carlisle, Cumberland.
G2TR.—J. SCHOLEFIELD, 82, Grove Park, Denmark Hill, London, S.E.5.
G2VA.—E. J. A. VAUGHAN, "Egbert," Speeks Lane, Wigmore, Kent.
G2WP.—P. L. WATERS, 31, Mayfield Road, Whalley Range, Manchester, 16, Lancs.
G2XG.—J. M. DAVIE, 75, Beresford Road, Chingford, London, E.4.
G5AY.—A. YOUNG, 8, Alston Avenue, Walker Estate, Newcastle-on-Tyne.
G5CH.—C. HAMPSON, 54, Granville Road, Higher Crumpsall, Manchester.
G5CJ.—A. L. SHERRIFF, Kittyghyll, Lake Road, Kendal, Westmorland.
G5FO.—W. S. HERDEN, Officers' Mess, R.A.F., Cranwell, Lincs.
G5HB.—H. BILTCLIFFE, "Ashbourne Villas," Springstone Avenue, Ossett, Yorks.
G5JX.—S. E. JAMES, "Alleyn," Oakdale Road, Carlton, Notts.
G5MA.—N. H. R. MUNDAY, "Crystaldene," Broadhurst," Ashtead, Surrey.
G5OT.—G. W. OTTAWAY, 29, Festing Grove, Southsea, Hants.
G5PV.—E. W. DEAN, 3, Swinshaw Hall, Love Clough, Rossendale, Lancs.
G5PW.—H. WRIGHT, 6, Crawshaw Fields, Pudsey, Leeds, Yorks.
G5RF.—C. H. RANFT, 59, Beresford Road, Cheam, Surrey.
G5SS.—A. W. L. SUMMERS, 871, Coventry Road, Small Heath, Birmingham.
G5UH.—R. E. GRIFFIN, c/o Mrs. Honeyfield, 239, Bishopsworth Road, Bristol, 3.
G5VX.—A. C. WILLIAMS, 16, James Street, Port Talbot, Glam.
G6BD.—D. G. BAGG, Fresh Woods, Tonbridge, Kent.
G6BP.—G. F. BUDDEN, 82, Kenton Road, Northwick Park, Harrow, Middlesex.
G6CW.—J. J. CURNOW, St. Ann's, Bramcote Lane, Wollaton, Notts.
G6FI.—F. G. INGLETON, 26, Cherry Tree Avenue, Staines, Mddx.
G6FY.—DR. R. A. FEREDAY, 16, The Vineyard, Richmond, Surrey.
G6NW.—J. G. NEWELL, "Fairlight," Oakwood Avenue, Eastwood, Southend-on-Sea, Essex.
G6OF.—M. SHAW, 84, Vaughan Gardens, Ilford, Essex.
G6PR.—J. PAINE, 38, Alpha Street, Slough, Bucks.
G6RD.—J. E. HOOPER, 27, Castle Road, Dagenham, Essex.
G6XI.—J. WILSON, 36, Woodburn Terrace, Morningside, Edinburgh, 10.
2AAF.—C. W. FARRELL, The Holt, Queen's Road, Knaphill, Woking, Surrey.
2AJW.—A. J. WEBB, 12, Mervyn Road, Bishopston, Bristol, 7.
2AJZ.—A. J. BEAUMONT, Church Street, Willingham, Cambs.
2ANA.—F. F. BOWLING, Market Place, Stainforth, Doncaster, Yorks.
2ANS.—P. G. SPENCE, 11, Nightingale Road, Bushey, Herts.
2ARL.—J. RICHARDSON, "Chichelea," Clay Lane, Newport Pagnell, Bucks.
2ASN.—R. C. STONE, c/o 13, Queen Street, Bath, Somerset.
2AWI.—S. WHITEHOUSE, 105, Lake Street, Lower Gornal, near Dudley, Worcs.
2AZU.—T. L. PETERSON, jun., 3, Belle Vue Crescent, South Shields.
2BCU.—W. E. BARTHOLOMEW, 102, Sidney Road, Watford, Herts.
2BHI.—S. HEMMINGS, 4, Red Hill Road, Lower Gornal, near Dudley, Worcs.
2BHM.—H. S. MCLINTOCK, 30, Lingard Street, Barnsley, Yorks.
2BHR.—G. W. HAYWARD, Meadowlands, Alsford Road, Purbrook, Portsmouth, Hants.
2BJN.—R. JENNINGS, End House, Westmeads Road, Whitstable, Kent.
2BQP.—F. N. BEDWELL, 199, Bath Road, Cheltenham, Glos.
2BQX.—R. E. FRIEND, 74, Putney Road, Enfield Wash, Mddx.
2BVG.—H. B. GELL, "Clovelly," Melton Road, Tollerton, Notts.
2BVT.—A. F. LARKMAN, 9, Shirley Road, London, S.E.5.
2BVZ.—H. H. LUGG, 67, Bustleholme Lane, West Bromwich, Staffs.

The following are cancelled:—2ASP, 2AUB, 2BDI, 2BHK, 2BMA, 2BVO, 2BWP.

NEW MEMBERS.

HOME CORPORATES.

W. T. SMITH (G2TA), "Elmwood," Uckfield, Sussex.
J. COOPER (G6CP), 53, Ramsey Street, Scarborough, Yorks.
C. V. WOOD (G6NN), 48, Westfield Road, Barnehurst, Kent.
P. G. DAY (G6PD), 170, Oundle Road, Peterborough, Northants.
V. C. SLIGHT (G6SX), 7, Talbot Street, Southport, Lancs.
N. T. J. BEVAN (2ADA), Lyndon Lodge, Golden Manor, Hanwell, W.7.
J. E. HOLDING (2AHG), "Hacienda," Abbey Road, West Kirby, Ches.
W. H. WENTWORTH (2AMW), 41, Tonsley Place, Wandsworth, S.W.18.
L. E. HARRIS (2AYH), 36, Stevenage Road, Hitchin, Herts.
W. V. CHAMPION (2AXB), 63, Station Crescent, Tottenham, N.17.
T. C. ISAAC (2BUI), 58, Hambledon Avenue, Bierley, Bradford, Yorks.
A. E. ROBERTS (BRS2006), Fairlawn, Nottingham Road, Stapleford, Nottingham.
J. H. CLOW (BRS2007), "Hawthorne," Bailliestoun, Glasgow, Scotland.
R. P. SCASE (BRS2008), Wills Hall, Stoke Bishop, Bristol, 9.
W. TAYLOR (BRS2009), 41, Poole Street, Avonmouth, Bristol.

G. I. Vokes (BRS2100), 11, Blessington Road, Lee, London, S.E.13.
D. Blackwood (BRS2101), 5, Bellesleyhill Road, Ayr, Scotland.
F. Cropper (BRS2102), "Garth," King's Road, Ashton-under-Lyne, Lancs.
N. E. Baker (BRS2103), 112, Gloucester Road, Cheltenham, Glos.
L. R. Brinton (BRS2104), 55, Hill Street, Totterdown, Bristol.
R. L. Rawles (BRS2105), Blackwater Corner, Newport, Isle of Wight.
M. G. Gould (BRS2106), "The Hut," 13, St. John's Road, Golders Green, N.W.11.
A. E. Huddlestone (BRS2107), Tannery Cottage, Ambleside, Westmorland.
W. H. Greenhalgh (BRS2108), 13, St. James Terrace, Winchester.
C. A. Harley (BRS2109), 85, Fisherton Street, Salisbury.
M. H. Haywood (BRS2110), "Glenville," Town Street, Leeds, 12.
A. G. Chambers (BRS2111), 94, Tennyson Road, Stoke, Coventry, Warwickshire.
K. C. North (BRS2112), "Midhill," Eastbank Road, Sheffield.
F. S. Nichols (BRS2113), High Carley Villas, Pennington, near Ulverston, Lancs.
C. H. Reed (BRS2114), 22, Ambra Vale East, Clifton Wood, Bristol, 8.
E. Foden (BRS2115), 384, Collyhurst Road, Queen's Park, Manchester, 9.
P. H. Openshaw (BRS2116), Brook Villas, Alsager, Cheshire.
K. G. Frazer (BRS2117), "Arkendale," Felbridge, East Grinstead, Sussex.
A. F. Jones (BRS2118), 15, Berkeley Mews, Portman Square, London, W.1.
A. Graham (BRS2119), Dudley and Staffordshire Technical College, Electrical Department, The Broadway, Dudley, Worcs.
J. H. Land (BRS2120), 24, High Street, Stotfield, Arlesey, Beds.
A. L. Browning (BRS2121), No. 4, Cell Barnes Cottages, Tyttenhanger Lane, Cell Barnes, near St. Albans, Herts.
V. W. Jose (BRS2122), 2, Vernon Avenue, Rugby.
A. S. Tripp (BRS2123), 1, Broxstowe Drive, Mansfield, Notts.
F. G. Whinfrey (BRS2124), 5, Revill Lane, Woodhouse, Sheffield, Yorks.
J. Sharpe (BRS2125), Police Station, Muirkirk, Ayrshire, Scotland.
J. Fane (BRS2126), Lawrence House, Imperial Service College, Windsor, Berks.
T. E. Wilson (BRS2127), Rosegarth, Mythop Road, Lytham St. Anne's, Lancs.
R. J. Newport (BRS2128), 22, Kewstoke Road, Stoke Bishop, Bristol, 9.
L. R. Blair (BRS2129), 192, Ribbleton Avenue, Preston, Lancs.
A. G. Cole (BRS2130), 56, St. Saviour's Road, St. Helier, Jersey, Channel Islands.
Lieut. E. C. Bayldon, R.N. (BRS2131), Gillotts House, Henley-on-Thames, Oxon.
A. R. Moate (BRS2132), "Chandos," 37, Welbeck Road, Doncaster, Yorks.
H. Crosland (BRS2133), Lydgate View, Newmill, near Huddersfield.
V. T. Dickins (BRS2134), 15, Latymer Court, Hammersmith, W.6.
J. Armstrong (BRS2135), 12, Park Terrace, Willington, Co. Durham.
T. F. McMillan (BRS2136), 50, Victoria Street, Gorebridge, Midlothian.
W. R. Clark (BRS2137), Glencairn, Peterculter, Aberdeenshire.
W. N. Craig (BRS2138), The Manse, Fortrose, Ross-shire, Scotland.
W. Joyce (BRS2139), 23, Royal Crescent, Glasgow, C.3, Scotland.
J. Van Puyenbroek (BRS2140), "Sparks" Radio, 26, King Street, Southport, Lancs.
A. E. Cock (BRS2141), 82, Married Quarters, R.A.F., Cranwell, Lincs.
R. C. Nye (BRS2142), 3, Jessamine Villas, Rosedale Footpath, Hayes, Middlesex.
I. B. Clark (BRS2143), 6, West Cliff, Whitstable, Kent.
P. Sugden (BRS2144), "Holmfield," Ravenoak Road, Cheadle Hulme, Cheshire.
Ross Jackson (BRS2145), 12A, Blackburn Street, Radcliffe, near Manchester.
M. G. Glenster (BRS2146), 42, Irene Road, Parsons Green, Fulham, S.W.6.

DOMINION AND FOREIGN.

J. Fleurbaey (ON4ZA), Lazarystr, 40, Hasselt, Belgium.
J. C. Batchler (VK7JB), 21, Quarry Street, North Hobart, Tasmania.
C. Ferns (ZC6CN), W/T Section, R.A.F. Station, Ramleh, Palestine.
F. C. Clark (ZE1JS), P.O. Box 700, Bulawayo, Southern Rhodesia.
A. E. Tidmarsh (BERS322), Army Wireless Station, Nicosia, Cyprus.
A. R. Kuys (BERS323), 12, Oatlands Road, Grahamstown, Cape Province, South Africa.

Trade Reviews.

We have recently received for review a range of components manufactured by *British Television Supplies, Ltd.*, 8-10, Charing Cross Road, W.C.2. Although a comparatively new firm to the short-wave market, their products are finding favour amongst constructors, due to the fact that they are well designed and reasonably priced.

A unique method of winding has been employed in the construction of their H.F. chokes. Using a hollow megacite former, the winding consists of a narrow pancake wound coil, followed by a single layer winding ⅜ ins. long and a second pancake winding. This construction is designed to reduce self-capacity, besides improving the electrical characteristics. The choke reviewed, a type 103, will carry 100 m.a., and is effective down to at least 28 mc.

Megacite is also used in the construction of B.T.S. valve holders. The makers claim very high insulation properties for this material, which appears to be suited to moulding operations. Silver-plated brass pins are used in the construction of the holders, and these are held securely in position by a spinning operation on the under side of the megacite top plate. Connections are made through a hole drilled in to the lower part of the pin, the wire being held in position by means of a knurled headed 6 B.A. screw. The 4-pin type is listed at 1s., the 5-pin at 1s. 3d., the 7-pin at 2s., and the 9-pin at 2s. 3d.

Both of these components should appeal to members who are looking for cheap but well-made components.

Activity in Brighton

We are informed by Mr. J. Dickson (G2HV) that a meeting of Brighton and District members will be held at 7 p.m., January 10, 1936, at Hove College, Kingsway, Hove. It is hoped at this meeting to appoint a Town Representative, who will organise activities in Brighton and neighbouring towns.

Members in the above area are cordially invited to attend.

A SILENT KEY

We have learned with deep regret that Colonel Clair Foster (W6HM) passed away on October 2, after a short illness. Colonel Foster was a member of the R.S.G.B., and in a recent letter to Headquarters, reminded us that he was a British subject, born in Canada.

His passing will be mourned throughout the world of amateur radio, particularly in the U.S.A., and in those parts of the British Empire which he had visited.

His station, W6HM, was one of the best known along the West Coast of America, and it is interesting to recall that he was one of the first amateurs to qualify for the W.A.C. award. His championship of the U.S.A. amateur radio cause brought him into much prominence in recent years.

We understand that a recommendation has been made to the Federal Radio Commission, asking that his call shall never be reallotted, a gesture befitting the passing of a splendid amateur.

'No battery can equal this for value!'

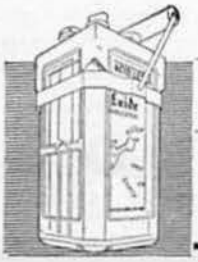
RED TRIANGLE 120 Volts **7'6**

Drydex BATTERIES

FOR WIRELESS

Other Drydex Batteries:

DRYDEX 'SUPER-LIFE,' 120 Volts, 10/6 • DRYDEX 'TEXET,' 120 Volts, 6/-



For wireless LT get the EXIDE 'INDICATOR' BATTERY. It tells you in time the time to recharge.

From Exide Service Stations and all reputable dealers.
Exide Service Stations give service on *every* make of battery.
EXIDE BATTERIES, Exide Works, Clifton Junction, near Manchester.

CLIX "MASTER" WANDER PLUGS

Clix are the only "Master" plugs which are non-collapsible and make perfect and permanent contact with any battery socket. No amount of vibration will move Clix plugs. Change over to Clix now and forget faulty contacts.

Clix "Master" Plugs for H.T. and G.B. are supplied in Red and Black engraved or 8 assorted colours. 1½D. each

How many points?

9D. COMPLETE

With the festive season coming along and the moving of radio sets from one room or position to another, the lack of power points is quickly overcome by using a "Clix" Plug Adaptor. In addition to giving you an extra Wall Plug you have a perfect contact fitting for plugging into any lamp socket.

The performance of many excellent sets is often ruined at the source of electric supply by badly fitting plugs. The pins of the Clix Plug portion give perfect contact with all types of supply sockets. These **"Clix" Plug Adaptors** are also very handy for use with domestic electrical apparatus.

From most Dealers, or Post Free for 1/- Postal Order.

We wish all Members of the R.S.G.B., A Merry Xmas and A Happy New Year.

CLIX

LECTRO LINX LIMITED

79a, Rochester Row, London, S.W.1

"RADIO"

THE GREATEST HAM MAGAZINE EVER PUBLISHED

AN AMALGAMATION OF

R/9 & RADIO

the . . . Greatest Technical Staff in the History of Amateur Radio

Featuring :—

JOHN N. A. HAWKINS W6AAR

Formerly Associate Editor of, and major contributor to, "RADIO"; co-author of the "Radio Handbook"; former vacuum tube and broadcast design engineer.

ROBERT S. KRUSE WIFG

Broadcast design engineer; Technical Editor of QST for 6 years; author of the "Radiophone Guide"; for the past year, Technical Editor of "R/9."

Also :—

RALPH O. GORDON W6CLH

Inventor of Class B modulation; former sound engineer for one of the major Hollywood studios; widely known as a consulting engineer and as an authority on ultra-shortwave apparatus design.

W. W. SMITH W6BCX

Crystallographer; writer on crystals and exciters for the "Radio Handbook"; former major contributor to "Radio"; for the past year, Managing Editor of "R/9."

CHAS. D. PERRINE, Jr. W6CUH

Well-known design engineer of high efficiency, high power transmitters, and of de luxe superheterodyne receivers.

BIGGER & BETTER "RADIO"

Improved technically—new and enlarged departments—profusely illustrated, better drawings and photographs—100 or more pages per issue—4 colour work; enamel, coated paper—dx and calls heard section—56 and 28 mc. dope—everything the others have and much that they haven't—world "DX Zone" map—only usable table for dx contacts, revised monthly.

No axes to grind; no manufacturers to favour; just to help you hear the other fellow and him to hear you as loudly and cheaply as possible, which is the real problem of radio communication.

REVISED RATES :

ONE YEAR - 13/6 POST PAID

TWO YEARS - 20/- POST PAID

Sole Representative in United Kingdom—

N. E. READ (G6US)

WILLOW ST., OSWESTRY, SHROPSHIRE, ENGLAND.

NOTES and NEWS from the BRITISH ISLES

DISTRICT REPRESENTATIVES.

DISTRICT 1 (North-Western).
(Cumberland, Westmorland, Cheshire, Lancashire.)
MR. J. NODEN (G6TW), Fern Villa, Coppice Road, Willaston, near Nantwich, Cheshire.

DISTRICT 2 (North-Eastern).
Yorkshire (West Riding, and part of North Riding), Durham and Northumberland (Middlesbrough is in this district.)
MR. L. W. PARRY (G6PY), 13, Huddersfield Road, Barnsley, Yorks.

DISTRICT 3 (West Midlands).
(Warwick, Worcester, Staffordshire, Shropshire.)
MR. V. M. DESMOND (G5VM), 199, Russell Road, Moseley, Birmingham.

DISTRICT 4 (East Midlands).
(Derby, Leicester, Northants, Notts.)
Mr. J. J. CURNOW (G6CW), "St. Anns," Bramcote Lane, Wollaton, Notts.

DISTRICT 5 (Western).
(Hereford, Oxford, Wiltshire, Gloucester.)
Mr. R. A. BARTLETT (G6RB), 31, King's Drive, Bishopston, Bristol Glos.

DISTRICT 6 (South-Western).
(Cornwall, Devon, Dorset, Somerset.)
MR. W. B. SYDENHAM (G5SY), "Sherrington," Cleveland Road, Torquay.

DISTRICT 7 (Southern).
(Berkshire, Hampshire, Surrey.)
Mr. E. A. DEDMAN (G2NH), 75, Woodlands Avenue, Coombe, New Malden, Surrey.

DISTRICT 8 (Home Counties).
(Beds., Bucks., Cambs., Herts. and Hunts.)
Mr. G. FEATHERBY (G5FI), 30 Lindsey Road, Bishops Stortford, Herts.

DISTRICT 9 (East Anglia).
(Norfolk and Suffolk.)
MR. H. W. SADLER (G2XS), Redways, Wootton Road, Gaywood, King's Lynn, Norfolk.

DISTRICT 10 (South Wales and Monmouth).
Capt. G. C. PRICE (G2OP), The Mount, Pembroke Dock.

DISTRICT 11 (North Wales).
(Anglesey, Carnarvon, Denbighshire, Flintshire, Merioneth, Montgomery, Radnorshire.)
MR. D. S. MITCHELL (C2H), "The Flagstaff," Colwyn Bay Denbighshire.

DISTRICT 12 (London North).
Mr. S. BUCKINGHAM (G5QF), 9, Brunswick Park Road, New Southgate, N.11.

DISTRICT 13 (London South).
MR. J. B. KERSHAW (G2WV), 13, Montpelier Row, Blackheath S.E.3.

DISTRICT 14 (Eastern)
(East London and Essex.)
MR. T. A. ST. JOHNSTON (G6UT), 28, Douglas Road, Chingford, E.4.

DISTRICT 15 (London West and Middlesex).
MR. H. V. WILKINS (G6WN), 81, Studland Road, Hanwell W.7.

DISTRICT 16 (South Eastern).
(Kent and Sussex)
MR. A. O. MILNE (G2MI), "Southcot," Larkfield, Kent.

DISTRICT 17 (Mid East).
(Lincolnshire and Rutland.)
REV. L. C. HODGE (G6LH), The Bungalow, Skirbeck Road, Boston, Lincs.

DISTRICT 18 (East Yorkshire).
(East Riding and part of North Riding.)
MR. T. WOODCOCK (G6OO), "Conakry," Cardigan Road, Bridlington.

SCOTLAND.
MR. JAMES HUNTER (G6ZV), Records Office, 51, Camphill Avenue Langside, Glasgow.

NORTHERN IRELAND.
MR. W. GRAHAM (GI5GV), 5 Ratcliffe Street, Donegal Pass, Belfast.

NEW MEMBERS ARE CORDIALLY INVITED TO WRITE TO THEIR LOCAL DISTRICT REPRESENTATIVE.

DISTRICT 1 (North-Western).

THE D.R. wishes all members the very best of luck and prosperity in the New Year and a very happy Christmas to wind up 1935. He is still active on the 7 mc. band, but has been bitten by the 28 mc. bug and is looking forward to interesting developments on that band.

Manchester Section.

A record attendance of 47 was recorded at the November Manchester meeting, which was a practical 56 mc. demonstration night.

A great variety of gear brought along by the members was on show, and in some cases in actual operation, including four tranceivers, three mobile transmitters, one push-pull master oscillator—push-pull PA—and a number of receivers of different design. Two-way working was effected between cars and the room without any difficulty, and as five receivers were in operation in the room at once, this enabled everyone to find an interest in the proceedings. Thanks are due to G2WP, 2WQ, 6UQ, 5US, 6SN, 2OI, 2AXH, 5YD, 2DH, 6TL, and others who did not leave their names, for bringing gear along and helping to make the night a success.

G2IN kindly forwards the following reports: 6YR is now fully active on 1.7, 7 and 14 mc. and only requires VK for WAC. 6SX busy on 7 daily. 5OP and 6ZR confine their activities to 1.7, and can be heard every Sunday morning on 'phone. 2IN is active on all bands fone and CW, using an all-metal chassis CO, BA, PA and is also using new 7 mc. aerial 300 ft. long with twisted feeders, and finds it a great improvement. All other Southport stations are active. 2QN reports active on 7 and is having considerable trouble with BCL's (try putting a 25-turn choke wound on a 1-in. former in the BCL's aerial lead, OM, also in the earth if one does not cure it). 5AD is now fully licensed (Congrats., OM!) and would welcome reports on his 7 mc. transmissions. 5ZN is active on 7 and 14 and finds conditions good on both bands for W. BRS1975 is working with him. 5YD busy on supers, 1.7 and 56 mc. 2WQ designing new 56 mc. as above. 6UQ also on 56. 5US on 56 transceivers. 6SN working 28 mc. 6GV rebuilding. 2WP 14 and 7 mc. 5CH, 5PX, 5XF, 6PL, 2OI on 1.7, 2BK on 7 and 1.7 mc. 2AXH on supers with spots of DX, 2DF on 7 mc., 6QA and 6AX both on various bands. BRS1332, ex

SU1MM, hoping to settle down and take out full G ticket. We pass our congratulations to 2BUB and YF on being now the proud possessors of a junior op. 5XC and 2RB trying to form a short-wave club in their district. BRS 1934 on 7 and 14. 6KS testing QRP on 7 and 14 mc. BRS1463 standing by on same bands. 5FC busy with RNWR. BRS1766 hopes to apply for AA, 2BZX QRT due to mains installation, 5XJ rebuilding, 5FA left for VQ3 on November 28—(Best of luck, OM; look out for the Manchester stations!). 2BPJ on 56 mc. 2BHK is now G5PV and requires reports on his 7 mc. sigs. And here's another—2BHF is now G5TR—also requires reports from 7 mc. BRS2046 reports active, 6GX on 1.7 mc. also still making crystals. 5WR beginning to take interest again, 5OZ on 14 mc.

To those who attended the above meeting and did not get a chance to have a chat with the C.R., G2OI extends a hearty welcome and hopes to see them regularly in the future. Members have a larger room at their disposal should they attain such a fine attendance as the last meeting. 2OI also wishes all members a very happy Christmas and a Prosperous New Year.

Liverpool Section.

The November Meeting in Liverpool was held at the new club room in Mason Street, and an attendance of 22 was recorded. The question of town representation mentioned in the November issue was fully discussed, and all members agreed that such a scheme was desirable.

Morse practices have been arranged to take place once every fortnight at 38, Mason Street, and members who wish to take advantage of these practices are asked to get into touch with G2DC at that address. G2RF emphasised the need for local members to assist G2MI in his commercial check work.

The meeting was then given over to a very interesting talk by G2DC on the subject of 56 mc. work, some practical demonstrations being both seen and heard by the members, and after the usual discussion the meeting concluded with a vote of thanks to G2DC.

Local activities are as follows: 6KY is on 7 mc. and getting good results with C.O., using 5 watts. BRS2081 experimenting with length and direction of aerials, 2DC using Doublet RX aerials and PP amplifiers with 56 mc. portable equipment, 6DP has new aerial and is experimenting with different types of aerial coupling, using Pen. F.D. on 14 mc. 2ASO is still waiting for G.P.O. to send him full licence, busy with tri-tet using 46. BRS1901 rebuilding, BRS1900 building untuned RF. SG.DET—Pentode RX, and checking commercial stations close to the amateur bands. G2RF completing new transmitter on rack and panel style.

It is understood that the C.R. (G6CX) does not desire to include his name amongst those willing to act as town representative at the end of the year, as he has very little time at his disposal to keep in touch with the members owing to the fact that he is now living away from the centre of the district and his time is also very much occupied with private business matters. He feels that there are other members more active and in closer touch with the individual members who would be more suitable to represent the Society. He is, however, quite prepared to continue to act as District Scribe. (Very many thanks. G6CL).

DISTRICT 2 (North-Eastern)

The North Yorks and Durham members are active. Individual reports are as follows: GTZ6 trying fone on 14 mc. and G6CV similarly engaged on 7 mc. G5XT has dismantled and is rebuilding in an attempt to get WAC on fone. G2FO is using remote control and a Collins coupler, and hopes to be on 1.75 mc. soon. 2BQO hopes to have a full ticket soon. G6MF is active on 7 mc. fone on Sunday mornings. A request is made to BRS men to send in a short report to the Town Representative for inclusion in the District Notes.

A report of his call being pirated comes from G6AY.

A visit was made to the Newcastle Area meeting last month by G6XT, and G2FO, where they were very welcome, and a return visit is to be paid to Middlesbrough by some of the members.

Contact with South Shields has been made on 56 mc. by G5QY using a beam aerial and only 2 watts input.

WEST MIDLANDS CONVENTIONETTE

SUNDAY, JANUARY 19, 1936

at

" Hope and Anchor " Hotel, Edmund St., BIRMINGHAM

Assemble - -	12.15 p.m.
Lunch - - -	1.15 p.m.
Business Meeting -	2.30 p.m.
Tea - - -	4 p.m.

Followed by station visits.

Luncheon 3/6. Tea 1/6.

Reservations to Mr. V. M. Desmond, G5VM, not later than January 15.

The stations most active include G6IR, 5QY, 6AY, 5WZ, 6PB, 2XT, 2BGG, and 5AY.

The last meeting of the Bradford Area was held at G5VD at Huddersfield, about nine members being present. The layout of 5VD was greatly admired by all, and is one of the finest stations in the area. The appointments of T.R.'s was amongst the subjects discussed. It was decided to start an area fund to be devoted to National Field Day, etc., instead of adopting the old method of getting together gear or funds which may be required for any event. Most of the usual stations are active, particularly on 1.75 mc. on Sunday morning. BRS1298 includes a report of stations heard on all bands.

The Area Manager for Sheffield has resigned, and in the meantime, members are asked to send reports to 57, Tillotson Road, Sheffield. Best wishes are sent to G2GN, who is newly licensed, and requests reports on his signals.

Station activities are as follows: 5HK is rebuilding and including an HRO receiver in the gear; 5FO testing out QRP TX, 6LF trying new aerials, BRS1944 busy with morse, 2AS working DX on 14 mc., 5LT busy on 28 mcs., 2HQ on 7 and 14 mcs. 2JY hopes to be on 3.5 mcs. soon. Members are asked to support the new manager and any suggestions will be welcomed by him. Notification will be given of future meetings in the area.

DISTRICT 4 (East Midlands).

The District meeting, held at Mansfield on November 24, was attended by 27 members, including some of the Leicester section. An interesting talk was given by G5KG on "Beam Aerials," which was appreciated by all; after tea a most amusing junk sale was held.

FORTHCOMING EVENTS.

Dec. 17.	District 14 (East London section), 8 p.m., at G6AU, 63, Margery Park Road, Forest Gate, E.7.
Dec. 18.*	District 1 (Liverpool section), 8 p.m., at 38, Mason Street, Edge Hill, Liverpool. Talk by P. Jones, G2JT, "Principles of Amateur Radio."
Dec. 18.	District 14 (Essex section), 8 p.m., at G2LC, 24, Percy Road, Leigh-on-Sea.
Dec. 18.	District 15, 7.30 p.m., at 2BAI, 148, Gunnersbury Lane, Acton (out-side Acton Town District station).
Dec. 18.	Scotland "A" District, 7.30 p.m., Room A, Institute of Engineers and Shipbuilders, 39, Elmbank Crescent, Glasgow.
Dec. 19.	District 13, 8 p.m., at Brotherhood Hall, West Norwood.
Dec. 19.	District 6 (Exeter section), 7 p.m.. at G5WY, 95, Fore Street, Exeter.
Dec. 20.	Annual General Meeting at Institution of Electrical Engineers, W.C.2. Lecture by Mr. F. Addey, B.Sc., "British Wireless Services," 6.15 p.m.; tea 5.30 p.m.
Dec. 22.	District 11, 6 p.m., at G5OD, "Rocklyn," Peulwys Road, Old Colwyn.
Dec. 22.	District 4, 7 p.m., at Welbeck Hotel, Mansfield Road, Nottingham. The Annual Christmas Party. Tickets 2s. 6d.
Jan. 1.	South London and District Radio Transmitters' Society, 8 p.m., at Brotherhood Hall, West Norwood.
Jan. 2.	District 6 (Torquay section), 7 p.m., at G5SY, "Sherrington," Cleveland Road, Torquay.
Jan. 5.	District 7, 2.30 p.m., at The Tumbledown Dick Hotel, Farnborough, Hants.
Jan. 8.	District 1 (Manchester section), 8 p.m., at Brookes Café, 1, Hilton Street, Oldham Street, Manchester.
Jan. 16.	District 12, 7.30 p.m., at Wander Inn Café, Church End, Finchley.
Jan. 19.	West Midlands Conventionette, at Hope and Anchor Hotel, Edmund Street, Birmingham.
Jan. 31.	London meeting at I.E.E., 6.15 p.m.; tea 5.30 p.m.

* Sale of disused apparatus at this meeting.

We are pleased to hear that 2BFD and 2ABF now hold full licences under the call signs of G6IM and G2XD respectively.

Congratulations to G5KG on working VK4EI just before the end of the 3.5 mc. contest, using 10 watts, receiving a very good report.

As the next meeting falls very near Christmas, it was decided to hold a dinner at 7 p.m., Sunday, December 22, at the Welbeck Hotel, Nottingham. It is hoped that all members will endeavour to be present and make a success of the District Christmas Party.

Don't forget 7 p.m., December 22.

DISTRICT 5 (Western).

As reported in the last issue, G6QW has resigned his office of D.R., and G6RB has been appointed his successor. The District thank G6QW for the excellent work he has done, whilst at the same time the new D.R. would like to thank all those who have wished him luck. He assures everyone that he will do his best to keep No. 5 on the map.

Activity seems rather less than usual for the time of year, which is surprising in view of the excellent conditions now prevailing on all bands. Despite the wonderful 28 mc. work accomplished elsewhere, apart from one or two isolated instances, there appears to be very little interest taken in this locality. G2HX has, however, accomplished some very fine work, having worked VE2FR and W2JN with 50 watts input.

If anyone in the district is undertaking 28 mc. or any other work of special note, the D.R. would be glad to hear so that credit may be given where it is due.

The usual monthly meeting was held in Bristol on November 5, when about 40 attended. Practically the whole of the meeting was taken up with discussions regarding Field Day, Technical, and Club Room Committees. Several interesting debates have been arranged for forthcoming meetings, and it is hoped members will make a point of supporting them.

G2BI reports activity at Swindon, where a short wave club has been formed, and the letter budget in his area continues with great success, having eight or ten regular contributors.

The new T.R. scheme seems to meet with general approval as regards the Gloucester-Cheltenham, Swindon and Bristol areas.

DISTRICT 6 (South-Western).

We are able to report still further progress in the affairs of the South West. This month comes the news that a group of members in Penzance and Penryn are fixing up collective activities. 2AQB is taking charge and has already started a local letter budget. It has also been arranged to hold monthly meetings, and judging by the many letters of interest the D.R. has received lately from that area, there should be no lack of support. Best of luck, OMs.

The members in Plymouth are also getting a move on, and there should be interesting developments soon from that town. Meetings have been held during the past month in Torquay and Exeter. The Torquay meeting was specially well attended, there being a total of sixteen present. It is also of interest to record that there were representatives from six towns at the meeting. 6WT brought his new American transceiver along, and this proved of

great interest. The Exeter meeting was not so well attended, and it is hoped that the membership around Exeter are not going to let the other towns surpass them.

The meetings at Bideford, under G6FO, are still going strong. The series of 56 mc. tests still continues, and as one outcome of the Torquay meeting, a special test was organised for one memorable Sunday, on which a string of stations down the coast of South Devon were on the air. The stations contributing to this test were G6WT, 2CI, 5GD, 5SY, 2AMO, and BRS1580, 1581, 1821, and 1918. G6WT and 5SY were both using beam aerials, and these seemed particularly effective. Both stations are also active on the 28 mc. band, and some good contacts have been obtained. 5SY has now worked W1, 2, 3, 5, 8, and 9, at strengths between R5 and R8. VE3 has also been worked. News has just arrived that his 28 mc. signals have been heard at R4 in New Zealand by ZL3AJ! In addition to the above, 5SY is rebuilding, and hopes to have a pair of the new 362 RF pentodes going before long. Rebuilding also applies to several other members. 5WY is still working at his RK20 outfit, 5QI has completed his gear on push-pull and is doing well on 7 mc., while 5ZV, of Exmouth, is rebuilding a three-stage C.C. outfit. 6FO has got going on phone on the 1.7 mc. band, and will soon be on 14 and 3.5 mc. regularly. Last, but not least, BRS1717 has been getting married! That explains why we haven't seen much of him lately! Congratulations!

The next Exeter meeting will be on Thursday, December 19, and that at Torquay on Thursday, January 2. Please support these efforts OMs.

DISTRICT 7 (Southern.)

The November meeting, held at G2YB, Caversham, Berks, was well attended. We were pleased to welcome several new members, together with a number of older members who are not able to get to the meetings held in the north and centre of the district.

The recent 28 mc. activity formed the chief subject of conversation. Now for the individual reports.

A massed listening period is to be carried out by all members of the Reading and District section each Wednesday evening from 8 to 8.30 p.m. on the 7 mc. band. Everything heard is to be logged and results compared, the idea being to try and find some logical reason for stations not being heard by certain participants when other members are logging them at good strength. Congratulations to G6GT, ex 2AQU, on obtaining his full licence; he has made a good start by working VK with 9 watts input. G2YB is now WAC, and has been experimenting with aerial matching networks, as has G5HH. G6WO, 5AO, 5RT, 2GG, 5TP and BRS members in the Reading district all report active. Will Berkshire members please note that G5AO is collecting notes for Berkshire, and they should get in touch with him direct?

BRS2049 has been away with the Fleet, but will be listening on 56 mc. between December 22 and January 1.

An interesting letter arrives from G5OT, who is also VP9O and VO4S. He is a Naval man and has been out of England for two and a half years, but is now back again. He has been operating both from Bermuda and Newfoundland. (We hope you will find time to get to one of our monthly meetings, OM, and give us a short talk on your radio experiences abroad.—D.R.)

G5ZK has his station back at Camberley, and has been successful in working ZL on 14 mc.

Mr. Ranft, of Cheam, has his full licence and is on the 7 and 14 mc. bands with 6 watts input. He has already worked W. (Congrats., O.M.!)

The I.O.W. report from G2ZR is largely negative, as G5UI is still away, whilst G5TZ's station is undergoing repairs following the storm damage. G2ZR himself is on daily and is now using a car battery and rotary converter for power supply. He remarks on the variable conditions noticed on the 7 mc. band. G6LK reports hearing ZL on 28 mc., but no contact yet.

The January meeting is at Farnborough.

Season's Greetings to all from the D.R.

DISTRICT 9 (East Anglia).

It is understood that a meeting will be held in Cambridge during January. Members in District 9 who intend to be present are requested to watch the District Calendar for the date.

Only two members have replied to the suggestion regarding Norwich meetings; other views will be appreciated.

News in brief: 2AFZ collecting gear preparatory to applying for full call. 5UD and 6QZ listening on 28 mc., 5IX planning a rack TX, for new shack, 5UF has worked W1 on 28 mc. 2XS busy with speech amplifier and modulation gear, 6FB has an a.c. outfit working at Oakham, and d.c. equipment at King's Lynn.

DISTRICT 10 (South Wales and Monmouth).

During the month successful and well-attended meetings have been held at Swansea, Newport and Neath. We congratulate BRS1855 on his award of the A.M.I.E.T. Diploma. G6JW has been doing a power rebuild, and has been bitten by the 28 mc. bug. 2ARS and 2AWZ hope to have their two letter calls by the time these notes are in print. The following stations report activity: G2JL, 5BI, 6BK, 2XX, 2PA, 2UL, 2OP, 5FI, 6GW.

Blackwood Radio Club are holding their annual Hamfest on Thursday, January 9, at the Central Café, Blackwood. G6BK is the secretary, and all are welcome.

The D.R. wishes everybody all the very best for Christmas and the New Year, during which he hopes that someone in the District will lift one of the Society's trophies to adorn the table at the Provincial meeting. The post of District Scribe is still vacant.

DISTRICT 11 (North Wales).

Your D.R. has to apologise for the fact that no notes have appeared for some months. These will be the writer's swan song, as he is compelled to resign from the position of D.R. for business reasons. He wishes to thank all members for the help received in the past, and hopes that they will continue to do their best for the new D.R.

There will be a meeting at 6 p.m. on December 22 at G5OD, "Rocklyn," Peulwys Road, Old Colwyn, Denbs., when the winter programme will be discussed.

DISTRICT 12 (London North).

All attendance records were broken at the last meeting when 33 members were present to hear Mr. Clark (G6OT) give an interesting talk on low-frequency amplifiers. The sale of gear at this meeting was not a success, and in future the old type of auction will be reverted to.

We offer our felicitations to G5XA, who has taken unto himself a YF. G5DJ has finished his rebuild: W and VK were worked with 9 watts.

Some months ago complaints were received from several members that district notes lacked interest. Will these and all others please note that bricks cannot be made without straw?

The D.R. and his colleagues, G5CD and 2BTZ, extend seasonal greetings to all members, both in and out of No. 12.

DISTRICT 13 (London South)

The Monthly District Meeting held on November 21 was well supported. We were pleased to welcome HB9Y, who is on a visit to London.

The main item of news this month is the visit paid by members of the S.L.D.R.T.S. and their friends to the Droitwich Station of the B.B.C. The party, which consisted of approximately 20, included several ladies, and met at 9.30 a.m. at Paddington on November 17. The train was rather late arriving at Birmingham, but the journey having been enlivened by the usual "Ham" discussions, no one seemed to mind, and good time was made by the motor coach which conveyed the party to Wychbold. The venue here was the Crown Hotel, where lunch was waiting and where the numbers were increased by a further seven or eight arrivals from London, who had travelled by car, and by G6CW and family. After lunch the party proceeded to the Droitwich Station, where the tour of inspection commenced with the massive 1,000 h.p. Diesel engines, four in number, three of which work at a time. Next came the rectifier room, with Brown Bouverie arc rectifiers in operation, and valve rectifiers and H.T. generators as stand-by power supplies. From the rectifier room the party moved on to admire the 36 μF smoothing condensers; a sight that made "Ham" mouths water! Next, grid bias and filament machines, at whose smooth and silent running all marvelled.

The control board was next viewed, and then the constant frequency drive with its LS5's starting off on 100 kc. and doubling to 200 kc. with the final stage of 10 watts output. This was followed by the series modulator panel, its air-cooled Catkin driving a sub-amplifier which in turn was driving the final PA stage of 4 CATL4's, the anode current of each valve being 7 amperes at 20,000 volts. "Ham" neon tubes were used here to test the H.F.

The party then faced the fury of the elements to visit the aerial masts and the aerial transformer house—neon tubes again being much in evidence! Returning to the station, the visit terminated and the party once more assembled at the "Crown," this time for tea.

Now for individual reports, which are very numerous this month. G6QN is busy with Commercial Activity checks, and in his spare moments is turning his hand to crystal grinding. G5GF is active on 56 mc., and is still endeavouring to produce a crystal controlled wave on this frequency, with reasonable power in the aerial. He asks for dope on receivers for the higher frequencies. G2GZ is now receiving very pleasing reports on his 7 mc. 'phone transmissions. G2ND is active on 7 and 1.7 mc., and makes the suggestion that any station calling "Test DX" on the latter band should add his QRA to his call sign. BRS250 reports that in addition to his usual band occupancy and band monitoring work, he has inserted a fairly large finger into the 28 mc. pie. In a very short space of time all continents had been logged, and a great thrill was experienced in hearing VK2LZ for the first time on this frequency. Several first contacts have been heard and altogether 28 mc. is proving decidedly interesting. BRS250 states that he intends to give up contest work in the future, owing to the unbearable proportions to which man-made QRM has risen in his locality.

G2JB is active on 7 and 14 mc. with CW and phone, but finds conditions poor. 2BKT is anxiously awaiting a reply from the P.M.G. *re* a radiating licence, and in the meantime is busy building a monitor and power pack. G2TH reports activity on 7 and 14 mc. and is conducting experiments in keying a link coupling between the CO and buffer amplifier. He adds that BCL interference has been considerably reduced by this system. G2LW and 2UW are active on the higher frequencies. The former is preparing a 56 mc. car outfit, and will welcome co-operation in the future. 2AGW and 2BTQ have both taken part in the VK-ZL Contest; the former scored 1,620 points, the latter 1,200 points. G2AI and 5YH both report rebuilding, whilst 2RD has been calibrating a frequency meter in between the various contacts he has made on the 7, 14, and 56 mc. bands. G5IS is testing out a new transmitter consisting of a Tri-tet and PA, using 59's and RK20, on 7 and 14 mc. A new crystal superhet is now in operation at this station. G2YG is active again on 1.7 mc., and hopes to be on 14 mc. soon. G6CB has changed his QRA and desires to record his sincere thanks to G6AN, 6HM, and BRS1675, who so ably assisted him in the erection os his new mast. Suppressor grid modulation is now being tried at G6CB. BRS2015 is experimenting with various types of receiver and intends to try a pen-pen-pen shortly. G5LG is getting his gear in action.

There are many new members to the District this month, and to all these the D.R. would like to offer a very hearty welcome. Do not forget to come along to the District meetings at the Brotherhood Hall, and meet the rest of the South London members. As District 13 seems to have occupied rather a large amount of space in these notes, we will conclude, but before so doing should like to remind members that the next meeting will be held on Thursday, December 19. On Wednesday, January 1, 1936, there will be a meeting of the S.L.D.R.T.S. at the Brotherhood Hall.

Finally, the D.R. would like to wish everyone a very happy Christmas and a prosperous New Year. His very sincere thanks are offered to all those who have helped so readily in making a success of District 13 in 1935.

DISTRICT 14 (Eastern).

At the East London Section November meeting held at G5AR, Woodford, the attendance was 15, and included HB9Y from Berne. At this meeting Towns Representation was discussed, but no proposals were put forward, it is expected, however,

that Ilford will be represented, Chelmsford is also another possibility if G6LB can gather support from that area. Congratulations to 2ANS, of Bow, who has been allotted the call G6OD. Morse classes will be continued at 2AYB, 16, Station Road, St. James Street, Walthamstow, E.17., at 8 p.m., on December 23, January 1, 6, 15, and 20. G6AU, of Forest Gate, is representing the District in the slow morse practices, and requests reports from those members utilising this service. Members of the district are sorry to lose G6FY, who has moved to Richmond, Surrey, but he has promised to occasionally attend meetings and field days. After many years, G6LB has been heard active again. Recent visitors to G6UT and G2XG, of Chelmsford, were HB9Y and the following Southend members, G6CT, G6IF, 2BWP, 2BCF, and 2AKA.

At the November meeting of the Essex Section, held at G6IF, the attendance was 11, including Mr. Adams, hon. secretary of the Southend Radio Society, to whom a warm welcome was extended. The active R.S.G.B. membership in this area have joined the former society *en bloc*, and it is hoped that others will do so, especially as this society intend applying for affiliation with the R.S.G.B. By this means there should be much more co-operation between the B.C.L.'s and the amateurs; it is proposed to run a joint field day during the coming year. At this meeting nominations for a T.R. and an assistant T.R. for Southend and district were made, the choice being G5UK and G2LC respectively. Congratulations to 2BWP, now G2LC. The C.R.—G5UK—is still in Italy, but hopes to return in time for Christmas. G6CT has been working DX on 7 mc. in the evenings, and has also built an "A" amplifier. G5VQ is testing his new TX and aerial systems. 2BCF has rebuilt his RX. 2AKA is shortly applying for full licence. 2BWP has rebuilt and by the time these notes appear will have been on the air, using CW on the 7 and 14 mc. bands. Attendances at meetings in the Southend area leave much to be desired, but it is hoped that now the winter months are here this will be remedied, and that a larger number will attend the next meeting on December 18: for details see "Forthcoming Events." The log by DE1752G mentioned in the November BULLETIN was examined by the members attending the meeting, and was found to be of great interest.

DISTRICT 15 (London West and Middlesex).

The seventeen members who attended, the November meeting took part in a discussion concerning the proposed running of a district magazine, as mentioned in last month's BULLETIN. It was decided to endeavour to put one in circulation and a "Ways and Means" committee was appointed to consider the matter. G5JL has agreed to accept the position of editor should the scheme go through. Will any member who can help by contributing short articles, technical or otherwise, please get in touch with him?

The letter budget will not be discontinued for the present, but it is hoped that it will eventually be superseded by the magazine.

It is pleasing to see the way financial help is coming along this year, and the D.R. takes this opportunity of thanking everyone and hopes we shall continue with the good work.

Two members have this month graduated and we congratulate them. 2ASP is now G6PR, while BRS1882 becomes 2AJX.

G6VP has such a good harmonic on 28 mc. that he has been reported the loudest G on that band! He intends to try the band again with a locked oscillator. G6WN has been on 28 mc. working W's, LU, and ZT, but cannot WAC or WBE, but has hopes now that a RFP362 has been installed. Still finds even that wants plenty of drive on that band, so is working it as an FD. G6CO has not done much to his new transmitter but has improved the receiver. 2BAI is practising code with 2AJX, who has rebuilt receiver. 2BAI takes a serious view of the discontinuance of listeners' reports and wants it discussed at the next meeting. (See Calendar.) BRS1226 sends some interesting details of his receiver. BRS2073 has been busy dispatching our 28 mc. cards to U.S.A., but still found a little time for radio. Hopes to get on 28 mc. soon.

DISTRICT 16 (South-Eastern).

Mr. C. W. K. Sands, the C.R. for Sussex, reports that 2AO and 6HH still continue their weekly skeds on 56 mc., 6HH being received *via* 2AO by 5JZ, but no signals from 6HH direct are now receivable at 5JZ. 2AO recently relayed W2XAF to G6HH. W2XAF at the time was relaying messages from the U.S.A. stratosphere balloon making its record ascent. G5JZ has recently been active with a new transmitter using a 14 mc. Windom which appears to work well. 5UY continues to work DX and is awaiting his W.A.C. 5AQ has recently removed to Plymouth.

The Heathfield Radio and Television Society still grows, having members in Uckfield and Hove.

G6CY, of Brighton, is active on 56 mc. using P.P.T.P.R.G. and *Ostar Ganz* valves. 2AFX has a transmitter built. BRS1173 is as active as ever and has built a portable 56 mc. receiver; he can receive 2AO at 14 miles, R9 plus, on the speaker. BRS2000 has built an O-V-1 receiver. 5BS, 5RO and 2AX have all been heard active.

In the M.A.T.S. contest 5FN finished first and 6VV second; congratulations, OMs. 5FN is now WAC. 6NU also W.A.C. in five hours during the contest, in which he finished third. 2VA has moved to Wigmore. 2CM is active with electron coupled circuit experiments. 5FN wants reports on his 28 mc. transmissions. 6RQ, 6QC, 2CS and 5XB are active. BRS745 is considering a super-het for 56 mc. work. (Many thanks for the good work done in the M.A.T.S. Contest, OM.) G2MI has finished his super-het.

In Ashford 2JV and 5QL are carrying out duplex 56 mc. work using loud speakers. 2BLN is learning Morse and he and 2BLU are active on 56 mc. also.

Tunbridge Wells is the usual hive of activity and we offer our heartiest congratulations to ex 2BVO, who is now 6BD. The activity is as follows: 1.7 mc., 2UJ; 7 mc., 5KV, 2UJ and 6BD; 14 mc., 6OB and 5OQ; 56 mc., 2UJ, 5OQ and 2AVN. 5OX and 2JH, two keen 56 mc. enthusiasts, recently visited the district. 5OQ is now WAC, but still wants VE for WBE. He recently had a chat with W3AWH—Yardley Beers, who was with us at Convention. 2AVN is testing a super-het on 56 mc. and 2BTI is trying CC on 1.7 mc.

In North-west Kent 2AW has a system by which several transmitters can work simultaneously on the same frequency and each operator can listen on that frequency to the other transmitters without interference from his own transmitter. (BULL

FULLER

L.T. & H.T. FOR THE AMATEUR

FULLER L.T. ACCUMULATORS

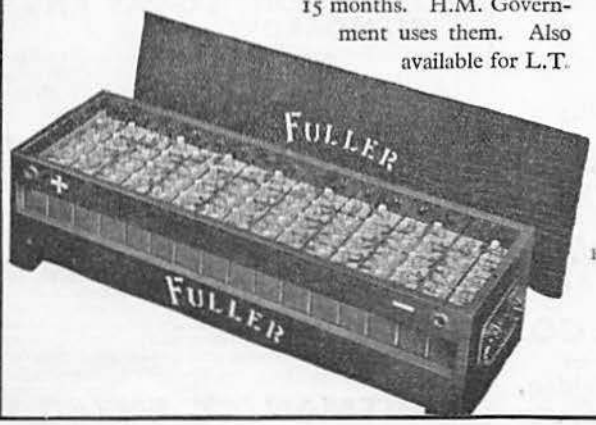
Embodying exclusive features, Fuller L. T. Accumulators possess those refinements looked for by the radio enthusiast; such as Patented Grease Cup Terminals, Indestructible Separators, etc. These features, with others, ensure a long life.

FULLER H.T. ACCUMULATORS

No source of H. T. is so smooth and steady as the accumulator. The Fuller is the H.T. Accumulator de luxe. Grease cups to prevent corrosion and a grease barrier to facilitate intermediate tappings. Supplied in 10 volt units in capacities of 3,000, 6,500 and 10,000 milliampere hours. Higher voltages available in crates.

FULLER INERT H.T. BATTERY

Where charging facilities do not exist Fuller Inert Cells provide a very satisfactory alternative. They are a modified form of dry cell that remain inactive until water is added, so that they can be stored indefinitely. Each cell gives 1½ volts and is suitable for anode currents up to 15-20 milliamperes in the No. 1 size and 20-30 milliamperes in the No. 2 size. On a daily service of 5-6 hours they will last for 12 to 15 months. H.M. Government uses them. Also available for L.T.



PRICES ON APPLICATION

FULLER ACCUMULATOR CO. (1926) LTD.
Chadwell Heath, Essex.

Makers of Batteries for all purposes.

B.T.S.

SHORT WAVE *and* TELEVISION COMPONENTS

DESIGNED by a special staff of experts whose exhaustive experiments and research have produced components unrivalled for reliability, efficiency and quality. Ultra-Short Wave apparatus calls for special design, construction and extra care in choice of materials. All of these have been successfully accomplished, and we are fully confident that we are offering components not only technically perfect and absolutely reliable, but reasonably priced and within the means of all. Illustrated here is a small selection only of the complete range of B.T.S. Short-Wave Components.

FROM ALL RADIO DEALERS
Write for complete lists of B.T.S. Short Wave and Television Components and Adaptor/Converters.

BRITISH TELEVISION SUPPLIES, LTD.
8-10, Charing Cross Road, London, W.C.2.

G2MR
G2NH
G2YD
G5MA
and
2BNS
of the

take this opportunity of wishing their many friends in the R.S.G.B.

A HAPPY XMAS
and
A PROSPEROUS NEW YEAR

THE QUARTZ CRYSTAL CO.
Manufacturers of S.W. Transmission Equipment
63 & 71, Kingston Road, New Malden, Surrey, England. Tel.: Malden 0334

PITMAN'S RADIO BOOKS

THE SUPERHETERODYNE RECEIVER

By ALFRED T. WITTS, A.M.I.E.E. This up-to-date book gives practical and expert information on the construction and maintenance of superheterodyne receivers. Every radio owner whose interest goes beyond mere listening-in should obtain a copy. 128 pp. **3s. 6d.** net.

TELEVISION: TO-DAY AND TO-MORROW

By SYDNEY A. MOSELEY and H. J. BARTON CHAPPLE. The standard book on the subject. Fourth Edition. 208 pp. **7s. 6d.** net.

RADIO RECEIVER SERVICING & MAINTENANCE

By E. J. G. LEWIS. Specially written for service men. 178 pp. **7s. 6d.** net.

TELEVISION FOR THE AMATEUR CONSTRUCTOR

By H. J. BARTON CHAPPLE, Wh. Sch., B.Sc., A.C.G.I., etc. This book shows how every television enthusiast can quite easily build his own receiver. By carefully following the detailed instructions, and consulting the numerous explanatory diagrams, really good results can be obtained. 284 pp. **2s. 6d.** net.

PITMAN Parker Street, Kingsway, London, W.C.2.

article, please.) The system has been developed to prevent collision of aircraft. 2ML has been co-operating. 5LB has an automatic Morse sender on 56 mc. which sounds like JNJ; it is a paper strip running between two contacts.

Folkestone Radio Amateurs have made great progress during the past month. The station headquarters has power, light and heat wired up, and it is hoped that by the time these notes appear G2FA—(F for Folkestone and A for amateurs)—will be calling test DX on 56 mc. with a rotary beam aerial. All groups in the district are asked to co-operate. The station is licensed for all amateur bands. Morse classes are being arranged by the Secretary, 6XB. Two are held every week at his QRA and they are very well attended. Good progress is being made and single signal supers will soon have to be the order of the day.

DISTRICT 17 (Mid-East).

A very successful meeting held at the Mason's Arms, Louth, on Sunday, December 1, was attended by 21 members under the chairmanship of the C.R. Several important matters were discussed and future district activities are now on a business-like footing. The plans for next year's N.F.D. received careful consideration and all the important details of provision of gear have been settled. The site of the A station will be at Cranwell as before, but the B station will be at Mablethorpe. It was decided to have a Conventionette at Cranwell or Skegness, but actual details will be discussed at a later meeting. With the purpose of encouraging the use of 3.5 mc. band, all stations working on this band will hold a District Party every Thursday. G5BD will act as control station and will call "Test 17" at 18.15. All stations will send reasonably slowly so that the B.R.S. may participate. It was decided to compile a District Frequency Register, and all members are requested to send in their frequency with their next report. This list will later be circulated to all members. The office of District Scribe will be held by 2BJY, who has done this service for some time without the dignity of this official title! The D.R. regrets that he was unable to attend, but is glad that everything went off so happily. In future there will be a district meeting every three months.

The most important report this month is the announcement of the formation of the Grimsby and District Short Wave Society, which is already in a most flourishing condition and is an indication of the enthusiasm and activity now prevailing in that area. The membership includes eight licensed transmitters, with G5BD as the President and G6AK as Secretary-Treasurer. Weekly meetings are being well supported.

G5GS is assisting G6AK with series modulation tests, while G2VY favours grid modulation. G6UG is putting out a very nice signal, having abandoned his D.C. mains in favour of a 500-volt generator. G2VY will be temporarily inactive while he changes his QRA. G5GS continues active on 7 and 14 mc. and is rendering great assistance to the G.D.S.W.C., having recently given them a lecture on 1.7 and 3.5 mc. work. G6RN will soon be active again now that all his gear has arrived. 2BYS is busy with amplifiers, 2BFC is carrying out tests and experiments in transmitter design and has lately turned his attention to 56 mc. receivers. 2BVU still carries on at Hull Technical College and represents the District at the Hull meetings. BRS1515 is collecting valves with an eye to an AA licence in the near future. BRS1021 has applied for AA and is listening on 28 and 56 mc. BRS1871 is also preparing to become an AA.

BRS1951 has been getting some very good DX and his super receiver is nearing completion. G5XL has his new transmitter functioning.

G5BD has been trying to get his transmitter going on 28 mc., with no avail (perhaps it has had enough DX, OM!); as a consequence his sked with W6GRX has been interrupted. They are hoping to get a T.B.T.O.C. Certificate. G5CY has had a general clean-up and overhaul, and annoys G5BD by showing him 28 mc. R.F.! The addition of a two-valve peak pre-selector to his Comet Pro has greatly improved his receiving end. G5LL continues to do excellent work on 7 mc.; he is to be congratulated on working ZT.

G6AC entered the 3.5 mc. contest. G2LR, who finished second last year, sportingly did not enter as their stations are very close and it was G6AC's turn this year. G6AC reports that local stations which have a great QRK in the late afternoon, fade very rapidly at dusk on 7 mc., but on 3.5 mc. daylight conditions are almost hopeless except for local contacts, but here the arrival of dusk brings in very loud Europeans. G2LR has acquired an R.F. milliammeter reading up to 50 ma. and has fitted a one-turn coil across it for use in place of the normal pea-lamp with excellent results.

G6GH continues active, but is finding conditions on 14 mc. unfavourable. 2BJY's new TX is now finished. 2AUR is learning Morse. G6LH has obtained a 50-watt licence and a new commercial-looking rack mounted CO FD PA has resulted.

The D.R. wishes to thank members for their reports and to express his regret that he was unable to be present at the Louth Meeting. In conclusion, a happy Christmas to everyone and may this District grow in enthusiasm and efficiency during 1936.

DISTRICT 18 (East Yorkshire).

G5BP at the time of writing was on the sick list, consequently news from the Hull area is somewhat scarce this month. G5FV, however, reports having worked numerous DX stations on the 28 mc. band during the past few weeks, including W6GRX.

2AVR is engaged on the construction of apparatus for band monitoring work. G5GI contacted LY and W1, using phone on 14 mc. G2TK is on 7 mc. with a CO.PA using 50 watts, and is now building for c.c. on 28 mc., with tri-tet, F.D., and a TY260 in the final. He reports hearing G6FV (QRB 60 miles) on 28 mc. G6CP is building a commercial looking 3-stage TX, with neutralised TPTG final. 5AX is rebuilding on relay rack lines and will then have tried out every conceivable method of construction. 5MV is doing extensive work with a Collins coupler, and has found it a distinct improvement, especially in regard to elimination of BCL interference. 2AHW is preparing for his full licence.

G6AW is preparing to return after a prolonged absence.

The Scarborough Short Wave Club continues to thrive, and the membership is increasing. 2AHW

delivered a most interesting lecture at the November meeting dealing with various types of radiating aerials.

Thanks are due to Mr. Wiggins for the information concerning activities in Scarborough. It is hoped to appoint a T.R. for this and other East Yorkshire towns within the next few days.

The D.R. wishes to thank all members in the District for their support in the past, and he takes this opportunity of wishing everyone an enjoyable festive season, coupled with a bright, prosperous New Year. He deeply regrets that for business reasons and lack of time, he finds it necessary to relinquish his position as D.R.

Scotland.

By the time these notes reach print, the name of the first winner of the "Wyllie Trophy" will be known. Arrangements have now been completed and nominations for the trophy have been received from all districts.

There has been a change of District Officer for "B" district; Mr. Laing, G6LG, has been forced to resign from this position, through pressure of business. Mr. Taggart, G5TA, has been elected in his stead, and we wish him every success.

The following changes fall to be recorded this month:—"A" District: Mr. Landles, 2BWV, has been allotted the call G2LQ. Mr. Ross, BRS1694, of "B" District, becomes 2AUT. "D" District has two changes, Mr. Wilson, 2AAL, and Mr. Blyth, 2AGM, having been granted full licences as G6XI and G5YX respectively. For some time past we have been periodically recording losses of members through their removal south; however, this month we welcome Mr. Lilburn, G5LN, to "A" district, and Mr. Huschman, G6HZ, who returns to "D" District, from England.

In addition to the above, there are a number of BRS and "A.A." men waiting word from the P.O. regarding their applications for radiating and artificial aerial permits.

"B" District have changed the venue of their meetings to the "Empress Cafe," Union Street, Aberdeen, instead of the Belmont Street Halls, and it is understood that the change has met with the approval of the members. At their first meeting at this new address, which was well attended, it was decided to visit several places of interest during the season and plans were discussed regarding 56 mc. activity.

While on the subject of meetings, members in "A" District are requested to note that the December meeting of the District will take place on the 18th instead of on the last Wednesday.

We have received the following information and we give it herewith for the benefit of any interested members:—VE5PM, T. F. Welsh, Royal Canadian Mounted Police motor ship "St. Roch," Cambridge Bay, Victoria Land, *via* Coppermine, North-West Territory, is a Glasgow man, late of the Caledonia Wireless College. Mr. Welsh is anxious to get in touch with Scottish amateurs and is on the air each Wednesday and Saturday night at 22.00 G.M.T. on 7 mc. with a 50 watt transmitter. VE5PM will probably be calling G2FV. He also works on 14 mc.

Interest in 28 mc. does not seem to be common in Scotland, although several members are considering work on this band. G6ZV, of Glasgow, has been active every week-end during November and has had a little success, although nothing compared with that accomplished by stations in the South of England. During November he had contacts with W, 1, 2, 3, 5, 8 and 9, but for some reason conditions experienced on Sundays were always inferior to the preceding day. Apart from W, the only DX heard on 28 mc. in Scotland has been ZU6P and a VE3.

Conditions seem to vary very considerably between Scotland and South England, as days on which poor conditions have prevailed in Scotland they have been reported good in the London area. G6RV has received reports of the reception of his 28 mc. signals from VK and OA. G6RV is also in the news on another band, having been heard in VK on 3.5 mc. during November 22 and 23.

The "A" District meeting was held on November 27 and a good attendance was recorded. During the evening short talks were delivered. G5TY gave a very interesting account of the best methods of metal working in cases such as encountered in amateur work, and this was followed by a talk on test equipment by G6MS. Both talks were enjoyed by the members. The matter of the "A" District officer for 1936 was also discussed during the evening, and Mr. Tyre, G5TY was unanimously elected to this position. "A" District members are asked to forward all reports on and after January 1, 1936, to D. Maxwell Tyre, 71, Waverley Street, Glasgow, S.1.

We are glad to receive a report from "C" District. G6LD has been elected D.O. *pro tem*, G5NW being very busy. G5WT, 6KO, 6RT, 6LD and 6RI are all active and regularly on the air. The District received a visit from nine members of "B" on Sunday, November 24.

Northern Ireland

The D.R. wishes to apologise for the non-appearance of notes last month, especially as a number of reports were received. We have to welcome two new members, viz.: BRS2094 and BRS2086, the latter is constructing a frequency meter for 7, 14 and 28 mcs.

2BNL has been notified that he will be granted a radiating licence on completion of the usual Morse test. GI6XS has been rather unfortunate, both his masts falling victims to the recent gales, but prior to this calamity he had been experimenting with various aerials, and had been QSO W6, W7, VK, ZL, VS, VP9 and K4. Mr. E. O'Byrne (BRS 1415) hopes to obtain a three-letter call in the near future, he lives at Clogher, Co. Tyrone, and cannot find another S.W. enthusiast in the district, consequently Morse practice is difficult to obtain. As the result of a recent change of QRA, 5SQ is now in possession of an A.C. supply, rebuilding operations are in progress, and he will be on the air almost immediately with a CO. FD. PA. outfit. 6YW scored 864 points in the recent VK/ZL contest, but is temporarily off the air as his 800-volt transformer once more has thrown up the sponge.

We take this opportunity of wishing our fellow amateurs a Happy Christmas and prosperous New Year.

Empire B.E.R.U. News.

B.E.R.U. REPRESENTATIVES.

Australia : I. V. Miller (VK3EG), P.O. Box 41, Tallangatta, Victoria ; Sub Representatives : J. B. Corbin (VK2YC), 15, Yanderra Flats, East Crescent Street, McMahon's Point, Sydney, N.S.W. ; R. Ohrbom (VK3OC), 22, Gordon Street, Coburg, N.13, Victoria ; A. H. Mackenzie (VK4GK), Fire Station, Wynnum, Brisbane ; G. Ragless (VK5GR), South Road P.O., St. Mary's, S.A. ; J. C. Batchler (VK7JB), 21, Quarry Street, North Hobart, Tasmania.

Bahamas, Bermuda and the Eastern Part of the West Indies : P. H. B. Trasler (VP4TA), Point à Pierre, Trinidad, B.W.I.

Burma : W. G. F. Wedderspoon (VU2JB), Government High School, Akyab, Burma.

Canada : C. S. Taylor (VE1BV), Stewiacke, Nova Scotia ; Earle H. Turner (VE2CA), 267, Notre Dame Street, St. Lambert, P.Q. ; W. P. Andrew (VE3WA), 1337, Dougall Avenue, Windsor, Ont. ; A. E. Howard (VE4CJ), 2401, 25th Street West, Calgary, Alberta.

Ceylon : G. H. Jolliffe (VS7GJ), Frocester, Govinna.

Channel Islands : Capt. A. M. Houston Fergus (G2ZC), La Cotte, La Moye, St. Brelades, Jersey.

Egypt, Sudan and Transjordania : F. H. Pettitt (SU1SG), Catholic Club, Mustapha Barracks, Alexandria.

Hong Kong : C. Emary (VS6AX), P.O. Box 391, Hong Kong.

Irish Free State : Col. M. J. C. Dennis (EI2B), Fortgranite, Baltinglass, Co. Wicklow.

Kenya, Uganda and Tanganyika : W. E. Lane (VQ4CRH), P.O. Box 570, Nairobi.

Malaya and Borneo : J. MacIntosh (VS1AA), Posts and Telegraphs, Penang, S.S.

Malta : L. Grech (ZB1C), 44, Sda. San Benedetto, Chircop, Malta.

Newfoundland : E. S. Holden (VO1H), Box 650, St. John's, Newfoundland.

New Zealand : C. W. Parton (ZL3CP), 69, Hackthorne Road, Cashmere Hills, Christchurch.

North and South Rhodesia : R. A. Hill (ZE1JB), P.O. Box 484, Bulawayo, S. Rhodesia.

North India : J. G. McIntosh (VU2LJ), Baghjan T.E., Doom Dooma P.O., Assam.

South Africa : W. H. Heathcote (ZT6X), 3, North Avenue, Bezuidenhout Valley, Johannesburg.

South India : J. Shepherd Nicholson (VU2JP), c/o Kanan Devan Hills Produce Co., Ltd., Munnar P.O., Travancore.

Australia.

By VK3EG, *via* ZL4CK, ZL4BT, and G6WY.

The 28 mc. Contest concluded with good results for some of our members, but since its ending conditions have been even better, and contacts with all continents have been made. Credit must be given to VK2LZ, 3BD, 3YP, 4BB, 4EI, and 6SA for their untiring watches on 28 mc., and they deserve the fullest praise and congratulations on their work. VK4EI, using '59 tritet, '59 doubler, and P.P. RK20, first broke through to Europe, and contacted ON4AU, F8VS, D4KPJ, and D4JMC. Stations being heard regularly include FA8IH, LU1EP, ZS1H, J2IS, J3FJ, J2HJ, VS6AH, and W's. What is believed to be the first ZS/VK 28 mc. contact came when VK6SA worked ZS1H on October 13, and to VK2LZ great credit is due for his first VK/G contact. VK4EI worked W8CMP the long way round, but until verified he is not certain of the prefix.

VK/ZL Contest conditions have been invariably good. On 14 mc., stations in all continents came through splendidly. The best G's were G6CJ, 5YG, and 2NM, whilst ZS2X and ZU5AC were audible on 7 mc. for hours.

Canada (Third District).

By VE3WA, *via* G6NJ.

During the past few months, VK and ZL stations have been heard daily on 14 mc. about 12.00 G.M.T., and during the VK/ZL contest they were heard almost throughout the whole 24 hours. Contacts, however, were scarce. On 14 mc. a few Asian stations are being heard, VS6AQ, VU2CQ and VS1AJ being the most consistent. This is most unusual for this band in Ontario. South African stations are coming through on 14 mc. at 19.00 G.M.T. Seven mc. has been very erratic and few contacts were made on this band in the VK/ZL contest. The 10-metre band has opened up and all continents but Asia have been heard in Ontario. ZS1H has been a fine signal. Numerous VK and ZL stations have been reported, as well as European stations. The best signals from G have been 2YL and 5LA. VE3WA is looking for an African QSO for W.A.C. VE3WB reports reception of ZB1H. VE3ZI and VE3UG have been heard again on 14 mc. after being off the air for the summer. VE3KF is working some fine DX with his 14,104 kc. 'phone, and will answer all reports from listeners. VE3AM has rebuilt his transmitter and is now working some long-sought DX.

Channel Islands

By G2ZC.

G5ON, of Guernsey, is active with telephony on 7 mc. It is interesting to recall that when G6OX resided in Guernsey, his signals were inaudible here in Jersey on 7 mc., and although G5ON's telephony is obviously being received at good quality in England, it is distorted, though intelligible, at G2ZC.

BRS1748 is active and doing useful observation work in conjunction with certain British stations. He recently visited G2ZC, who has been engaged entirely on frequency measuring work for the last few months.

Mr. Banks reports that his Scout Troop, who are affiliated to the R.S.G.B., are engaged on bench work and other tests. The troop recently picked up a transmission on 56 mc., though, owing to bad conditions, the call could not be logged. As Jersey would be DX on this frequency, those interested might be tempted to try and get across. Mr. Banks, whose address is 14, Byron Road, St. Helier, Jersey, will, no doubt, be pleased to arrange schedules.

Egypt, Sudan and Trans Jordania

By SU1SG (*Received by* G2ZQ *at* G6KP).

Activity on 28 mcs. has been the main topic of interest during the last month, and SU1SG has been joined on this frequency by SU1RO and 5NK. SU1RO has been active on this frequency only, and has listed some excellent DX, including J, VK, W, LU and ZS, he has worked LU twice and VK, but so far has been unable to contact U.S.A., which, with Asia, is needed for WAC. SU5NK has had some trouble in getting his gear to work satisfactorily, but hopes to overcome the difficulties in a day or two. SU1SG is usually only on " ten " during week-ends, and has made what is believed to be the first contact on this frequency between SU and W, and between SU and VK. VK4EI reporting him R6 on phone.

SU1RK has been dividing his time between 20-metre phone and broadcast concerts. With the assistance of friends he produced an hour of most enjoyable entertainment, which was broadcast from the Cairo main station, and much appreciated by listeners. SU1WM has been QRT owing to change of QRA, but hopes to be active again soon with improved results from the new QRA. With the exception of Port Said, all districts including ZC have been linked up daily for exchange of messages on 7 mc. A QRP portable rig with an input of 3 watts has been under test at SU1SG, and 7 mc. CW has been reported R4 by G5JX. It is anticipated that the design will form a basis for our next NFD portable, the input to which will probably not exceed ten watts. It has since been learned that the first CO/SU contact was made by SU6HL on phone in 1932, and not by SU1RO as suggested in previous notes. It is thought, however, that it is safe to claim for SU1RO the first SU/LU contact on ten metres. Active members are SU1CH, 1KG, 1RK, 1GP, 1FS, 1RO, 1TM, 1SG, 5NK. The call-sign used by SU5NK on 28 and 56 mc. is SU1JT. ZC6CN and ZC6FF are the only licensed stations in Palestine, and only ZC6CN is active.

Hong Kong.

By VS6AX, *via* VS6AQ, VS1AJ and G6CJ.

Conditions on 7 mc. are improving for European contacts, whilst 14 mc. is falling off generally.

VS6AH has rebuilt, and is working Europe on 14 mc. 6AX has worked VE5, and awaits confirmation for WBE. 6AZ is on with fone on 7 mc., using Heising Modulation. BERS273 and 309 are busy on 7 and 14 mc., and with commercial activity checks. XU8CB is rebuilding to C.C., and would appreciate reports on his 28 mc. transmissions. BERS308 is still in hospital. Active stations are 6AX, 6AQ, 6AH, 6AZ, BERS273 and 309, and XU8CB.

Irish Free State

By EI9D.

Activity on 28 mc. continues, and during the past few weeks EI5F has worked all W districts, except W6, on this band. Using 14 mc. in the VK/ZL contest, he scored 294 points, working all ZL districts. He also noticed the good conditions for W5 during July and August at the unusual times referred to by GI5QX in last BULLETIN. During the two months mentioned he had 19 contact with W5 between 23.00 and 00.30 G.M.T.

EI8G has been getting out well on 7 and 14 mc., making several VK and other DX contacts. EI6F will be back on the air shortly, his services are badly needed.

EI2B, 4D, 9D, BRS1843 and 1932 report activity, but nothing of especial interest. Many stations, however, have not reported.

We welcome Rev. N. H. Waring, 35, Wellington Road, Dublin, as a new member.

The I.R.T.S. held a very enjoyable Hamfest in the Moira Hotel, Dublin, on November 15. The occasion was the presentation of the Society's cup to GI6TK, winner of the I.T.S. A.R.R.L. contest.

Kenya, Uganda and Tanganyika

By VQ4CRH.

Conditions during October on 14 mc. were very good, but on 7 mc. very little was done, at least so far as Nairobi stations were concerned, as the mains QRM is on the increase, and is now well above signal strength.

BERS191 is now VQ4CRC. CRC will welcome reports on his 14 mc. signals, and all such reports will be acknowledged.

VQ4CRO has been putting over some excellent phone on both the 14 and 7 mc. bands, on the former he has had QSO's with W, G, VU, and African stations. (VE's please note and keep a look-out for CRO.) VQ4CRO is now Empire Link Station for East Africa.

VQ4CRR is now engaged on erecting a new aerial system which should prove 100 per cent. efficient if the calculations made with the aid of a field theodolite are anything to go by.

Congratulations are extended to Miss Nelly Corry, G2YL, on her 28 mc. achievements.

Malaya and Borneo

By VS1AA.

VS1AJ is active on 7 and 14 mc., mainly for E.L.S. schedules. He will be pleased to arrange tests on 28 mc. VS2AG finds conditions variable, but is busy in several directions, including the calibration of his main aerial; portable aerials are also being tested. VS1AA has recently finished the construction of an electron coupled frequency meter-monitor, which has successfully passed

through its tests. Mr. Williams is welcomed as a new B.E.R.S. member.

The Indian station VU2CQ has been heard transmitting simultaneously on two frequencies 100 k.c. apart in the 14 mc. band.

BERS294, Mr. Cornish, of Alor Star, Kedah, has been allotted the call sign VS3AA.

The writer will be pleased to receive news for inclusion in these notes; at the present moment very few of the members in the Malaya-Borneo area report regularly.

Malta.

By ZB1C, *via* ZB1E and G2VV.

The 14 mc. band is undergoing the erratic changes usual at this time of the year with good, but patchy, periods from 1500 to 1800 G.M.T. ZD, ZE, ZS, ZT, ZU, VQ, VK, ZL have been worked during these periods. QRN is still too heavy on the 7 mc. band for DX work. As the use of 28 mc. is not yet permitted here, there is nothing to report on this band except that D, G, W and ZS have been heard.

ZB1B has left for G. ZB1C is changing his QRA. ZB1E is again active after having been laid up for two months owing to an accident to his leg. ZB1H is active with a new ES502 for PA.

The QRA's of ex-ZB1F and ex-ZB1I are wanted as QSL's await them here.

New Zealand.

By ZL4FO and ZL2OV, *via* G6WY.

Conditions, on the whole, continue to be very interesting, and several WAC's have been obtained lately by ZL amateurs. The 14 mc. band, which was so consistently good during October, went dead soon after the end of that month and has been patchy since. 7 mc., however, is still improving; the large number of European stations heard being worthy of mention. American stations, on the other hand, are not nearly so prominent as usual.

Great interest is being taken in the 28 mc. achievements of the G. VK. amateurs, and with the continuance of existing conditions, it is hoped before very long to add a ZL/G contact to the growing list of 10 metre records. Congratulations to Miss Nelly Corry on her noteworthy feat.

With regard to the 3.5 mc. contest organised by the R.S.G.B. for December, we would mention that a large number of ZL stations are active on this frequency and will be on the look-out for G contacts. Between 07.00 and 09.00 G.M.T. proves to be the best period for reception in New Zealand.

The annual general election to determine the location of N.Z.A.R.T. Headquarters for the ensuing twelve months, resulted in Wellington again being chosen. The President for 1936 will be ZL2BH. In the VK/ZL International Contest, the highest number of points claimed so far is 21,701 by ZL1GX. ZL4BT, W.A.C. and W.B.E. within five hours, using the 14 mc. band. The contest received admirable publicity, particularly from the European societies, and the support accorded throughout the world was very encouraging to the Joint Committees of the W.I.A. and N.Z.A.R.T.

ZL1BA and ZL3AJ were the only ZL entrants for the 28 mc. contest, and they now keenly await publication of results. Attention is drawn to the fact that telephony is allowed on a limited portion of the 28 mc. band in New Zealand, but not on the 14 mc. band, as reported in "QST" for October.

56 mc. work is receiving a fair amount of attention, experimenters hoping to be the first to conduct either trans-Tasman or trans-Cook Strait QSO's, using this frequency. Trophies have been offered for either achievement.

In conclusion, ZL amateurs would like to take this opportunity of conveying to their fellow amateurs and friends throughout the world seasonal greetings. They express the hope that 1936 will see still bigger things achieved in radio science.

Northern India.

By VU2LJ, *via* VS1AJ and G6CJ.

The most important event to record this month is the opening up of the 28 mc. band; three G, two VK, and one ON stations being worked from VU2LJ on October 27. The band was extremely lively, QRM from other stations at times being as bad as on 14 mc.!

Both 2EP and 2EQ are active, the latter having discarded the driven amplifier in favour of the TPTG. 2DK has been in hospital for six weeks, but is now back on the air. He is C.C. on 7050 kcs., and the new rig is giving extremely good results. Both BERS75 and 314 will make their debut as soon as their licences arrive.

Southern India.

By VU2JP, *via* VS1AJ and G6CJ.

VU2AU has been moving to new quarters. He is now arranging gear, and hopes to be in action shortly. 2BY is silent, but there are rumours of television. 2LS is rebuilding to C.C. 2DF has temporarily been transferred to Dhond, and as mains are DC he will be QRT. 2BH does not report, though there are rumours of 56 mc. activity. 2BP is experimenting with condenser and ribbon mikes. 7MF is getting gear together for 7 and 14 mc. 2JP has been kept busy with the budget and schedules. QRM from commercials is very bad.

2JP has received many letters supporting the formation of a transmitters' club, though there are still many replies outstanding. Please reply if you have not done so.

Southern Rhodesia.

By ZE1JB.

The Postmaster-General has declined to issue any new experimental licences pending the promulgation of the new regulations which the Chairman of the Radio Advisory Committee informed us would be placed before the Rhodesian B.E.R.U. for perusal and comment prior to publication.

Conditions on 14 mc. are rapidly changing as we approach the peak sunspot period, and this year are considerably different from last year. In November, 1934, the only signals audible after about 18.00 G.M.T. were North Americans, and dozens could be worked with ease. This year DX is good from all directions and we hope to contact a ZL, as they are audible and have reported hearing ZE signals.

ZE1JB will probably be off the air during December and January as he is acting as locum in Umtali during these months. Possibly a small outfit will be constructed and taken to Umtali.

ZE1JC has been doing some DX on 7 mc. and is now to be heard on 14 mc. ZE1JF and 1JJ will probably have returned from leave by the time these notes appear and will no doubt soon be active again on 14 mc. ZE1JM has now qualified for WAC by contacting W8EEN on 14 mc. He has needed a W for some time. Good DX is being done, including VK and LU. He has now installed two half-wave Hertz antennæ and feeds them through a Collins matching network.

ZE1JN has built a Unity coupled 56 mc. rig and is testing this out with dummy antenna. A long lines rig is also under construction. He has been competing with ZE1JS for the shortest WAC time. ZE1JN has got WAC in 3 hours 45 minutes, but ZE1JS has gone one better by doing it in 3 hours 35 minutes. The stumbling block in each case was South America, a difficult country to work from Bulawayo in the early evening. Both stations had the other five Continents in under two hours.

ZE1JO can only do a little radio in the early morning. ZE1JT is now on 14 mc. with an input of 14 watts and desires contacts. ZE1JU is testing on 28 mc. at 16.00 G.M.T. daily, but to date has had no QSO's. He thinks this probably due to his receiver and is reconstructing. ZE1JY is rebuilding to look like a real commercial job. He has installed class B 'phone and is very pleased with the results.

It is unfortunate that the 3.5 mc. tests have to be conducted in December, as this band is almost useless due to QRN at that time of year. During winter the band is used a good deal.

I take this opportunity of wishing all R.S.G.B. and B.E.R.U. members the compliments of the season and good DX in the New Year.

EUROPEAN NOTES

Belgium

By ON4AU.

During the last month a fair amount of work has taken place on all bands. On 28 mc., Asia has at last made itself heard. VU2LJ was worked by ON4AC, and was heard at R7-8, but it seems that conditions were not good in India. J2HJ has also been heard at R3. W6CAL, 6GRX and 7AMX have been heard several times at R5-6 on 14 mc. Conditions on that band are patchy between 19.00 and 06.30 G.M.T., although they are good on 7 mc. between the hours mentioned.

ON4AU heard a harmonic of WCC on 6.20 metres about October 19, and believes it may be possible to QSO U.S.A. on 56 mc.

ON4AC and ON4AU are at present in Spain. They have noticed that DX conditions are very much better in that country than in Belgium. On 14 mc. W and VE stations are to be heard from 06.00 to 20.00 G.M.T., while on 7 mc. DX is audible all the time. Apart from several QRO stations, the majority of EA's use between 50 and 100 watts input.

All Belgian amateurs of the " Ten gang " send their very 73 and heartiest congratulations to G2YL for her very good work on 28 mc.

Denmark

By OZ7Z.

DX conditions were quite good during October, and a number of Danish amateurs contacted stations in all continents. OZ9WB/9Q did the best work of the month by contacting all Australian and New Zealand districts. This is a Danish record for work with the Antipodes. OZ2M also did some good work, he QSO'd all U.S.A. districts and four Canadian. OZ3FL is the best Danish station for South Africa. The two latter stations are WAC and WBE.

There is an important notice this month regarding prefixes. Amateurs in Greenland and the Faroe Islands have always used OZ, but this proved very unsatisfactory for QSO's with Europe, as no one recognised hearing a DX station with an OZ call. For that reason EDR proposed that special prefixes should be assigned. This has now been done, and in future amateur stations in the above-named places will use OX and OY respectively. The use of all other call signs such as NX and OZ should be discontinued. Faroe Islands is, by the way, considered a part of Denmark, whereas Greenland is a Danish colony.

As far as is known, there are no Danish amateurs on 28 mc. at present. Some years ago OZ7T worked South Africa on that band, whilst OZ7G1. was the first to contact a foreign station on ten.

I take this opportunity of extending best wishes for the season on behalf of my society, hoping that 1936 will prove a real DX year, and prosperous for amateur radio.

Empire Calls Heard

E. C. May, Royal Signals, Kowloon, Hong Kong (*BERS*308), *September* 15—*October* 5, 1935 :—

7 mc.: g6ko (3.3), 6pk (3.4), 6zt (3.4), zt2em (3.4), vs7rf (3.4), vu2em (3.4).

14 mc.: g5si (3.5), 6mk (5.5).

N. C. Cleveley, Royal Signals, Kowloon, Hong Kong (*BERS*309) :—

14 mc.: gi6yw (4.5), g2ps (5.6), 2lb (5.5), 2xt (4.5), 5gq (5.7), 5kj (4.4), 2dk (4.5), zs5z (5.5).

J. R. Cragg, P.O. Box 391, *Hong Kong* (*BERS*272). *September* 19 *to October* 13 :—

14 mc.: g2lb (8.5.5), 5gq (9.3.4), 5kg (9.4.4), 5ri (9.4.4), 6ly (9.3.3), 2pl (9.5.6), 2kz (9.4.5), 6xs (9.4.4), 5wt (9.4.5), 6cj (9.3.4), 6nu (9.4.5), 5wp (9.4.4), 2ky (9.3.4), 2yl (9.4.5), 2ao (9.4.5), 6xl (9.4.6), 6cy (9.5.5), 6wy (9.5.7), 5kj (9.4.4), 2xt (9.4.4.), zs6b (DC.5.7), 1jn (9.4.5), 6t (9.5.6), ze1jm (9.4.5), 1js (9.4.4), zt6w (9.5.6), zs2x (9.4.5), zt6x (9.5.6), zs5z (9.4.4), zt6ak (9.5.6), zt6a (9.4.5), zs4u (8.4.4), zs6am (9.5.5), zt5v (8.5.5), zu6l (8.5.5), zu6m (9.4.4), su1sg (8.5.6), 1fs (9.5.6), 5nk (9.5.6), 1rk (9.4.5), vp5pz (8.5.5), zb1h (9.4.4), vq4kta (8.5.5), vs2ag (9.5.7), vu7fy (9.5.9).

7 mc.: g6ko (9.5.5), 6vp (9.5.5), 6if (9.4.4), 6rv (9.4.4).

By E. Trebilcock (*BERS*195), *Telegraph Station, Tennant Creek, North Australia. From October* 2 *to* 31, 1935 :—

7 mc. (cw): g2iy, 5bd, 5cu, 5il, 5jm, 5jz, 5kg, 5ml, 6hw, 6pd, 6vp, su1ch, 5nk, vp4tc, vq2wab, vs6aq, zs2x, 5h, 5z, 6af, 6al, 6am, zt6av, 6n, 6y, zu6a, 6b, 6m, 6y.

14 mc. (fone): vu7fy, ve5ha, (cw) g2as, g2nm, 2pl, 2sd, 2tm, 2zq, 5gq, 5wq, 6jb, 6rb, 6wy, 6yu, su5nk, ve3wa, 5bi, 5ha, vk9nw, vp2bx, 5ab, 5aç, 5pz, vr4ba, vs1ns, 2ag, 3ac, 6aq, 6bd, vu2au, 2eb, 2ep, 2eq, 2jp, 7fy, zt5v, 6ak, 6y.

AMERICAN VALVES

(Guaranteed for 6 months)

We stock only first-class makes such as Arcturus, Raytheon, and Sylvania. Guaranteed for 6 months. 247, 235, 551, 89, 18, 19, 46, 59, 6A7, 15, 42, 41, 38, 39, 78, 75 57, 58, 224, 44, 36, 235, 83, 43, 5Z3, 53, **12/-**; 56, **9/6**; 45, **7/6**; 25Z5, 12Z3, **11/-**; UX171, UX199, UX280, UX245, UX226, UX227, **7/6**; UX250, UX210, UX281, **17/6**; UX867 photocells, **25/-**; all other types of American valves in stock. Transmitting valves also supplied. Osram LS5, **12/-**; American Valveholders, 4-5-6 and 7-pin, **8d.** each.

WARD'S BARGAINS IN COMPONENTS, ETC.

GARRARD UNIVERSAL GRAMOPHONE MOTORS, with auto-stop, etc., **£3 10s.**; Blue Spot Class "B" output Chokes, **3/6.**

BRITISH RADIOPHONE CONDENSERS, fully screened, superhet or straight types, 3-gang and 2-gang, **7/6.**

CENTRALAB RESISTANCES, 1 watt type, **6d.**; 2-watt type, **1/2**; 3-watt type, **1/9**; B.I.C. 8 mf. and 4 mf. 550 volts peak, electrolytics Condensers, **3/3.**

MARCONI MODEL 25 PICKUPS, 21/-; Cosmocord, **12/-**; B.T.H. Pickup Tone-Arms, **3/-.**

A.C. and D.C. ELIMINATORS, first-class make, tapping, S.G. detector, and power, 150v., 25 m.a., D.C. type, **12/-**; A.C. type, with Westinghouse rectification, **25/-**; A.C. type, with 0.5 amp. trickle charger, **30/-.**

WESTINGHOUSE RECTIFIERS, L.T.4 or L.T.5, with mains transformers, **18/6.**

MAINS TRANSFORMERS.—350-0-350v. 60 m.a., 4v. 4 amps., 4v. 2.5 amps., **12/-**; 425-0-425v. 120 m.a., 4v. 1 amp., 4v. 1 amp., 4v. 7 amps., 4v. 2.5 amps., **26/-**; L.T. transformers, 4v. 3 amps., CT., 4v. 3 amps., CT., or 2½v. 8 amps., CT., 5v. 2 amps., CT., or 26v. ½ amp. and 2v. at 6 amps., **8.6** each.

CARRIAGE PAID; cash with order, or c.o.d.

Our Comprehensive List "T" sent free upon request.

WARD 46, FARRINGDON ST. LONDON, E.C.4

'Phone: Holborn 9703

ELECTRADIX

67/6

"BIJOU" Direct-coupled Electric Pumps for A.C. or D.C. mains. Centrifugal, all-bronze pump, enclosed motor. 3 ft. lift, 120 to 150 gals., 6 ft. jet. For cooling, circulating, bilge or sump, fountain, or waterlogged shack. With 50 yds. twin rubber cable and iron-clad D.P. switch.

MOTOR BLOWERS or Exhausters. Strong iron body, 3-in. fan outlet, direct coupled to motor. A.C. 220-v., **65/-**; 110-v. D.C., **45/-**; D.C. 220-v., **55/-.**

PORTABLE FIELD TELEPHONES, Army Type, in pigskin case, for speech, key for code. No. X135, half price, **30/-**; or two with 1 mile D2 unbreakable war cable, **£5.**

MORE BOTTLES. NEW VT13B. A fine 30-watter 6-v. 1½-amp., anode 1,500-v., imped. 35 thou., mag. 35. Less than half price, **25/-.** DC 1, S.W. 7-Guinea Bottle, unused, **45/-.** Few left now. AT50 5-Guinea line, 7-v. 2½-a., 1,500-v., mag. 30, as new, **25/-.** Big Rectifiers, NU2, 5-v. 2½-a., 250 watts up to 20,000-v., **45/-**; 100,000 volts 2 m/a., **35/-.** 100-watt T3T2A, **45/-.** Also a few ½ kw. Bottles.

REAL RECTIFIERS, A.C./D.C. 1½ kw. in steel case. List £30. Output from A.C. mains 220-v. 6 amps. D.C. Sale **£16 10s.** Hewillic ditto to 210-v. 6-a. D.C., **£14.** Westinghouse ditto to 280-v. ½-amp. D.C., **£9.**

KEYS. We have a very fine selection from the High-speed MacIlroy Bug Side Swiper and Posh Service Keys to the Scouts' Tapper. All Police Depts. use our Keys and rozzers know.

SWITCHBOARDS. Full auto cut-out and -in, field reg. switch, meter, fuses, etc., from **22/6.** Let us quote you.

HEAVY CURRENT CELLS. Long-life Edison and Nife Steel Batteries for heavy duty in Lab., Boats, and for emergency. 120/400 amp.-hours at a fifth usual price whilst stock lasts.

TELEPHONES. The cheapest tester is a pair of 2/9 Sullivan phones and a **6d.** cell for any circuit. Brown's "A" reed for short-wave sets, 1,500 ohms, **21/6,** 120 ohms **17/6,** Western Elec., 2,000 ohms, **4/3** pair.

1,000 *other bargains in New Sale List "T.R.," post free.*

ELECTRADIX RADIOS

218, Upper Thames Street, London, E.C.4. *'Phone: Central* 4611

A New Power Output Valve

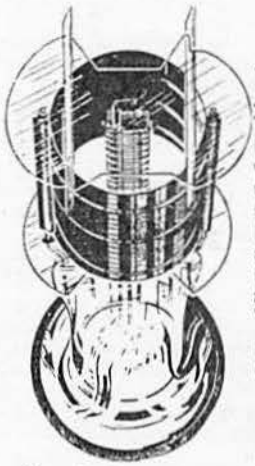


Illustration shows the "critical distance" between anode and outer grid, whereby special characteristics are obtained.

THE HIVAC HARRIES

To Radio Engineers

The High Vacuum Valve Co. Ltd. will be pleased to forward to all associated with the design of Radio apparatus, full details of the Hivac Harries Valve together with a reprint of the two-page illustrated article which appeared in "The Wireless World."

Multi-grid Sensitivity without loss of Triode Quality.

HIVAC
THE SCIENTIFIC VALVE

HIGH VACUUM VALVE CO. LTD.
113-117 Farringdon Road, London, E.C.1 *CLE 7587*

CRYSTAL CONTROL
FOR ALL—

BAND.			ACCURACY.
(*a*) 1·75 mc.	...	... 16/6	± 1 kc.
,, 3·5 and 7 mc.	...	... 15/-	± 2 kcs.
,, 14 mc.	...	... 30/-	± 5 ,,
(*b*) 100 kcs.	...	... 15/6	± 0·1 kc.

Temp. Coeff. (*a*)—(23×10^6)
(*b*)—(5×10^6)

Enclosed Holders, plug-in type, suitable all bands 12/6

BROOKES MEASURING TOOLS,
51-53, Church Street, Greenwich, London, S.E.10
Tel.: Greenwich 1828

"T. & R. Bulletin."
ADVERTISEMENT RATES.

Per insertion.		Per insertion.	
Full Page ..	£6 0 0	Half Page..	£3 0 0
Quarter Page	1 10 0	Eighth Page	0 15 0

Series Discounts—5% for 6 or 10% for 12 consecutive insertions. Full-page type area 7¼" × 5¼".
Advertisements specified for *Covers and Facing Matter Positions* are *not* subject to series discounts.
The T. & R. Bulletin is published on the 14th of each month. Orders, Copy and Blocks should reach us by the 30th of each month for the following month's issue.
All applications for space or specimen copies should, please, be sent to Advertisement Manager,

PARR'S ADVERTISING LTD.,
Craven House, Kingsway, W.C.2.
Telephone: Holborn 2404.

EDITORIAL.—(*Continued from page* 205.)

Representatives that they should allow the membership a free hand in the election of T.R.'s, but it is fairly safe to say that unless one or two of them had interested themselves privately in this matter, the number of nominations would have been considerably smaller.

We feel confident that if this scheme is properly supported it will provide an example to other Societies, of good organisation, but so long as apathy reigns it is difficult to give a lead to other bodies who are probably as anxious as we are to have strong representation throughout their local field of activity.

If your town has no representative, we suggest that you make a New Year's resolution to have one appointed forthwith.

PIEZO-ELECTRICITY.—(*Cont. from page* 210.)

build up to a large value. The mechanical forces arising during vibration develop piezo-electric charges and by this means an intimate coupling between mechanical vibrations and electrical oscillations is secured, and a method provided for maintaining the frequency of the electrical oscillations of a circuit at the frequency of mechanical vibration of the quartz.

(*To be continued.*)

THAMES VALLEY.—(*Continued from page* 219.)

of the gear used at each station may be of interest.

G5VB (fixed station) was using a push-pull oscillator with choke modulation and about 6 watts. G6RS was using a unity-coupled transmitter with choke modulation and an 8-ft. vertical aerial with about 4 watts. G2KI was using push-pull oscillator with class B modulation and 2 watts. G2VV used single-valve oscillator, choke modulated with 6 watts and Picard 5-metre aerial.

In closing, we tender our sincere thanks to G6GB for his excellent work as field day manager.

C.W. COMMUNICATION ON 56 MC,

(*Continued from page* 227.)

ordinary station receiver, and with batteries for H.T. it sounded like crystal control. The transmitter could be left running, and after the first few minutes, when the valves had warmed up, the frequency became so constant that one could listen to it for the next ten minutes without having to touch the receiver condenser.

The H.T. supply to the PA was then keyed and the resulting note was quite chirpless, with the bell-like note that one associates with crystal control. Vibration in the room occasionally caused a wobble, but the receiver was found to be more prone to frequency variation than the transmitter, and even moving the phone leads, one of which was earthed, caused a change in note.

The PA was modulated about 90 per cent., and G6XB reported that the phone was the best he had heard on the 56 mc. band, surpassing that put out with an ordinary self-excited long-lines oscillator. With an input to the PA of 2.5 watts and the somewhat inefficient aerial previously mentioned, signals were R9 plus on the phones.

A Receiver.

The trial receiver used by 2AZM for the reception of these signals consisted of an 0-V-1, reaction control being obtained by variation of the plate voltage to the detector by means of a potentiometer. The circuit diagram is given in Fig. 5. It was actually an adaption of his ordinary super-regenerative receiver and was somewhat prone to hand capacity. With this receiver he reported a clear-cut CC signal with no background, and stated that the tests showed definite promise of the achievement of our ideal of C.W. communication on 56 mc. He is at present working on a special straight receiver for use on this band.

Mr. L. Knight

We have learned with regret that one of our Surrey members, Mr. Leslie Knight, 2BVV, has lost the sight of an eye as the result of an unfortunate shooting accident, whilst the sight of the other is badly impaired. Mr. Knight is continuing his interest in amateur radio, by co-operating with G2MV in his tests. On behalf of his many friends, we extend our best wishes for a full recovery to health.

Empire Calls Heard

By J. Alexander, 2AXX, 63, Tennyson Road, Birmingham 10, from October 17 to November 20, 1935:—

7 mc.: velec (5.6.9), 2ca (5.6.9), vk2ci (5.6.9), 2oc (4.5.9), 4fo (5.6.9), 4gm (5.5.9).

14 mc.: su1ch (5.7. fone), 1wm (5.6.9), 2tw (5.5.9), 5nk (5.6.8), velce (5.6.9), 1ed (5.5.6), 1fv (5.7.9), 1hg (5.6.7), 1sg (5.6.8), 2ab (5.5.9), 2bd (5.6.9), 2dm (5.5.9), 2fq (5.7. fone), 2ge (5.6.9), 2hk (5.7. fone), 2ka (5.6.6), 3ab (5.6.9), 3ac (5.5.6), 3qn (5.5.9), 4ro (5.6.9), vk2as (4.5.9), 2bk (4.5.9), 2dg (5.5.6), 2el (5.5.9), 2ex (4.4.9), 2ic (5.5.9), 2no (5.6.9), 2oj (4.6.7), 2py (5.6.9), 2rx (5.6.9), 2xm (5.5.9), 2zc (5.6.9), 3bw (5.5.9), 3cp (5.6.9), 3cx (4.5.7.), 3dp (5.5.9), 3jc (4.5.9), 3jt (5.5.9), 3oc (4.4.8), 3zw (5.6.9), 4er (5.5.9), 5dq (5.5.9), 5gw (5.6.9), 5lb (5.5.9), 5ld (5.6.9), 5mv (5.6.9), 6bo (4.5.9), 6fo (5.6.9), 6mn (5.6.9), 7rc (4.5.9), vp1jr (5.5.7), 2at (5.6.8), 2cd (5.6. fone), vq4crm (5.6.8), ze1jb (4.5.9), 1jn (4.5.9), zl1dv (4.4.9), 1gx (4.5.9), 1hy (4.6.9), 2ju (4.5.9), 2of (5.5.9), 2oq (5.6.9), 3ab (5.6.9), 3ad (5.5.9), 3ja (5.5.9), 4bt (5.7.8), 4ck (5.7.9), zs1al (5.5.9), zt6a (5.6.9), zt6w (5.6.9).

Ballot Form

T.R. Elections, 1936.

To the Secretary, R.S.G.B.,
53, Victoria Street,
London, S.W.1.

I wish to record a vote in favour of Mr.....

as Town Representative for Swansea.

Signed..... Date.....

Ballot forms to be returned by December 28, 1935.

Note.—A copy of this form will be accepted.

EXCHANGE AND MART.

RATES.

Private members' advertisements 1d. per word, minimum 1s. 6d. Trade advertisements 2d. per word, minimum 3s., cash with order. First line, if desired, will be printed in capitals. Copy to reach 53, Victoria Street, or the Advertising Manager, Parrs, 121, Kingsway, W.C.2. not later than the 1st of the month preceding date of publication.

COLLINS and Marine complete Transmitters, Class B Units, etc.—Send your enquiries to G2NO, American Importers, 11, Lichfield Street, Wolverhampton.

CONTENTS experimenter's workshop, including Treadle Lathe, many accessories. Materials, various apparatus, show case, testing table with drawers and cupboard. Work bench, vices, tools, open to offer.—Sam, 29, Talfourd Road, Peckham, S.E.15.

FACTORY REPRESENTATIVE. — Messrs. Stratton & Company (short-wave specialists) require Traveller for Southern Counties. Good trade connection essential and knowledge of amateur needs an advantage. Full details by letter to—EDDYSTONE WORKS, Bromsgrove Street, Birmingham 5.

FOR SALE.—EDDYSTONE HAM BAND TWO in die-cast cabinet, complete with Mazda valves and coils for 3.5, 7 and 14 mc. bands. One month used; cost £8 5s., accept £7. Also 27s. 6d. Model A. Belling-Lee Pick-up, unused, 15s. Carriage paid.—A. NIVEN, The Litten, Greenford, Middlesex.

G5KT.—Attractive new designs QSL Cards. Lowest prices obtainable. Finest quality. Samples will convince.—QRA, 33, Howard Road, Westbury Park, Bristol, 6.

G6DS For neat and snappy QSL Cards, Log Books and Pads. Send for samples. QRA, "Ingleneok," Orlando Drive, Carlton, Nottingham.

GENUINE R.C.A. and National Union American Valves. Stocks all tested, guaranteed. 59's, 46's, 80's, 83's, and all types needed by amateurs, at ham prices.—Write G2NO, 11, Lichfield Street, Wolverhampton.

HAMMARLUND Comet Pros; write for details and current prices. Instruments always in stock. Supplied cash or on hire-purchase.—G2NO, 11, Lichfield Street, Wolverhampton.

A CHANCE OF A LIFETIME.

HIGH-VOLTAGE CONDENSERS of well-known make. Brand new. Example of price: 8μF. 1,500 volts working (list price £2), 12s. 6d. Send for list of sizes and prices.—(2AYB) W.T.C. RADIO, 2 and 16, Station Road, London, E.17. 'Phone: Walthamstow 2541.

QSL'S AND LOG BOOKS.—You want the best—then write.—G6MN, Worksop, for samples and prices.

QSL'S.—Attractive designs and attractive prices.—Write for samples, G6LX, 222, Eastfield, Peterborough.

ULTRA LOW LOSS COILS, made to any length or diameter. The W's say that owing to their design they keep cold at a kilowatt. The coils are rigid and stand up to rough handling. When ordering, state length between your insulators or plugs, and the coil will be made to fit snug. Vertical or horizontal. 18 to 12 S.W.G. at 1½d. per turn.—Write for descriptive leaflet.—R. V. INDUCTANCES, Mossgrove, Bridge of Allan, Scotland.

VK4WH, Longreach, Queensland, wants exchange stamps with other ham collectors in all parts British Empire. Used or unused.—Write Box 137, Longreach.

GREETINGS TO ALL HAMS from E. PAROUSSI, maker of "Parex" Metal Cabinets, Transmitter Racks, etc., 10, Featherstone Buildings, High Holborn.

Patents and Trade Marks.

GEE & CO. (Established 1905). Patents and Trade Marks throughout the world.—H. T. P. GEE, Mem. R.S.G.B., A.M.I.R.E., etc., 51-52, Chancery Lane, London, W.C.2. (Two doors from Government Patent Office). 'Phone: Holborn 1525 Handbook free.

Tail Piece

Abrupt termination of a QSO heard by G6ZU: "Sa om mni tks for qso. Ur morse sounds like u had the key nailed to the ceiling es u were standing on ur head es sending wid ur left foot."

R.S.G.B.
NOTEPAPER.

RADIO SOCIETY OF G.B.I.U. GREAT BRITAIN

Full quarto size at **2/6** *per packet of* 100 *sheets.*

A.R.R.L. Handbooks. Members	5/-
Non-members	5/6
Call Books. Members	6/-
Non-members	6/6
Call Sign Brooches -	2/6
Enamelled Coat Badges of Emblem R.S.G.B. -	1/6
B.E.R.U. -	1/6
R.E.S. - -	1/6
Rubber Stamps of Emblem, R.S.G.B. - -	1/6
A Guide to Amateur Radio - - - - -	-/8
Radio Magazine Handbook	4/6
Car Plaques of Emblem	3/6
Hints and Kinks - -	2/6

All the above are Post Free, but orders must be accompanied by a remittance.

The R.S.G.B. Sales Department
53, Victoria Street, London, S.W.1

THE FIRST TELEVISION JOURNAL IN THE WORLD

"TELEVISION AND SHORT-WAVE WORLD"

Keep abreast of the many developments that are taking place in television and short-wave work by reading TELEVISION and Short-Wave World, the journal for the specialist.

DEC. ISSUE NOW ON SALE 1/-

PRINCIPAL CONTENTS OF THE DECEMBER ISSUE

The B.B.C.'s Plans for Television.
Development of the Scanning Circuit for Cathode-ray Television.
Prophets of 50 Years Ago.
Simple Television Transmission.
56 mc. Absorption Wavemeter.
New Method of Photo-transmission.
Transmission and Synchronisation with the Goldmark Electron-optical System.
Check on Quality.
Two-valve Short-wave Battery Receiver.
Effects and Laws in Television Physics.
Recent Developments.
Television Night at the Press Club.
Interlacing and Definition.
Checking the Wireless Set with the Cathode-ray tube.
Controlling Background Effects.
Portable Noise Detector.
New Stroboscopic Speed Indicator.
First Steps in High-Definition Reception.
Transmission for the Beginner.
Receiver for High-Definition Signals.
Universal Mains S.W. Three.
3-valve S.W. Superhet Circuit.

Obtainable from all Newsagents and Bookstalls

PUBLISHED BY **BERNARD JONES PUBLICATIONS LTD.**
Chansitor House, 37/38, Chancery Lane, London, W.C.2

THE NEW BRITISH SHORT-WAVE JOURNAL

Printed for the Inc. Radio Society of Great Britain, 53, Victoria Street, London, S.W.1, by Loxley Brothers Ltd., 50, Southwark Bridge Road, London, S.E.1.