The SHORT WAVE Magazine

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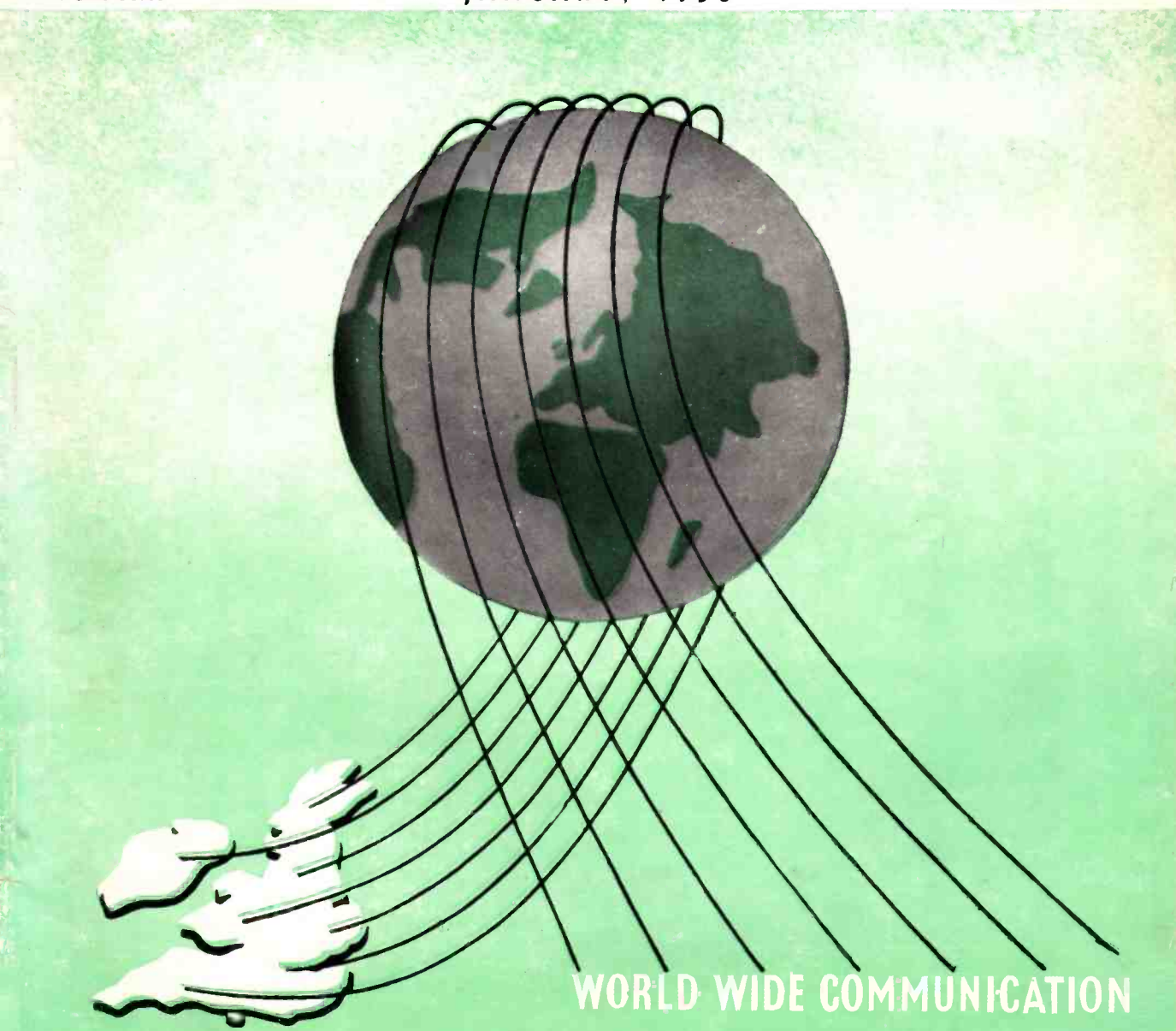

WORLD WIDE COMMUNICATION

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SHORT WAVE MAGAZINE

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FOR THE EXPERIMENTER AND THE RADIO ENGINEER

The SHORT WAVE Magazine

EDITORIAL

Prospects

With the New Year before us, many signs and portents for the future can be seen in the world of radio. Some are good and full of hope, others are not so encouraging, even if not unexpected.

In the latter category comes the deplorable situation into which the radionics industry and the public are being led by the folly of CTV. The operations of the ITA are now reliably estimated to be running at a loss of £12,000 a day — in round terms, £4¼ millions a year, or about six times the annual subsidy being paid to the ITA from public funds. Transmitting times have had to be cut for lack of advertising support — so much for the " alternative service " which it was promised the ITA would give — and already hopeful glances are being turned back towards the BBC by many of those who were so eager to " accept the wider opportunities open to them in commercial television." Even more ludicrous is the other fact that now emerges — that the whole concept of CTV, based as it is on the encouragement of mass sales by advertising appeal, is directly contrary to the Government's present financial policy.

The brighter side of the picture is the expansion of the radionics industry in the fields of automation and nuclear energy, with all the opportunities that offers and the promise it holds for the not-distant future.

In our own kind of radio, the outlook is no less encouraging. The firm basis upon which the whole fabric of Amateur Radio rests is still Communication, and practically all radio amateur activity is subordinated to this central idea. What we all want to be able to do is talk, at will, with our fellows, either across the parish or across the world. The prospects for this have never been better and the coming year will assuredly see a great increase in international communication by Amateur Radio.

For ourselves, it will continue to be the function and the responsibility of SHORT WAVE MAGAZINE *to keep readers in touch with everything of interest to the radio amateur, as we have attempted to do in the year just past. So, it now only remains for us to wish all our readers, wherever they may be, a Happy and a Prosperous New Year.*

Austin Forbes G6FO.

Aerial Coupling Network

FLEXIBLE SYSTEM WITH SCREENED LINK

E. J. WELLMAN (G2HJT)

This article discusses the writer's installation, on the output side, for the suppression of TVI. Of course, for complete success, it demands also that the transmitter should itself be TVI-proofed right up to the PA stage, as is the case at his station.—Editor.

WHEN nearing the completion of the modernised, rebuilt RF unit at G2HJT it became evident that in order to take full advantage of its Pi-output harmonic filtering at 80 ohms, a flexible aerial coupling system and tuning unit were going to be essential. As a follow-up on previous TVI-proofing, already installed, it was thought advisable to put in an efficient low-pass filter in the link between the transmitter and aerial tuning unit. Luckily, at this juncture *Short Wave Magazine* published an excellent article by GM3IAZ on Low Pass Filters ("Keeping Back Harmonics," February, 1954). This unit had all the requirements desired, its outstanding point being the use of non-inductive condensers, which, if carefully constructed, would be theoretically "spot on," and therefore no tuning controls would be needed.

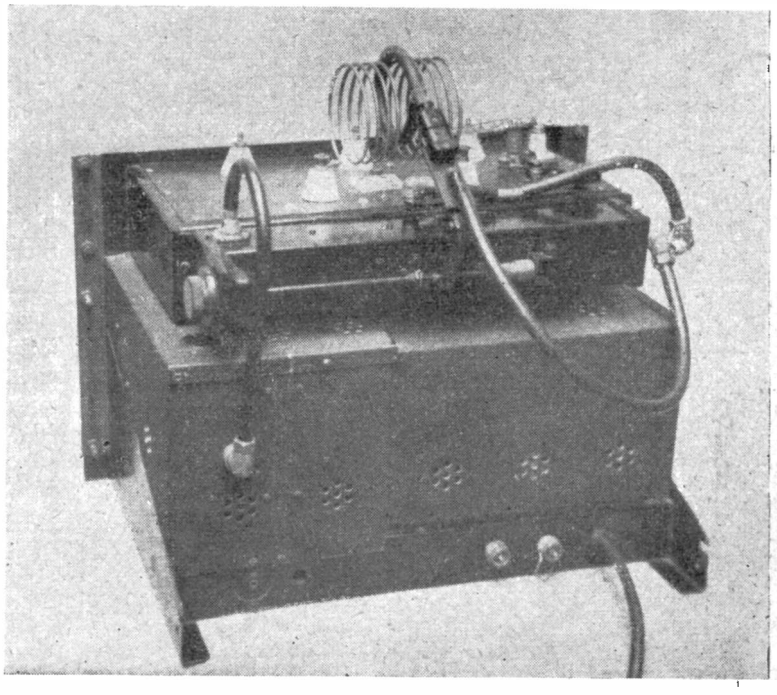
On first reading the article, this filter seemed mechanically difficult to construct. But after a little practice in cutting aluminium and splitting mica you find a "thou." is quite a large unit, and realise you have nothing to fear!

Normally, a low-pass filter is a piece of equipment that neither belongs to the transmitter or aerial tuning unit and consequently gets rather in the way, giving the transmitter something of an "added-on look."

Bearing this in mind and as the transmitter at G2HJT is constructed in a 31 in. Eddystone rack, with the top 3½ in. panel reserved for aerial tuning, it was decided to house the complete coupler, link and low-pass filter in this position. Unfortunately, the makers do not offer a chassis unit for this panel, so a substitute was required; it was made from a TU tuning unit frame split laterally into two equal halves (one for you and one for your friend). The following stages are best understood by studying the drawings, but briefly the TU section is bolted to the 3½ in. panel and the cover plate replaced by a paxolin panel. (The perforated cover can be used as a template for making the paxolin panel.) This took care of the aerial tuning chassis and formed the mounting for the low-pass filter, which was to be installed at the rear of this unit.

Link Construction

In previous transmitters the method of placing the link in the aerial coil had been rather haphazard and had the nasty habit of moving either in or out, upsetting the PA loading and all tuning in general. To overcome this a simple swinging link was designed to be



General arrangement of G2HJT's aerial coupling unit, as described in the text and shown in detail in the drawings, Figs. 1 and 2. The coupler, built as one unit and incorporating a low-pass filter, is mounted directly on the PA casing. The whole transmitter is itself TVI-proofed.

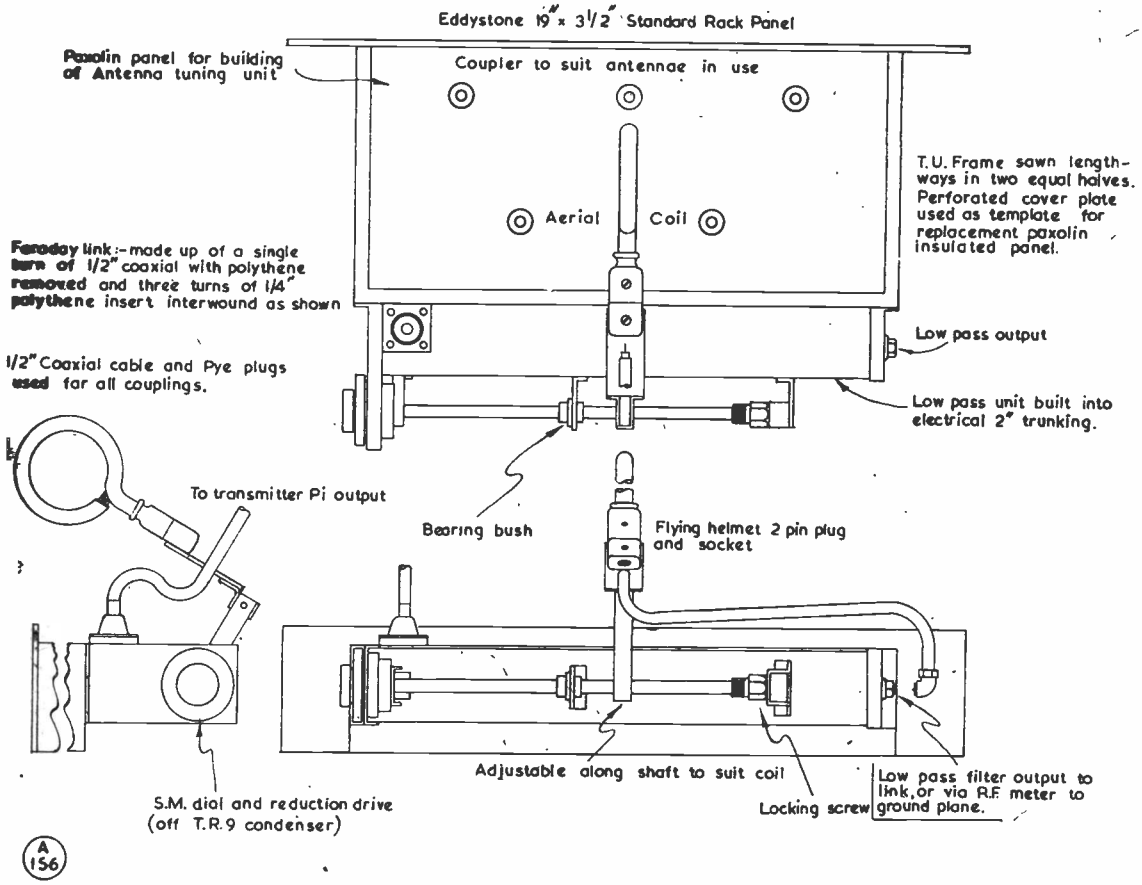


Fig. 1. Detail of the mechanical arrangement of G2HJT's Aerial Coupler Unit with Screened Swinging Link. This drawing should be studied with the photograph. The Low-Pass Filter is as described by GM3IAZ in "Short Wave Magazine" for February, 1954 and illustrated on p. 726 of that issue.

mounted "pick-a-back" fashion on the rear of the low-pass filter. Again this is best understood by referring to the drawings and photograph. But no particular details will be given as the construction relies on the ingenuity of the builder in using the bits-and-pieces on hand —though the TR9 slow motion dials and TR1196 condenser locking screws are a big asset. The main purpose of the reduction drive is to offset the weight of the link and to make it "dead beat." The tendency of the link to fall is also reduced by the weight of the ½ in. coax. feeding the link plug, which can be rotated in its socket to find a state of balance; this can be made to stabilise the link. After the best position has been found for loading, the mounting shaft is locked by the locking arrangement.

To follow up the low-pass filter the link used is of the Faraday type and is easily constructed by cutting a length of ½ in. coax to the circumference of the aerial coil and removing the polythene; about ¾ in. from one end make a hole into which three to four turns of polythene-insulated inner out of 75-ohm TV coax. is inserted to form the link circle; this easily pulls up tight, one end being threaded through the short end of the coax., the other being carefully soldered to the neck of the loop. To complete, connect to the flying helmet type of two-pin plugs. This plug arrangement can also be taken advantage of by connecting a lamp holder to a plug, this making a very convenient dummy load.

Aerial coupler systems vary in almost every station, but the circuit layout given will cover most tuning requirements, and again, ingenuity is needed to overcome the problem of switching from one system to another.

TVI Results

In the writer's case the transmitter works

AERIAL COUPLING NETWORK

POSSIBLE TUNING SEQUENCES

(1)	**Series**	7-3, 8-4
(2)	**Low-Pass** ...	7-2, 3-4, 8-5
(3)	**High-Pass** ...	7-2, 2-3, 4-5, 5-8
(4)	**Ground Plane**	6-2, 3-1 (Condenser tuned)
(5)	**Folded Dipole**	7-2, 3-8 (Condenser tuned)
(6)	**Collins Coupler**	1, 3, 4 earthed; 5 to link on PA tank, *via* coax with sheathing earthed.

For each of the above modes, all other connections must be removed from the numbered points. Numbered points are bridged as given, using flexible leads and plug-socket connectors.

in the same room as the standard commercial TV receiver, which acts as a convenient monitor. In modern practice, to ascertain the source of TVI, drive and power controls are *essential*. With these controls and an unfiltered transmitter the results are quite interesting. For example, without "swamp" filter in the TV receiver, the filtered transmitter on 14 mc is found to swamp, causing the picture to darken and brighten at powers over 60 watts. At full power with the swamp (hi-pass) filter inserted in the TV receiver, no TVI is noticed. On 3·5 mc with transmitter *unfiltered*, aerial direct on to coupler, 40 watts input at 4 mA drive is found to cause TVI. In lots of cases over-drive is the cause of harmonics, but with the system given, even on 14 mc full drive at 10 mA to a pair of 807's can safely be used. The effect of the Faraday link is that it counteracts a badly-tuned Pi-coupler and prevents TVI on initial tuning up.

It is also worth mentioning that the GM3IAZ filter seems to match excellently to the writer's Ground Plane (3 radials sloping 30°) and again no TVI is noticed. The swamp filter referred to in the TV receiver is only required when operating the transmitter on 14 mc or bands higher in frequency. On 3·5 and 7 mc, the transmitter suppression is complete.

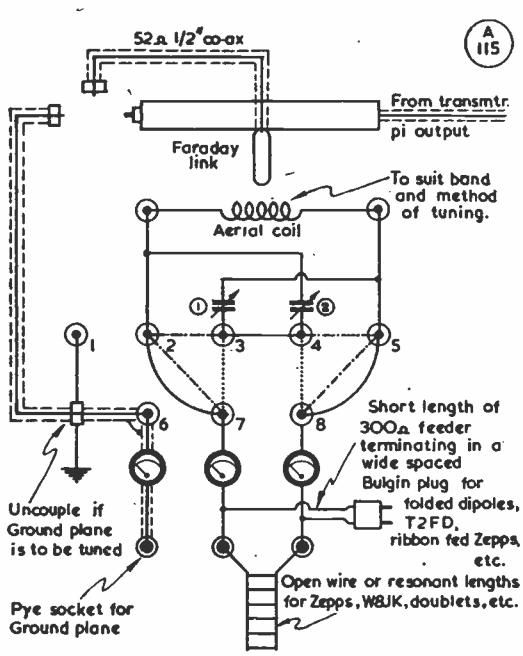


Fig. 2. Electrical layout of the aerial coupling network described by G2HJT. The inter-connection is given in the table and the finished appearance shown in the photograph. Wiring runs from the numbered points can be with flexible leads using plug-socket connectors. The variable condensers are 118 $\mu\mu$F, ex-TU Unit. On high current feeds the RF thermo ammeters may require shunting with heavy gauge fuse wire.

In conclusion, the writer would like to say that the chain Pi-Coupler—Low Pass Filter—Faraday Link—Aerial Tuner is well worth the trouble. It gives a feeling of great satisfaction when the key is pressed to watch the TV screen and see no trace of TVI.

GB2SM — SCIENCE MUSEUM

With reference to the article on pp.543-544 of SHORT WAVE MAGAZINE for December, 1955, we are now informed that G3KAB is not a regular operator on the Science Museum station GB2SM.

DIE-CAST BOXES FOR CONSTRUCTION

Stratton & Co., Ltd., now offer, in the world-famous "Eddystone" range of radio equipment, three well-designed and carefully sized die-cast aluminium boxes. It might be thought that there is not much in producing an aluminium box with a close-fitting lid—for the purchaser, the usual difficulty is to get one the right size to suit the job in hand. These Eddystone boxes are in three sizes: 4½ in. by 2¼ in. by 1 in. deep (6s.); 4-9/16 in. by 3-9/16 in. by 2 in. deep (8s.); and 7¼ in. by 4-9/16 in. by 2 in. deep (14s.); each has a close-fitting flanged lid. These boxes have many obvious applications where the specification is for a compact assembly, fully screened and protected from damage. The boxes are supplied metal-finish only (ready for painting, or spraying).

FIVE MILLION TV LICENCES

The GPO announce that during the month of October, 1955, the number of TV licences increased by over 194,000—this brings the total of TV licences to 5,078,262. The total of sound-only licences in force at the same date was 9,130,223.

Low Power Transmitter

USING MINIATURE VALVES

FOR those interested in the use of miniature valves, here is the circuit of a simple self-powered transmitter which can be built for any band 160 to 20 metres for direct crystal control. Alternatively, it can be VFO controlled merely by removing the crystal and connecting in the VFO drive as marked.

The power supply, shown as an integral part of the transmitter, can, of course, be omitted if a suitable pack is already available. But, again, it shows what can be done with a miniature-type rectifier—the Brimar 6X4 is hardly the size of your thumb. Another small rectifier suitable for the purpose is the Mullard EZ80, which is rated rather more generously than the 6X4.

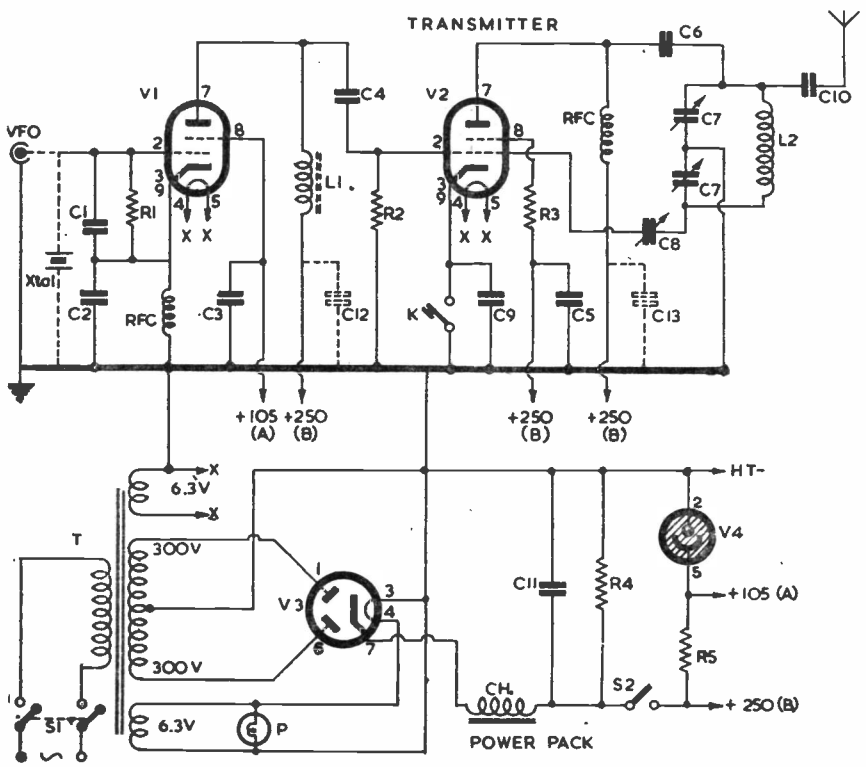
Some Circuit Points

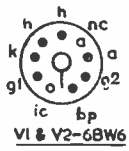
Condensers C12 and C13 are probably necessary for operation on 160 and 80 metres, even if they are omitted on the HF bands. The 6BW6 in the PA can be run to the full 10 watts, with from 250 to 300 volts HT. It should be noted, incidentally, that the 6BW6 is a better valve for most applications (where either could be used) than the 6AQ5.

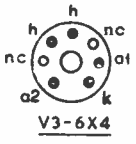
Table of Values

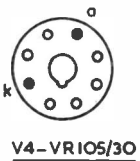
Circuit of the Low Power Transmitter.

C1	=	10 $\mu\mu$F, mica
C2	=	200 $\mu\mu$F, mica
C3, C5, C9	=	.01 μF, paper
C4, C6	=	500 $\mu\mu$F, mica
C7	=	50 x 50 $\mu\mu$F (*see text*)
C8	=	Neut. capacity (*see text*)
C10	=	30 $\mu\mu$F mica, or 50 $\mu\mu$F variable (*see text*)
C11	=	8 μF, elect.
C12, C13	=	.001 μF, mica
R1	=	50,000 ohms, ½-w.
R2	=	15,000 ohms, 1-w.
R3	=	10,000 ohms, 2-w.
R4	=	50,000 ohms, 2-w.
R5	=	3,000 ohms, 7-w.
RFC's	=	As appropriate for bands used — 2.5 mH for LF, 1.5 mH for HF bands.
V1, V2	=	Brimar 6BW6
V3	=	Brimar 6X4 (or Mullard EZ80, *see text*)
V4	=	Brimar VR-105/30
Ch.	=	10 Hy., 100 mA
Trans.	=	300-0-300v./100 mA, 6.3v. twice
S1	=	DPST, mains on-off
S2	=	SPST, HT on-off
P	=	"Live" indicator, panel lamp
L1, L2	=	*See text*









Circuit of the VFO/crystal two-stage transmitter, using miniature valves. The power supply can be omitted if something suitable is already available. For more output, V2 could be a Brimar 5763, which would give about 8 watts RF power at 300v. HT. It would also be possible to use a 6V6 for V1 and a 6L6 for V2. For screen modulation, C5 should be reduced to .001 μF.

which is the miniature version of the 6V6.

For CC working, a fundamental crystal is required for 1·8 mc, doubling in V1 to 3·5 mc for operation on 80 metres; for the 7, 14 and 21 mc bands, a 7 mc crystal can be used, either fundamentally, doubling or trebling at L1.

The PA V2 will need neutralising, C8, on the HF bands, since the grid-anode capacity of the 6BW6 is 0·6 $\mu\mu$F. This is a very small capacity to get (even though it is sufficient to set the valve off) and is best done by twisting a pair of insulated wires together until V2 cannot be made to self-oscillate in any circumstances.

Coil Data

L1 can be a slug-tuned coil, using 32 SWG enamelled wire on a ½-in. dia. Aladdin former, loaded as follows: For 1·8 mc, 200 turns pilewound; 3·6 mc, 90 turns pilewound; 7 mc, 40 turns, even wound; 14 mc, 20 turns even wound; 21 mc, 15 turns even wound and slightly spaced.

With the suggested value for the split-stator condenser C7, inductance values for L2 are: 3·5 mc band, 72 μH; 7 mc, 20 μH; 14 mc 5 μH; 21 mc, 2·15 μH; and 28 mc, 1·3 μH. In terms of physical dimensions, this would mean: For 3·5 mc, 82 turns 24 SWG enamelled, close-wound on a 1-inch diameter former (winding length 2 ins.); for 7 mc, 30 turns as before, ¾ in. winding length; for 14 mc, 15 turns 18 SWG enamelled, closewound on a 1-in. dia former (winding length ¾-in.); for 21 mc, 7 turns 18 SWG, 1-in. dia. former, turns spaced over ¾-in.; for 28 mc, 5 turns 18 SWG, as before.

For the Top Band, C7 is too small and would have to be paralleled with a fixed capacity of 25 $\mu\mu$F. The inductance value for L2 would then be 148 μH, and this would be given by 60 turns of 20 SWG enamelled, on a 2¼-in. diameter former, the length of the winding being 2½-ins. approximately.

If it is intended to use the transmitter mainly on the LF bands, 1·8 and 3·5 mc, it would be better to increase the size of C7 to 150 $\mu\mu$F per section. A suitable condenser for this is the Jackson Bros. ("J.B.") type C603/SE18. If this is done, the values of L2 will need to be adjusted accordingly. For HF working, C7 can be the "J.B." type C603/SE6.

Construction

While the experimenter will have his own ideas about this, it can be said that the whole transmitter section will go on a chassis about 6 ins. by 3 ins., as the circuitry round V1 takes up very little space. The general layout should, as always, follow the sense of the circuit diagram. Matters should be so arranged that no part of C7/L2 can "see the grid" of V2, otherwise neutralising will be very difficult; it may be necessary to put a small screen in to effect this.

The space required for the whole transmitter *with* power supply will depend rather upon the size of the mains transformer that may be obtainable. The R.S.C. 300v./150 mA drop-through type used on the model requires a chassis space of 4 ins. by 3½ ins.

With a 6X4 for V3, the output available at the "B" connection on the power pack is 25-30 mA; substituting a Mullard EZ80 (also a miniature-type rectifier), it would be about 50 mA.

Keying and Modulation

In the circuit as shown, keyed in the cathode of V2, a good clean note is obtained, with no trace of spacer at any distance. As mentioned on p.529 of the December issue of *Short Wave Magazine*, a resistor of 50,000 ohms or more should be connected between the cathode of V2 and one side of its heater, to protect the valve under key-up conditions. (This resistor is not shown in the circuit.)

The PA could be fully modulated by plate-and-screen control, with about 5 watts of audio —say, with a Mullard EL84, which takes a B9A base and is classified as a miniature type. For really economical—but not so efficient—operation, V2 could be modulated on the screen alone with less than 2 watts of audio. To do this effectively, R3 would have to be removed and the screen supply for V2 taken through the secondary of the modulation transformer to the 105v. tap on the power supply. With a Brimar 6AM5 as modulator (fed from a *separate* supply), full modulation would be obtained through a 1 : 1 modulation transformer; the latter could be any small iron-cored item capable of carrying a few mA on the secondary side and about 20 mA in the primary, in the plate of the 6AM5; C5 should then be ·001 μF.

With screen modulation, however, the RF power output from the PA would only be about half that obtainable under "full CW conditions," *i.e.*, with normal screen voltage. This is the factor that limits the usefulness of screen modulation, except for local working or when a large PA valve is used which can be run at high plate inputs at the low screen voltage.

Aerial Connection

For the bands 3·5 to 28 mc, the simplest

aerial arrangement to use is an end-on wire 136 feet long, coupled through C10 as shown in the circuit. This can be a fixed capacity, as given, or a 50 $\mu\mu$F semi-variable, so that the loading effect can be reduced on the higher frequencies.

The points put forward in this article are offered for the interest, guidance and information of the experimenter. The theme can be varied in several other ways, which will suggest themselves to readers who like the idea of getting much out of little.

Suspended Ground Plane

SIMPLIFIED CONSTRUCTION

N. P. SPOONER (G2NS)

GROUND-PLANE systems are usually visualised as being mounted on a pole or metal pipe standing in the ground, on a flat roof or firmly lashed to a tree or chimney, or even built on a specially-constructed plinth. Some amateurs with full business and domestic commitments may already have decided that while quite devoid of complication, this type of mounting still entails time and labour that cannot always be spared. Renewed interest may therefore be aroused by the writer's method of suspension that cuts constructional effort and materials down to the bare minimum, indicated by Figs. 2 and 2A.

The scheme consists simply of hanging the Ground Plane downwards from a rope suspended where convenient between existing poles, or chimneys, or trees. Sagging is prevented by using lightweight Telcon coax feeder (50 feet weighing only 14 ounces) and counteracting loss of effective height due to rope shrinkage during wet weather by two weights hanging from the rope ends. To the financial advantage gained by the complete absence of rod, tubing, wood or piping is added the domestic advantage that "another radio confloption," as she might term it, does not have to spring up in the XYL's garden.

For the information of readers who do not know the Ground Plane, it consists usually of a vertical radiator, slightly less than a quarter-wave in length, fed by coax at its low-voltage base where elaborate insulation is not required. The impedance at the base is approximately 30 ohms and to it is joined the inner conductor of the coax, while round it but not touching it, are four wires joined at the apex and spaced 90 degrees apart, each wire being slightly more than a quarter-wave in length. The outer braiding of the coax is joined to these radials, as they are termed, and their purpose is to form a ground-mat and endow the system with its popular DX low-angle radiation characteristic.

Matching

The impedance of the base can conveniently be increased from 30 ohms to about 40 ohms by the simple expedient of slanting the radials downwards towards the ground at an angle of approximately 45 degrees from the horizontal. A reasonable match will then be obtained by using Uniradio 4 coax feeder. By altering the matching angle to about 30 degrees, the impedance becomes approximately 52 ohms and a reasonable match will be obtained with RG-8/U, RG-17/U or as used in the present case, lightweight Telcon K16M.

What about 72-ohm coax? This will provide a match when the radials are dropped straight downwards as if they were a continuation of the radiator but unfortunately the ground-mat characteristic is then completely lost and the system immediately becomes a

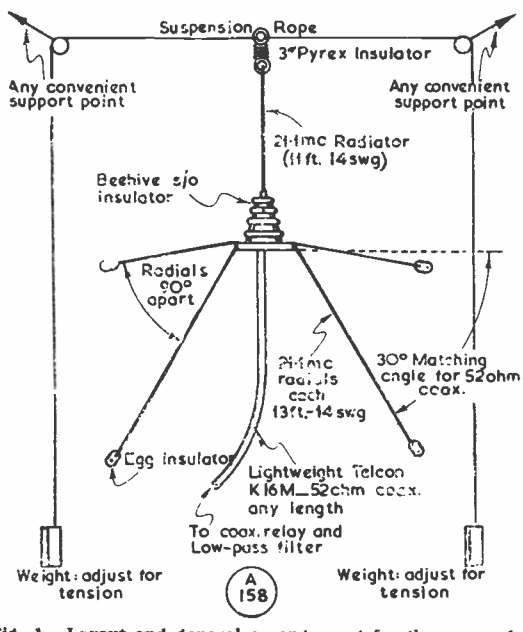


Fig. 1. Layout and general arrangement for the suspended ground plane as used by G2NS. The suspension cords can be fixed from any convenient point, and the radial anchorages keep the whole thing steady in the vertical plane. The Ground Plane is proved to be a very effective DX aerial on the HF bands.

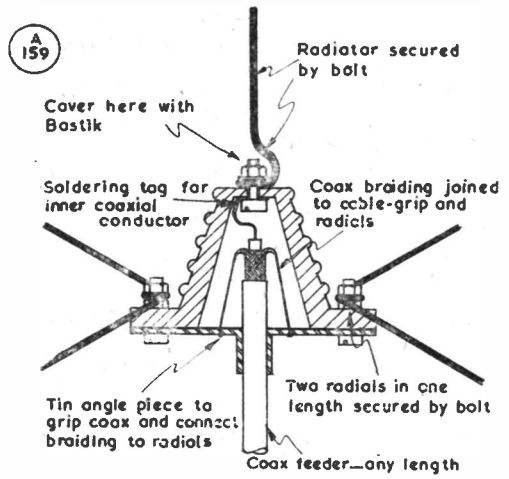


Fig. 2. Detail of centre fitting, showing arrangement inside the large beehive insulator which acts as the centre connector.

centre-fed vertical half-wave dipole dependent upon the nature of the sub-soil for any low-angle radiation it may retain. In most cases the drooping radials are called upon to act as guys as well as a ground-mat and by cutting the full length of each for 7 mc and then splitting and inserting insulators at the 14, 21 and 28 mc points, four-band operation becomes possible. With the system mounted in the usual manner on an easily-lowered pole or pipe, the radiator can consist of whip-rod or tubing and when altering its length for the band required, the appropriate radial section can be brought into circuit by shorting across the insulators where necessary. To avoid disturbing the omni-directional radiation pattern, it is advisable to run the coax feeder down and below the reach of the radials before turning it towards the shack.

Scope

While it falls far short of being the ideal aerial, the Ground Plane can lay good claim to the suggested title of "Built-up Area DX'er" because for the city-dweller it ignores the nature of the sub-soil, requires only a moderate height above ground and virtually no space. It appears friendly towards amateur aerials of a different breed and when the neighbourhood is TVI-proof (no 14 mc IF's) it should not attract undue complaints from viewers or listeners. Its vertical polarisation gives improved local coverage for mobile station contacts and control and when used together with a rotary beam on the same band it provides the quickest check of the two on the actual direction from which the best DX is arriving. This facility should prove useful to investigators of the 28 mc scatterback phenomenon brought to light by G2CDI in the July, 1947, issue of *Short Wave Magazine*. Acknowledgments for the matching angle, the radiator and radiator lengths, given in Fig. 1 for 21·1 mc working, are due to G3HLW, who as ZB1HLW worked officially on Ground Plane research and design when in the island.

With the writer's suspension method, any type of coax, with its correct matching angle, can be used if effective height is not too greatly

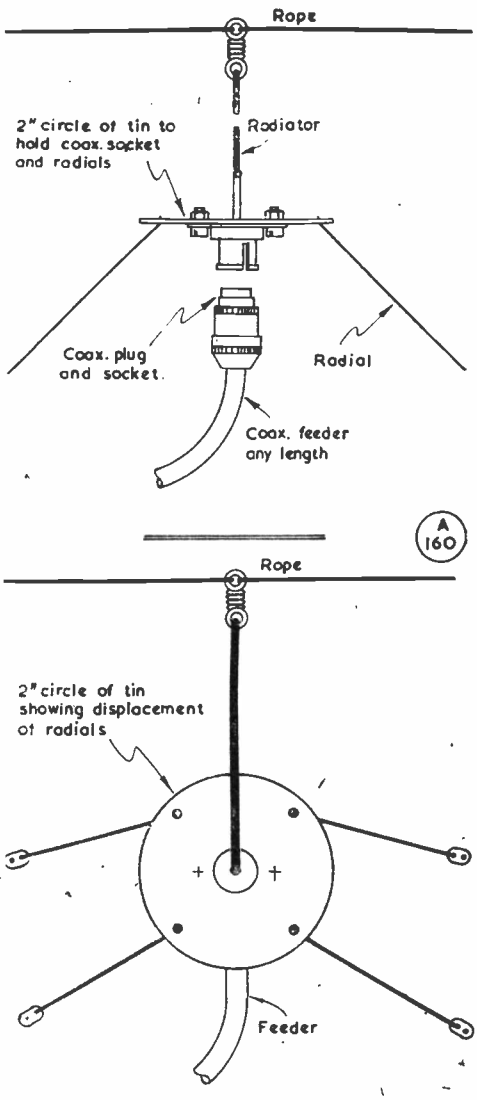


Fig. 2A. A simplified form of construction, where the assembly can be made light enough. The centre connector, both in this case and in the Fig. 2 arrangement, should be smothered in Bostik before being pulled up.

reduced by sagging. The egg insulators are for staying the radials at their 30-degree slant and 90-degree spacing. In the present case the rope is 30 ft. above ground, the radiator base about 20 ft. and the radial tips about 10 ft.—all in the clear and as far as possible towards the centre of the garden. From the simple construction suggested, the next logical step would be a one-band pipe-mast system, crowning a convenient chimney with radiator and radials of duralumin tubing.

Alternatives

For the benefit of readers interested in other methods of matching, without resorting to stubs, the base impedance can be increased fourfold, to about 120 ohms, by folding the radiator in the manner of a dipole. When the fold and the radiator are both of the same diameter, feed might be accepted from a 150-ohm ribbon if one conductor was taken to the fold and the radials, and the other conductor to the insulated radiator base. Folding in the same manner would also provide a match for 72-ohm coax if the diameters of the radiator and fold were different and a trombone section was included to provide a means of altering the lengths—but this would begin to make the thing a nuisance mechanically. For those who like stub matching, the 21·1 mc system described can be fed with 72-ohm coax when a couple of quarter-wave sections each measuring 7 ft. 8 ins. are paralleled and inserted between the base of the radiator and the feeder line proper. Alternatively, one single quarter-wavelength of 52-ohm coax inserted between the base of the radiator and the 72-ohm feeder line will affect the same matching.

The low-angle radiation characteristic of the Ground Plane can be verified if a change is made during a QSO to another existing aerial system, *while conditions on the band are changing*. In the writer's case, with an alternative long-wire, stations in W5, W6 and W7 invariably report the Ground Plane to be one S-point and better than the long-wire when a change is made just as the band is dropping out. The same applies when the band is just opening up. These results are with a Ground Plane system only ten feet from the house and shielded to the West, has its base only fifteen feet above ground, and its four radials stayed back into some apple trees.

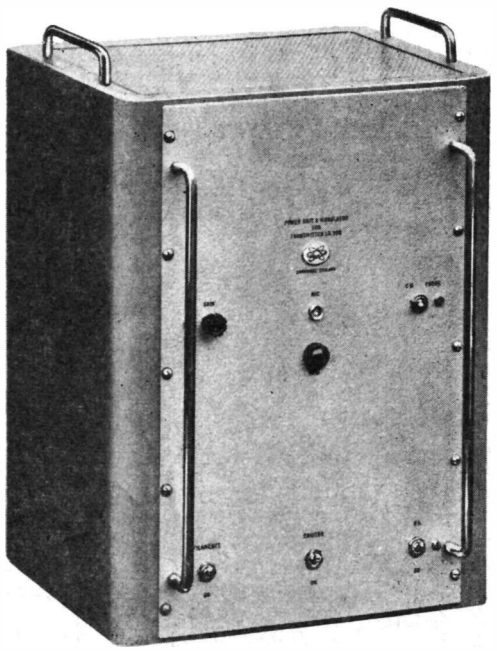
Wherever one is led by experimentation, 21 mc already shows good promise of becoming a band where, so to speak, the mere rubbing together of a couple of wires in an English hamlet will be heard in California !

PSU-MODULATOR for the LG.300

Labgear now have available a power supply unit and modulator specifically designed for the LG.300, reviewed in our November 1955 issue. The power supply side, speech amplifier and modulator are built, as separate sections, into a substantial cabinet corresponding in size and general appearance to the LG.300 itself—*see* photograph herewith.

This PSU-Modulator is capable of running the Transmitter at 150 watts input, fully modulated, on all bands 3.5 to 28 mc inclusive; a complete set of interconnecting leads fitted with the appropriate plugs and sockets is provided. The load on the mains at full output is 700 watts, and the maximum audio output power 80 watts. The valve sequence in the speech amplifier-modulator is ECC81-6N7 into two QVO6-20's in Class-AB1. The rectifiers are four Brimar 5R4GY's. The speech amplifier is suitable for any of the usual types of crystal microphone, and the frequency response, 300-5000 c/s, is such that excellent speech quality is assured.

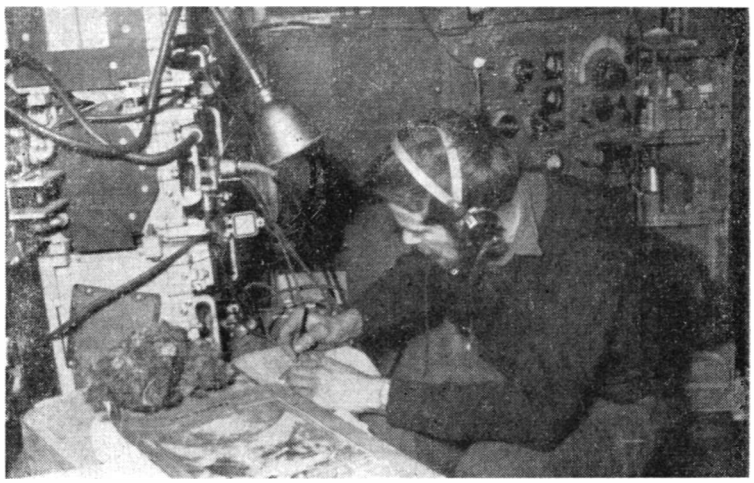
Control switching for the Transmitter, operating either CW or phone, is arranged on the front panel of the Power Unit, and a socket is provided for remote "transmit/stand-by" control. The price of the PSU-Modulator, complete with all valves, screened inter-connecting leads, plugs and sockets, is £80 nett. The manufacturers are Labgear (Cambridge), Ltd., Willow Place, Cambridge.



The Power Supply Unit and Modulator for the Labgear LG.300. As described in the accompanying note, it will run the Transmitter at the maximum input of 150 watts on all bands, with full modulation.

DX COMMENTARY

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



G3AAT/OX

JANUARY comes round again, and once more (for the tenth time as your Commentator) we wish you all the best of DX in the coming year. And this one does with considerably more foundation for it than for many years past. In saying good-bye to 1955, we are parting with a momentous year in Amateur Radio—one that has shown us the shape of things to come. Do not forget that many of those who have been thrilled by the steadily-improving conditions have been observing this phenomenon for the very first time, having been weaned on dead bands and poor DX. So, on into 1956, which we hope will start the Age of Plenty for all DX-chasers.

As usual with January issues, we have rather a dearth of reports. Publication date for the December issue was rather late in the month, the dead-line for this one was early on account of the Christmas mail, and naturally people were too busy with shopping and the preoccupations of Christmas to bother about dropping a line. However, those who have written have been quite newsy enough for us to build up a sound picture of the past month's DX.

CALLS HEARD, WORKED and QSL'd

Top Band DX

The best news of the year was received when the contacts between G and ZL were reported (in the November issue). Despite a lot of hard work in Hong-Kong, the VS6's did not make themselves heard over here. As some small compensation, though, VS6CQ worked ZL3GQ on November 5. Attempts to get through to W's were unsuccessful, and VS6CQ is by now back home, leaving VS6CW and VS6CZ to carry on.

On November 6, TI2BX was on the band, calling W's; on the 20th he was at it again. And South America now comes into the picture, for on November 14 G3FGT (Birmingham) reports working HC1JW! This is, we think, the first HC/G contact, and a very nice piece of work.

On November 20, LU1EL is reported by W1BB as "heard in G-land"—but we don't know by whom. However, on the same day G3PU (Weymouth) worked ZL1GX (449/559) and the ZL also heard G6VC. G5JU was replied to by LU1BL, whom he hopes might be genuine, but no QSL as yet. Up to the 20th, U.S.A. stations were bothered with QRM and QRN, but on November 27 things were better; KP4KD and KZ5PB were worked by W's, but no G's were contacted. W1BB suggests, already, that this may be another season in which the North/South paths will predominate over the others.

Other items of news: VP1SD will be on 160 metres this season; W3FBV will be very active testing out various aerial systems; W6SK will be around; and W5SOT (New Mexico) will help with your Top Band WAS!

Late Flash: G5JU worked W2WZ, K2BWR, W1EPE and W1BB on December 4; also heard W3EIS and KZ5PB. On December 11 he worked W2WZ, W2QHH, W2RM and W1BB. A GM station was calling W1BB on the latter's frequency, while he was transmitting! Can't these chaps read?

Also on December 11, G3IGW worked W1BB—his first WDX after five years of trying. He heard others, also DL4HC on phone and other DL's on CW.

County-Chasing

The internal Top-Band activity has slackened off a little, as we all knew it would when the other bands started to liven up. We must console ourselves with the thought that One-Sixty made a fine stop-gap while the outlook was grim everywhere else.

G3JHH (Hounslow) has settled down again and will remain on the

band for a few weeks. He finds that fish-fone has increased since his last session; was pleased to hear G3ARS putting Rutland on the map; and would like a QSL from Denbigh! Best QSO to date was with GM3KLA (our northernmost station), who QSL'd very promptly.

GM3AUD (Ross-shire) asks whether the counties in Eire count towards WABC . . . the answer is most definitely in the negative! Though A.J.D. accepts them for VHFCC, the fact is that EI's are not normally licensed for Top Band—EI8J is an exception—and WABC has, in any case, always been confined to U.K. counties. GM3AUD also raises some queries about the L.C.C. area and the overlapping counties, the answer to which is that "London Postal Districts" count as London, the rest as—wherever they are.

G3ICH (Leighton Buzzard) worked GM3KLA and GM3DOD but says he finds it harder going these days, with an almost complete absence of GI and GC stations, and GW's not exactly overcrowding the band.

G2CZU (Bath) has now worked his 60 counties, but as one of them (Breconshire) will not spill a QSL he has got to go out and look for another. 'CZU finds he has worked 29 on phone, but the little rig on which he did that is now used at the Club station G3IVL. G3FTV (Ripon) now possesses two WABC's—one for the home station and one for G3FTV/A. During the last year he has been running 5 watts and is now reduced to a battery set with 2 watts!

G2NJ (Peterborough) has no mast at his home QTH, for the first time since 1922! So he transmits only at week-ends, from his boat in Hunts. He confirms that G3ARS has moved from Lancs. to Rutland, whence he is putting out a nice signal.

Eighty Metres

There is still very little interest in *Eighty*, and, as we have said before, one can't wonder at it. Why, we remember the days when . . . (no, we won't!) At the present time, anyone not endowed with a supernatural amount of patience writes this one off as a dead loss.

G6LB (Chelmsford) reports a few W's in the early hours, and was pleased to get one at night "just before TV ended," but he had to dig him out from under the fourteenth layer of slime, as he says. G3JHH finds his new 132-ft. aerial paying dividends, and he raised CT2BO with 20 watts. Later, he found a new one in HA8WS, who gave him a long QSO and tried out his QRP rig. 'JHH is still chasing after the WASM Certificate, which he will have to master on Eighty only, as he can't yet work any other band.

G3IGW says 80 metres is really opening up, and he has worked W's as early as 2215 GMT. He also collected VE1ZZ and IT1TAI on CW, with EA and OH on phone.

Forty-Metre Doings

There is also a scarcity of reports on *Forty*, although that band is quite full of DX on occasions. However, people don't like doing things the hard way these days, and who can blame them?

G6LB says 40 metres is worthy of more attention than it gets, and he recently worked KP4KD when it appeared almost devoid of signals. This was their first QSO for 26 years! G3CMH (Yeovil) collected a new country in the shape of LZ1NAB.

Certain DX countries make far more use of Forty than we do in Europe—doubtless because we are in the centre of all the QRM. We have seen a letter from ZS1PD, for instance, saying that he often works as many as *sixty* W's between 0330 and 0730. He is now ZS8L . . . will that attract more G's on to 7 mc?

DX worked by W3ECR, W9HUZ and W9NN on *Forty* during the middle of November included 4X4, YI, VK, ZL, SVØ, CR7, PY and PZ. W3ECR runs a full-size 3-element beam on the band!

G2YS, Filey, Yorks., is well known both as a DX operator and an outstandingly successful club secretary—first he put Coventry and then Chester into the first flight of active clubs. Now he has retired to the comparative peace of "PRO, Scarborough," and here we see him with his Panda PR-120V transmitter and AR88 receiver, winkling out a new one on 21 mc.

The trouble with Forty is now likely to be lack of population, rather than poor conditions; with Fifteen and Ten opening up as they are, we must expect a mass QSY of DX-happy types.

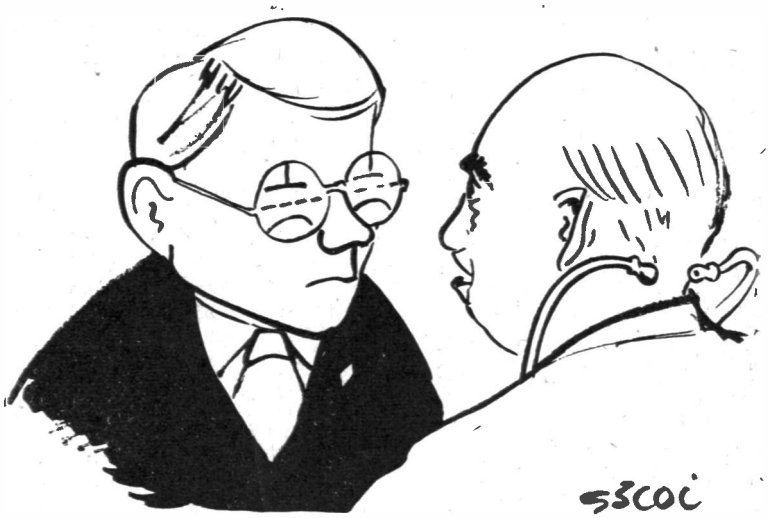
The Overseas Mail

ZC5CT (British North Borneo) has been doing a fine job putting three countries on the air, for he was very active as VS5CT (Brunei) and VS4CT (Sarawak). His rig was a Panda PR-120V, an HRO and a BC-221, with two 20-metre dipoles at right-angles to each other. Power came from a generator driven by a petrol engine, shared with the 500-watt LF transmitter, which is part of the chain of navigational aids along the coast of Borneo. Times of operation on Twenty depended upon the hours kept by the main equipment.

21 mc MARATHON

(FINAL APPEARANCE)

STATION	COUNTRIES
G4ZU	138
VQ4RF	137
VQ4RF (Phone)	135
GW3AHN	134
G4ZU (Phone)	133
G5BZ	125
G3HCU (Phone)	117
G3FXB	113
DL7AA	109
GW3AHN (Phone)	108
G3DO	106
G3FXB (Phone)	104
G3FPQ	100
G6QB	100
G3TR (Phone)	98
ZS2AT	92
G3CMH	85
G2YS	84
G2BJY	83
GM2DBX	81
G2VD	80
GM2DBX (Phone)	79
ZB1KQ	64
5A2CA (Phone)	60



". . . . Whatever your hobby is, my boy, you've been overdoing it . . . ."

During 6½ months on Twenty, Pete had about 1500 QSO's with 94 countries, and finds the QSL situation quite a problem. He was the only European on the station, which is right in the jungle—eight miles from the nearest native village.

If you want any of these three countries now, you're too late, because Pete has reverted to the prosaic G3DCT, c/o 15 Western Road, Brentwood, Essex.

MP4BBX has just started operation in Bahrain on 14, 21 and 28 mc, with 60 watts to various ground-planes. His first contacts, on December 1, were with YI2AM, ZL3RB and VK2ACX—all on phone. (He says he uses phone because key-clicks are a problem!) 'BBX will be very glad to meet anyone from Yorkshire, his home county.

K6DV (San Jose, Calif.) remarks that he is a "pioneer in wireless," dating from World War I, but he still hasn't got WAC, being short of a card from Europe. (If DL1FF or G5RI would oblige, he would be a happy man!) We have already read about the "Beer-Can Antenna" as used in the States; K6DV says that JA8AE is an engineer in a fish cannery, and proposes to make himself a massive vertical with fish-cans, so he might be easy to hook . . .

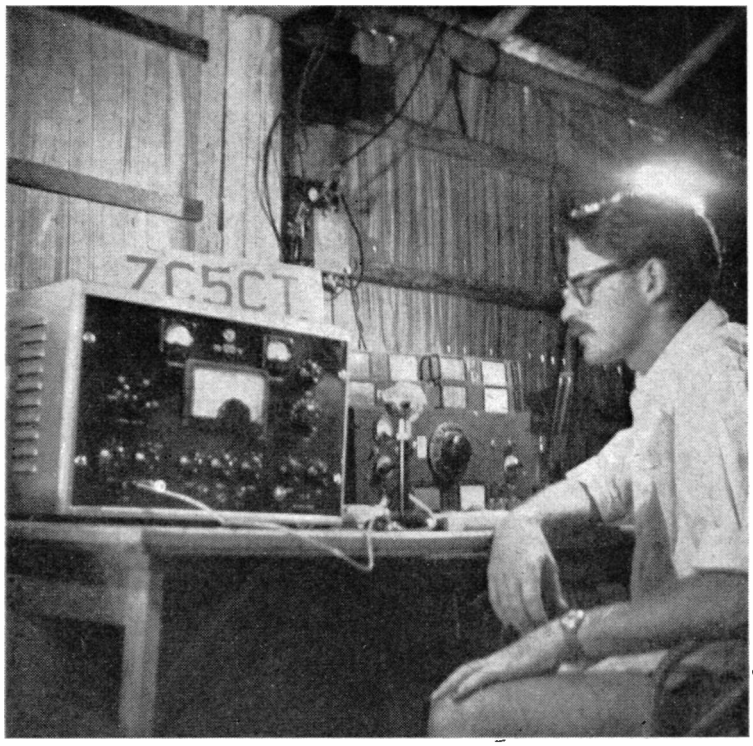
Conditions have brightened up no end, says ZE3JO (Salisbury), with Twenty as the best band (PJ, VP5, TI, CX, KH6, KZ5, KG4 and the like). Fifteen has also improved, and Ten has opened with a rush. But he doesn't like the way the phone stations have squeezed right down to the CW end of Ten, and hopes the CW men will do more to stake their claim. Mal asks whether C3BF (Formosa) was genuine — he worked him about three years ago, but has never had a card.

VQ4DW (Nakuru) writes to say that some pirate is using his call, mostly on Forty CW and calling himself "Mike." The real 4DW has been off the air for eighteen months; he is recovering from a mild attack of polio, and we wish him a rapid return to good health and activity.

The DX on Twenty

Much of what is floating around on this band receives a mention further on, under "DX Strays." For this present section we must confine ourselves to the few actual reports received from this month's correspondents.

G5BZ (Croydon) mentions some good stuff in the mornings, and after trying for 26 years to raise an FK8, he collected both FK8AB *and* FK8AO! He also worked



One of the DX rarities of recent years has been ZC5CT. Here he is, in his jungle station 40 miles from Jesselton in British North Borneo. Power was from a petrol-electric set. Operating on 20 metres, ZC5CT had 1500 QSO's in 94 countries, from his locations in Brunei, Sarawak and North Borneo. Because ZC5CT aims to QSL 100%, the provision of QSL cards, to the number of well over a thousand, was a serious problem; they had to be printed in Singapore, and took a month to reach him (if there was a mail). At home, ZC5CT is G3DCT and he is now back in this country.

JA6, JAØ, KL7 and 3W8AA; the latter says he is in Hanoi, Vietnam, though 3W is officially the prefix for Cambodia. Things are so chaotic out there that no one seems to know which government controls what, so we can't settle it.

GM2DBX (Leven) worked F9RY/FC in November, and was glad to get his QSL. A card also arrived from KW6BD, but he was worked in 1952! TG9, YV and VP3 also turned up. G3JJZ is now operating from G3HXZ (RAF Compton Bassett) and appreciating the good aerial facilities. W, PY, LU and CE were worked on a quick check-out.

Fifteen Metres

G5BZ didn't raise any new ones, but found things pretty good. G3CMH, very active, rolled in CX2CO, FY7YE, HC1ES, OA5G, TF2WAS, UQ2AN, VP6FR, ZD3BFC and K6EST/MM, all on phone; his score is now up to 85. G3JJZ raised his first station on the band—W8EV.

It seems that many G's still need Mexico, not only as a country, but as a Zone 6 contact. For years it has been difficult to find one on CW on any band, although the XE phones have been in evidence, if not numerous. Now, however, we seem to hear XE1PJ almost every day. He sits around 21040 kc and is a terrific signal between 1300 and 1500—and there doesn't seem to be any difficulty in raising him.

Other unusual ones which *can* be worked on Fifteen, if you happen to hear them, are: UC2AA, UB5KBA, UA9CC, EL2P, KG6AFY, KL7BFW—all on CW. The real rare ones like XW8AB, 3W8AA, YA1AM and the like all seem to stick to Twenty at present, but we hear encouraging rumours about a possible QSY for some of them.

Last-minute report from G3HCU (Chiddingfold) tells us that he has worked CR7, CR9, HR, UB5, VE8, VK, VS6, ZL and ZS during the month; also that he had miscalculated his score and the addition of UB5KAA makes it 117, phone only.

Ten Metres

G5BZ has been putting up his 28 mc score with the help of YV, PJ, YO, ZS3, LU and HC—all on phone except the PJ. GM2DBX has also been on phone, and has pulled out ZD6, CX, VQ4, HZ and CR6.

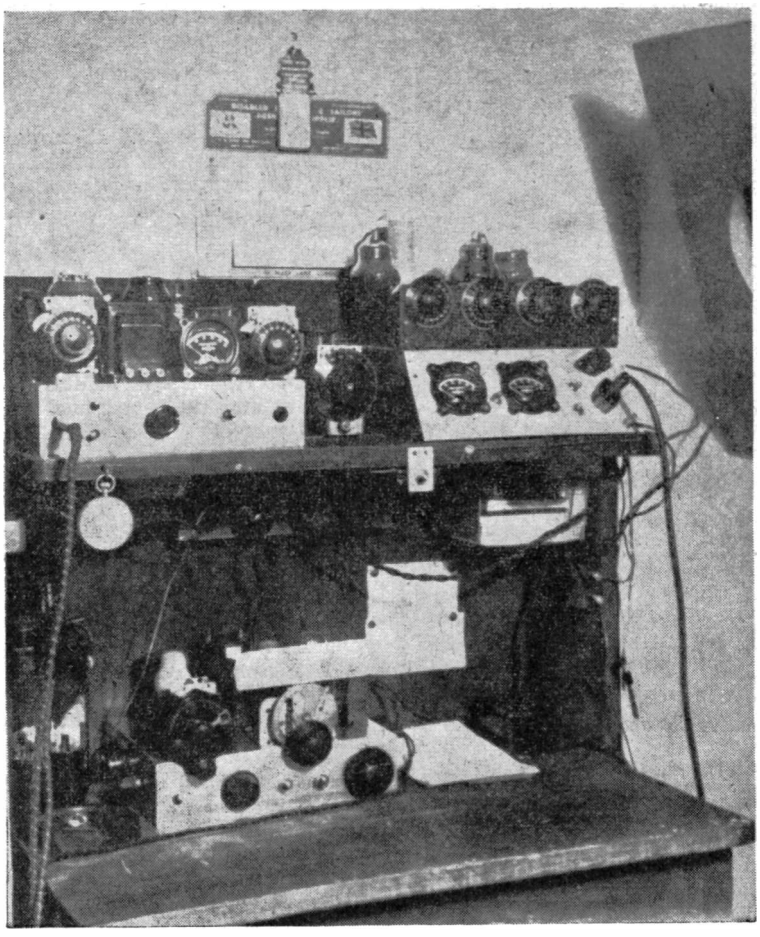
G3IDG (London, S.W.12), who always follows the band through thick and thin, logged 36 countries during the month (26 of them DX). On phone were CO, HK, YN, YV, ZD6 and ZS3, all between 1200 and 1500 GMT, others being CR9, CX, OA, OD, VP9 and many of the less rare ones. G3IDG is still running 10 watts to an indoor dipole, and on this he raised YO3LM for a new one.

There were very few days during the past month without an opening of some kind on Ten, and the W's were there in full force on most of the occasions when we inspected the band. VK's and ZL's on phone were surprisingly strong on at least four occasions, but, as always, there was a lack of CW activity. It seems to be necessary to hold a contest to bring out the key-punchers on Ten.

G3HCU put up his new beam, with the help of VE3ATU, who was staying with him for three weeks. It is a 3-element 0.15-spaced array, 40 ft. up, and on the first trial 'HCU raised VS6, VE, VK, ZL, ZS and Europeans. He is now all set for our 1956 Marathon—*see* later paragraph.

ARRL Contest

We have received advance notice from the ARRL that their 22nd International DX Competition will be held on the following dates: ***Phone,*** February 10-12 and March 9-11; ***CW,*** February 24-26 and March 23-25. Operations start and finish at midnight



Example of a four-band station built on a shelf type of operating desk. This is the QRP outfit at G3OV, Rotherhithe, as it was some time ago. Bands used were 20-160 metres, with inputs of 5 watts or less, CW and phone. G3OV is now located in London, S.E.1.

GMT on the dates mentioned.

As in last year's event, the stations inside Canada and USA will be sending their State or Province after the RST or RS report; other stations throughout the world will send three numerals representing their power in watts.

This identification by the W/VE stations makes the contest more interesting and sets everyone the goal of WAS on every band. You have 48 States, 10 Canadian Provinces, Yukon and N.W.T. to round up. How many bands do *you* think you can do it on?

QSL Complaints

We hear from the West Gulf DX Club that W6AM has worked 257 countries and has cards from all of them. He badly wants to work another one so that someone will owe him a card!! Just how this 100 per cent. record is achieved would probably make an interesting story.

Over here we generally find that the high scorers have at least ten cards missing, sometimes from countries in which they have worked three or four stations. Those who are luckier than that must spend more time coaxing out the cards than actually operating.

Postal Complaint

KV4AA writes: "I am sick of paying 5c. postage due on G letters. Please tell 'em to put on 3d., not 2½d." We presume this arises owing to the "overweight" phenomenon, in which case anything over *one* ounce should be stamped with 3½d—not 3d. (All rates may have been changed again by now, so look it up yourself!)

AR1TI (Box 81, Beirut, Syria) is around on 14015 kc . . . ZD3A is back on the air after trouble . . . Bear Island, near Spitzbergen

TOP BAND COUNTIES LADDER

(Starting Jan. 1, 1952)

Station	Confirmed	Worked
G2NJ	97	97
G5JM	97	97
G3HIS	95	95
GM3EFS	94	94
G3JEL	92	94
G3HIW	92	93
G3JEQ	92	92
G6VC	92	92
G3EUK	91	93
G3GZB	89	91
G3HYJ	84	85
G2AYG	83	84
G3JHH	80	81
G3BRL	79	80
G3GGS	77	80
G3FTV	74	82
G3JKO	73	85
G3DO	72	72
G3JJZ	71	73
GM3DOD	70	71
G3FAS	69	80
G3KEP	69	74
G3JBK	67	71
G3HZM	67	69
G2CGL	63	70
G3JVL	62	77
G3JAM	62	70
G2HKU	62	62
G3AKX	60	71
G3FTV/A	60	69
G3DGN	60	64
GW3HZZ	60	63
G2CZU	59	60
G3FNV	57	71
G8CO	54	66
G3JZK	43	48
G3HQT	39	41
G3ICH	16	36

has an operator awaiting a licence. It might be a new one, but even if it counts as Spitzbergen it should still be of interest . . Two RAF types await their VU5 licences for operation on the Andaman and Nicobar Is.

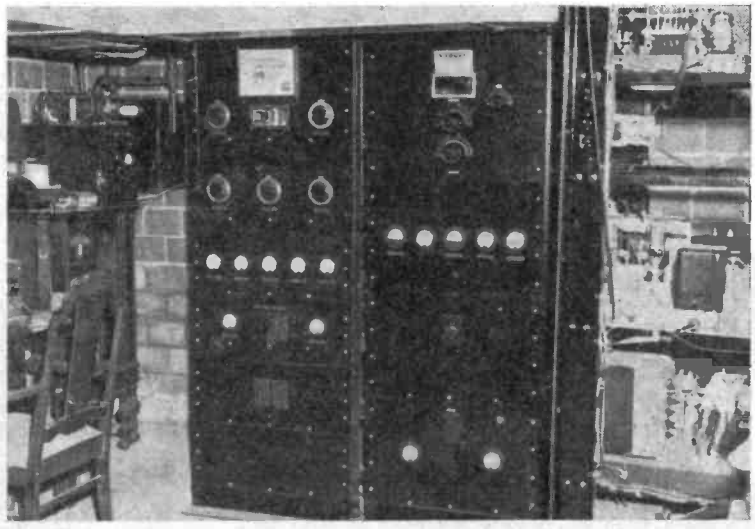
Despite VS4CT's evacuation, there might be a chance of getting Sarawak. VS4BA is said to be active (14050 kc) . . .

Contest Scores

Here are a few scores in the 1955 DX Contest to add to last month's selection. *Phone :* W2HJR (multiple op.) 455,000 ; W4KWY, over 300,000 ; 4X4DK, 325,000 ; HC1ES, 250,000; EA2CQ, 260,000; CO2BL, 219,000 ; W6YY, 194,000. *CW :* W2HJR, 520,000 ; K2EDL, 455,000 ; W4DHZ, 350,000 ; W8JIN, 337,000 ; W6AM, 292,000. Terrific, isn't it!

Public Relations ?

We have been asked by Radio Pakistan, Karachi, to give publicity to their BC schedule of times and frequencies. As we weren't asked for *favourable* publicity, we gladly pass on the news that they operate on 7010 kc from 1530 until 2045 GMT. Just what right they have to be there we don't know, but they are an unmitigated nuisance during those hours to all legitimate users of the 7 mc band, and we are only too glad to learn that they finish at 2045. Their other schedules are all outside the amateur bands, fortunately, and so they need no publicity in this *Magazine*.



WØUYC is in Webster Groves, Missouri, and runs an all-band high power rig. The station is located in a cellar.

DX Strays

All the following come from a very newsy letter from W6YY (La Canada, Calif.), to whom we are most grateful for such a collection of red-hot news.

FB8ZZ (Amsterdam Is.) is on 14026 *and* 7020 kc . . . ZD9AD (Gough Island) was worked by W6YY, long path, on phone (14105) . . . AC5PN was worked by W1FH and W9NDA, CW (14050) . . . YA1AM worked quite a few W6's around 1500 GMT (14084) . . . ET3AH is regularly on 14010 kc ; ET3TRC has been on phone from the Ethiopian Central Fair . . . VR6AC works phone on 14143 kc, Tuesday and Saturday nights . . . ST2AC has cropped up on 14085 CW . . . ZL2GX and ZL2CU still hope to open up operation from Kermadec Is. (new country) in January ; Twenty only, phone and CW.

For the Certificate-Happy (*see* last month) W6YY says that there are 83 licensed YL's in South Africa and that you only have to work ten of them to get a sheepskin . . . We imagine that anyone working all 83 might get a bikini in mink!

Nice ones appear in the West Gulf Club's Bulletin as having been worked by W's in November and December. *Twenty* CW includes AC5PN many times, VQ8CB (1230). YA1AM (mostly around 1300), XW8AB (all times), VK9RM, FB8BR and 8BS, ZS7H, FB8ZZ, VP8BF, 3W8AA, HS1VR and ZD9AD. *Twenty* phone shows MP4QAI, ZD6RD, MP4KAB, FB8BC. VK1VK and AP2U. At least 95% of the DX

FIVE BAND DX TABLE
(POST-WAR)

Station	Points	3.5 mc	7 mc	14 mc	21 mc	28 mc	Countries	Station	Points	3.5 mc	7 mc	14 mc	21 mc	28 mc	Countries
DL7AA	691	99	159	219	109	105	222	G3FPQ	351	48	48	134	100	21	153
G6QB	619	52	109	223	100	135	237	G8KU	347	23	52	161	36	75	171
G5BZ	618	63	114	234	125	82	238	W6AM (Phone)	287	13	32	210	39	21	210
G3FXB	538	67	122	189	113	47	196	G8VG	284	36	77	124	21	26	141
G4ZU	534	12	45	215	138	124	222	G6VC	245	27	30	125	36	27	131
W8KIA	530	55	141	251	4	79	251	G6TC	230	17	61	113	12	27	122
G2VD	511	48	94	180	90	109	189	GM3JDR	211	39	36	101	34	1	108
G3DO	487	24	46	204	106	107	225	G3IGW	201	38	50	62	43	8	87
G2BJY	466	48	78	141	83	116	181	GM3EFS	189	22	39	96	12	20	105
G2YS	426	61	79	146	86	54	161	G2DHV	173	19	25	111	6	12	114
GM2DBX (Phone)	382	33	31	158	79	81	169	GM3DOD	71	10	15	36	9	1	40
G2BW	368	24	57	144	100	43	165	G3HEV	53	8	24	16	4	1	34
W6AM	366	13	34	257	39	23	257	G3IDG	40	11	10	6	1	12	24

reported by WGDX Club members is on Twenty, even now.

FB8BR hopes to operate from Comoro Island; there are licence difficulties, but his brother-in-law is the governor of the island, so they might be smoothed out! HS1VR is on 14050 kc, and has been worked around 1300 GMT . . . Station calls authorised for the American Antarctic Expedition, now on location, are KC4USA, 4USB and 4USN . . . If anyone heard ZS8I on *Ten*, they might be interested to know that he was actually on Eighty, being relayed on Ten by ZS4F!

The first WBC claims *(see* pp.541, 542 December) are already in. All overseas authorities and journals are being notified direct of the availability of this Award, which will in due time make many of our counties rather more important to world DX men than they are at the moment.

The 1956 Marathon

For those who missed the announcement last month, or those who need reminding of these things, may we state that we are now discontinuing the 21-mc ladder in its present form. It fades out with G4ZU (Croydon) in the position of honour with his 138 countries on this band.

Taking its place for the next twelve months will be the *1956 Marathon Ladder*, based on scores on 28 mc and 21 mc as from January 1st, 1956. Send in your scores for these two bands each month, making it clear whether they are "Phone Only" or "All-In." We will arrange the ladder so that the order is sometimes based on the 21 mc score, sometimes on the 28 mc score and sometimes on the combined total. Note that the latter is meant to be the *number of different countries worked*, using both bands—*not* the sum of the two individual scores, which might mean duplication of practically all the countries worked

We look forward to seeing the first scores in this new table with your next batch of correspondence, although, of course, they will only apply to the first ten or twelve days in January. The new Table will be started off as soon as sufficient claims are received. And talking of claims for tables, how about a few more on the Five-Band?

And so we sign on for 1955, with hopes of a very interesting year to come. The next dead-line is unavoidably early, owing to the vagaries of the calendar, and we want everything in by **first post on Friday, January 13.** In spite of this queer date, we wish you lots of luck and plenty of DX to report. Send everything to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1, and *Do It Now*. 73 to you all. Happy New Year, and BCNU.

Impression of the operating position at ZS2MI, Marion Island, 1500 miles out in the Indian Ocean, south of Capetown.

BBC TV TRANSMITTER AT PONTOP PIKE

The new permanent medium power TV transmitting station at Pontop Pike, near Newcastle-on-Tyne, was opened on November 15. This station, with an effective radiated power of 12 kW (vision) and 3 kW (sound) replaces the temporary low-power station on the same site which had been in service since May, 1953. The new station operates on the same frequencies as those used by the temporary station, namely, Channel 5 (Vision 66.75 mc, Sound 63.25 mc), horizontally polarised. Viewers who have been receiving their television programmes from the temporary station at Pontop Pike will, therefore, be able to use their existing aerials, and their receivers will not need to be retuned.

Acting DIRECTOR, NATIONAL PHYSICAL LABORATORY

The resignation of Sir Edward Bullard, Sc.D., F.R.S., from the directorship of the National Physical Laboratory took effect on December 31. Sir Edward, who is taking up a fellowship at Cambridge University, authorised publication of the report on the N.P.L.-observed test of our daylight-powered transistor transmitter, published in the December 1954 issue of SHORT WAVE MAGAZINE.

Appointment of a permanent successor to Sir Edward Bullard will be announced in due course. In the meantime, Dr. R. L. Smith-Rose, C.B.E., D.Sc., M.I.E.E., has been made Acting Director, with immediate effect. Dr. Smith-Rose is a distinguished physicist, well known as Director of Radio Research at Slough, who has always taken a keen interest in the activities of radio amateurs.

URANIUM PROSPECTING BY RADIO

It is reported that one V. J. Pick, of Saratoga, Cal., has made himself a fortune by "striking it rich" in uranium—not the hard way, with a shovel, but by air prospecting. An experienced bush-pilot, he fitted a small aircraft with scintillation equipment to detect radio-activity, and a Raytheon radar altimeter for accurate height measurement near ground. Flying in geometric patterns at a precisely-known altitude, he was able to plot areas of radio-activity, the most promising of which were subsequently explored on foot, with the certainty of making a strike. Using these methods, he has made large uranium ore discoveries in the western United States, and has been much publicised in the American press

MORE GUIDANCE FOR THE BEGINNER

EXPERT ADVICE AGAIN

THE following came in a few days after the publication of the December issue of SHORT WAVE MAGAZINE, and is reproduced here without comment, exactly as received:

Sir,—*I am astounded at Old Timer's ignorance in the matter of DX working.*

Whilst I appreciate there is always someone prepared to break away from traditional methods, I do feel you should not deliberately mislead your readers.

From careful observation on the bands, I have drawn up the attached rules which appear to me to be of real help and will give the novice much more fun.

VINCENT PENFOLD, G3JZ.

Cuckfield, Sussex.

DX FOR THE BEGINNER

The following rules are intended to cover the rudiments of the game, and until they are fully understood it is useless passing on to the really crafty moves.

(1) Never send faster than 5 w.p.m. When calling do not send "CQ DX" less than 15 times before making your call-sign, which should be sent once only.

(2) When making a change of frequency never take power off the aerial.

(3) Zero beat with the station you wish to call (this is not essential but it is more interesting for him), then call for at least three minutes (five is better still). If no answer and you can spare the time, keep this up at regular intervals for 15 minutes. Ignore any QSO that may arise during your call or calls. If still no answer, call "CQ DX" on the same frequency for 10 minutes.

(4) If one of the rarer call-signs is heard, whether calling CQ, in QSO, being called by someone or merely mentioned in the course of a QSO, comply with Rules 1, 2 and 3 immediately. (Never wait for a *VA*—it does not mean a thing, anyway).

(5) If you hear, say, a ZL in QSO with a W5, you have three alternatives, but act quickly, for you are not the only one. Zero beat (careful attention to Rule 2) and call either "CQ ZL," "CQ W5" or "CQ ZL/W5."

(6) Choose a frequency (there is no need to listen on it to see if there is any DX coming through), then call "CQ DX" (mind your speed—Rule 1). There is always the chance a very rare one is waiting and listening for just your call-sign.

(7) If all the above fail, your Tx needs adjustment. Choose a frequency on which you can hear DX, switch on full power and swish over about 50 kc of the band calling TEST. The word TEST is important; a rare one might call you thinking he was missing out on a Contest. Then call "CQ DX" (Rule 1). This is a real chance-your-arm approach and not to be recommended for serious DX hunting.

Notes: Rules 1 and 2 are very important and must be carefully observed. Rules 3, 4 and 5 have the advantage of operating the "defensive method"; *i.e.* even if you do not work the DX it makes it harder for your competitors to do so (up ladder, *I'm* inboard).

An interesting variation which may produce results is to send your call-sign (G2, G3, G4, G5, G6 or G8) as GIO, GSM, GHT, GIS, GTH and GOI respectively. There are other combinations; you must use your initiative. You may then be mistaken for an aircraft, or something (QSL cards with pictures on them).

You can train yourself to send "CQ DX" (Rule 1) and read a novel at the same time. And, remember, a drifting VFO certainly gives greater frequency coverage.

Having made the DX contact, never give a report of anything less than T9; T4's and T5's do *not* help that card on its way to you.

If you still cannot work DX, do not give up Ham Radio in disgust; listen at the HF end of 80 metres, where all types are catered for. There will be a niche for *you* in one of those nets.

NEW QTH's

Readers are reminded that all newly-licensed amateur stations in the U.K., or changes of address of stations already licensed, should be notified to us for publication in "New QTH's" in SHORT WAVE MAGAZINE, and subsequently in the *Radio Amateur Call Book*, the directory to the amateur stations of the world. We, of course, accept notification of a new address from any amateur, home or overseas, but in general only those from the U.K. area are published in the *Magazine*, these and all others received also being forwarded to the American publishers of the *Call Book*, for which we are agents in the U.K. and Europe. There is no charge of any sort for this service, which is available to all who wish their call-sign/address to appear correctly in the *Radio Amateur Call Book*.

MORSE CLASS

We are informed that a class for those wishing to take the Morse Test for the Radio Amateur Licence will start at the Brentford Evening Institute, Clifden Road, Brentford, Middlesex, at 7.0 p.m. on Thursday, January 12. Those wishing to join should get in touch with the Head of the Institute. The fee is but 5s. for the full course.

AMATEUR RADIO — For The Beginner

PART X

PRINCIPLES OF MODULATION (1)

By **A. A. Mawse**

THE term modulation, as applied to an amateur band transmitter, can be taken to mean that the listening station can obtain reception without the aid of a heterodyne oscillator. In other words, he should hear speech when tuned to the signal.

Amplitude Modulation (or AM, as it is known) is that mode of modulation, or method of control, by means of which the amplitude and not the frequency of the continuous wave carrier is varied at audio or speech frequencies. Fig. 1A represents a continuous carrier, the amplitude of which is plotted against time. Fig. 1B depicts part of a much lower (audio, or speech) frequency over the same period, and Fig. 1C shows the effect when this is superimposed on the high frequency oscillation. Notice that at some points the modulation causes the combined amplitude to rise beyond the unmodulated carrier limits, whereas at others it is reduced almost to zero. When the degree of amplitude above and below the mean carrier level is exactly equal to the latter, the carrier is said to be fully, or 100%, modulated. Fig. 1D shows the effect if too much audio is applied, resulting in over-modulation — a condition which must be carefully avoided.

Sidebands

Now, unlike a pure *sine* wave, the speech characteristics with which we are dealing are very complex in waveform and contain a whole range of varying frequencies, from around 300 cycles up to 5000 c.p.s. or more. These beat with the carrier frequency and produce, by heterodyne action, a series of side frequencies, collectively known as Sidebands. It can be shown that the channel occupied by a radio-telephony station needs to be twice that of the highest audio frequency present. For example, if the transmitter is tuned to 2 mc, or 2000 kc (150 metres) and the highest audio frequency is 5000 cycles or 5 kc, the band-width required for this particular set-up will be from 1995 to 2005 kc—which, in the present congested state of our bands, is a little greedy. Over-modulation will produce a state of affairs which is even worse, causing a type of transmission which is known in Amateur Radio circles as "spitch." The word is sufficiently descriptive, without need of further definition!

As opposed to broadcasting technique, where high-fidelity is aimed at, perfectly adequate "communication quality" can be achieved with a much lower range of frequencies, so that in general a filter is incorporated in the speech equipment which has the effect of suppressing anything over approximately 3000 cycles, thereby reducing the band-width requirements from 10 to 6 kc or so, with a consequent saving in ether space.

Speech Waveform

If the modulating voltage is an undistorted *sine* wave, then the percentage modulation will be the same on both positive and negative peaks. But this seldom occurs in the human voice, particularly so in the male voice, with the result that the waveform is unsymmetrical and the percentage on one peak will be different from that of the other. It is therefore desirable, when testing speech equipment for the first time, to make provision for reversing the leads to the input or output of one of the transformers and to listen on an adjacent receiver, which is appreciably detuned from the transmitter frequency, for any trace of "spitch" or splatter when modulation is taking place, and to adjust the transformer leads for correct operation.

Modulated Power

Reverting to Fig. 1C, the curve shown can be taken as instantaneous values of either current or voltage, and since power varies as the square of either (with constant resistance), the instantaneous power at the positive peak is four times that of the unmodulated carrier. At the negative peak, since the amplitude is zero, the power is also zero. The *average* power with 100% modulation is half as much again as that of the unmodulated carrier. This is an important point to remember, particularly if by good design it is not dissipated over an excessive band-width. To state the power requirement another way: For full modulation a 10w. carrier calls for 5 watts of audio modulating power, and a 100-watt carrier needs 50 watts of audio to modulate it fully.

Modulation Capability

This is defined as the maximum percentage, or "depth," to which the carrier can be modulated without the production of spurious sidebands or excessive distortion. The limiting factors can include such items as inadequate emission from valve filaments on positive peaks; inadequate drive; poor regulation on power packs; or incorrect bias setting, amongst others.

Carrier Requirements

For good speech reproduction, it is very necessary that the power supplies be well-filtered and that voltage regulation, particularly as it applies to the supply feeding the modulator stages, is good. For

this reason, it is accepted practice to provide a separate power unit to feed the speech equipment—except in the simpler modulation systems, where there may be adequate output available from the power pack. It is also very necessary to ensure that transmitter frequency control is good and quite unaffected by variations in the PA loading. This point has already been dealt with in the present series—in the articles on the Beginner's Transmitter (September 1955) and the VFO (December 1955).

The Microphone

The sounds produced by the human voice must first be converted into electrical impulses, and this is effected by a microphone. The sensitivity of this instrument varies widely with different types and between different models of the same type. The distance between the microphone and the "noise source" also affects the issue. The frequency response, usually expressed in decibels, is a measure of the ability of a particular model or type to provide faithful reproduction over a sufficiently wide frequency range. A range of 200-300 cycles to 3000-4000 cycles is adequate for amateur telephony transmission purposes, and if a particular instrument

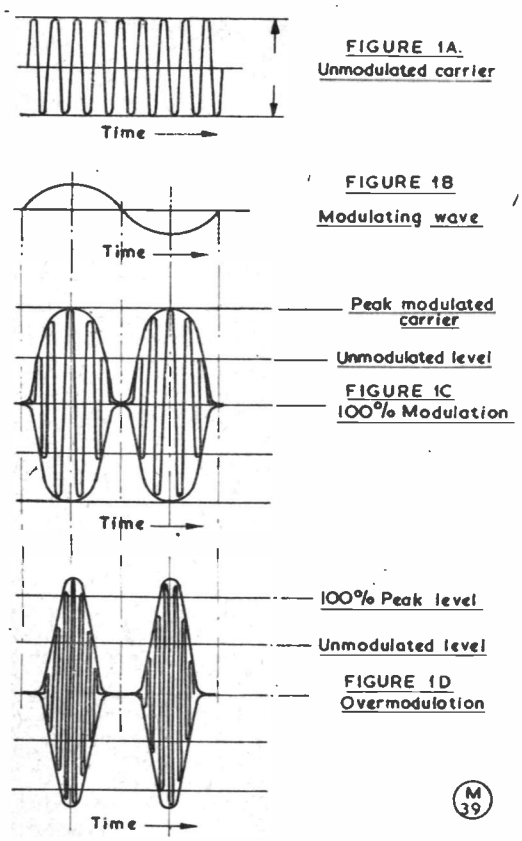


Fig. 1. Diagrammatic representation of the process of modulation. In a properly adjusted amateur band transmitter, the aim is 100% modulation on peaks only.

STARTING ON PHONE

Because of the new relaxation in the terms of the Beginner's licence—freedom to use telephony from the outset, as announced on p. 517 of our December issue—we are commencing this month a general discussion on the principles of modulation, to appear in two parts. This will enable those following this series to build with confidence the Beginner's Modulator, which will be described in detail in the March issue of SHORT WAVE MAGAZINE. This Modulator is designed to work with the Beginner's Transmitter and Power Pack, as already described in our issues for July and September, 1955.

varies only a few decibels between two given limits, it is described as having a *flat response* between those limits. There are a number of basic types of microphones, but only three need be mentioned in this article as being those types most used by amateurs. They are the Carbon, the Crystal and the Dynamic.

The *Carbon* type comprises a diaphragm of metal which is in contact with an insulated container filled with carbon granules. Contact is made from the diaphragm, through the primary of a transformer of approximately 100 : 1 step-up ratio and a primary resistance of 100 ohms or thereabouts; thence to a source of low DC voltage (such as a dry battery) which is in series with a suitable potentiometer or rheostat for controlling the microphone current; and finally, the circuit is completed by contact with the carbon granules. The impact of speech waves on the diaphragm causes variations to take place in the resistance of the granules, causing alternating currents in the primary which are stepped-up by the transformer, the output (secondary side) of which is connected to the grid of the first amplifying stage. The alternating voltage available across the grid of the first stage is of the order of 3 to 10 volts across 100,000 ohms. Generally speaking, the speech quality produced is not of the highest order, and this type is apt to be somewhat variable in performance. Carbon microphones are, however, cheap, readily obtainable and, because of the good, relatively high, output they give, it is possible to dispense with one or more speech amplifying stages, with a consequent simplification in design and a financial saving. Moreover, since the over-all gain of the amplifier is proportionately reduced, there is less need for very careful shielding at the input end to prevent hum and other noise pick-up.

The *Crystal* type is a much more delicate instrument. It comprises two crystals cemented together, the junction being sometimes mechanically coupled to a diaphragm. Vibration causes the generation of electrical energy by piezo-electric action—it can be likened to a crystal oscillator in reverse—the output

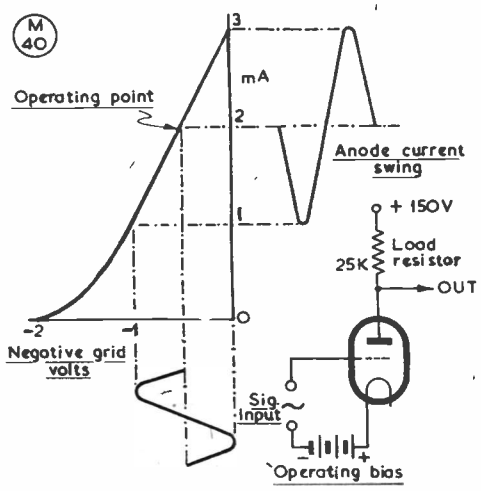


Fig. 2. Illustrating the functioning of the valve in a Class-A voltage amplifier, as explained in the text.

being fed to the grid of the first amplifier. No external energising current is required. The frequency characteristics are good, but the output is very low—in the region of one-hundredth of that of the carbon type. Consequently, additional amplification is required and, with the higher gain called for in the speech amplifier, much more care must be taken to provide adequate shielding at the input to the first grid. Crystal microphones have a very high internal resistance, and can thus be connected straight across the first grid with a high value of grid resistance in shunt.

The *Dynamic* microphone can be thought of as a moving-coil loud-speaker in reverse, with either a low or high impedance output; the former is employed if long microphone cables are called for, in which case a step-up transformer is used at the input to the amplifier. The output level is somewhat higher than that of the crystal type.

Amplifier Design

Enough has now been written to show that very small and often minute voltages are available with which to produce a great deal of audio power with a minimum of distortion. A transmitter running at the legal limit of 150 watts may, under certain forms of modulation, require as much as 75 watts of audio in order to produce 100% modulation, calling for some careful design work with only about .01 volt available to start with at the input end! Many readers will probably have listened over the air to a description of somebody's rig which, read quickly, goes something like this:

"The line-up here, old boy, is an X7Z crystal mike into a 6SJ7, into a 6C5 phase inverter, into a pair of 6C5's running AB1 into a pair of 6A3's in AB2 into a pair of TZ40's in Class B, driving a pair of 813's Class C, of course . . . ."

which all comes fairly pat, due, no doubt, to frequent repetition. At the same time, it is rather necessary to have some idea of what is meant by Class A, B and C, and so forth, since the same valve may be employed to function in widely different ways and for specific reasons.

The microphone at the start of the chain is essentially a *voltage* and *not* a *power* producing device, so that the early amplifying stage(s) must on no account draw or attempt to draw power from this source, or else severe distortion will at once be caused and amplified-up right along the line.

Consider, then, a familiar static curve of a typical triode, as shown in Fig. 2, in which the anode current is plotted against various grid voltages. It will be seen that the portion of the curve between 0 and −1 volts on the grid is a straight line, or is linear, as it is called. This means that a variation in grid volts between these two extremes will produce a *proportional* variation in anode current from 1 mA at −1 volts to 3.0 mA at 0 volts. Now, until the grid volts become positive in value no grid current will flow, so that if the input grid voltage swing is restricted to operate between these two points, the anode current will swing in a linear manner and *no power* will be drawn from the course. In practice, the mid or operating point of 0.5 volts negative would be set by means of external or cathode bias, and a peak input not exceeding this figure would be permissible. Under these conditions, the valve is said to be operating in Class-A and is functioning as a voltage amplifier. In order to make this possible, however, a suitable load resistance must be inserted in the anode circuit, and, for the purpose of an example, we have selected a value of 25,000 ohms.

Now let us examine what happens with a *supply* voltage of 150 volts. At the mean or operating point the steady anode current is 2 mA and the voltage drop across the resistor is 50 volts ($E = I \times R$) and the actual voltage on the anode is therefore 100v. If now an alternating current having a peak

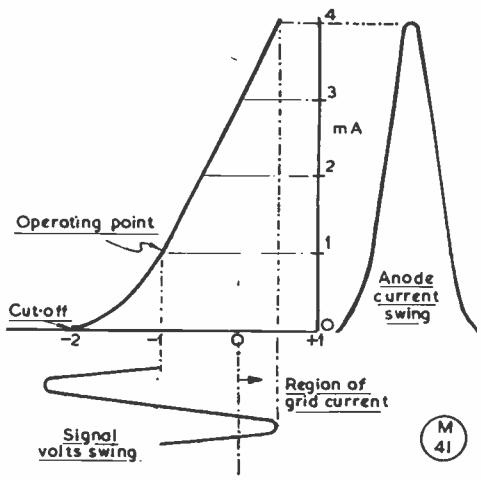


Fig. 3. What happens in the valve when the amplifier is described as "in the Class-B mode."

value of 0.5 volts is placed across the grid circuit, at one extreme the grid potential will become zero and the voltage drop across the resistor will rise to 75 volts; at the other extreme the grid will become −1 volts and the voltage drop 25 volts. The actual voltage between plate and cathode will be 150 − 75 = 75 in the one case, and 150 − 25 = 125 in the other. The peak value of the alternating output voltage will be the difference between either of these figures and the steady no-signal voltage of 100v., *i.e.* 125 − 100 = 25, or 150 − 125 = 25. Since the grid input voltage has a peak value of 0.5 volts, the voltage amplification ratio of the valve is $\frac{25}{.5} = 50$.

If, therefore, a crystal microphone with an output figure of 0.02 volts is connected across the input, we could expect to obtain a peak *output* of fifty times this figure, or 1 volt. If two such stages are connected together in cascade—the output from the first stage being fed into the grid circuit of the succeeding stage—we then obtain a final output of 50 volts, which is something measurable and meaty enough for driving the succeeding stage.

Remember that in a Class-A amplifier the anode current, as shown by a meter in the HT supply, will give a constant and steady reading, and that the limiting value to which such amplifiers can be loaded will be dependent upon the grid swing figures, as already explained, and the maker's value for anode dissipation, which is arrived at by multiplying the actual anode voltage and current readings together.

Producing Audio Power

The next consideration is to produce some power, as distinct from an amplified reproduction of the original input volts. For this purpose, it is customary to use a valve, the circuit constants of which are so chosen that it operates in Class-B. In this mode the operating grid bias is fixed so that the no-signal anode current is low. Fig. 3 shows a similar curve to Fig. 2, but in this case the negative swing of the input voltage carries the valve beyond cut-off and the resultant anode current swing reproduces only one-half of the input waveform. Class-B amplifiers, when used for audio frequency work, must be operated in pairs in push-pull. so that both halves of the cycle will be present in the output. Since the grids are driven into the positive region, it follows that grid current will flow for a portion of the cycle and some power will be required at the driving end. This form of operation is known as Class-AB2. It is still possible to operate Class-B without grid current when lower power levels are to be considered, and in this

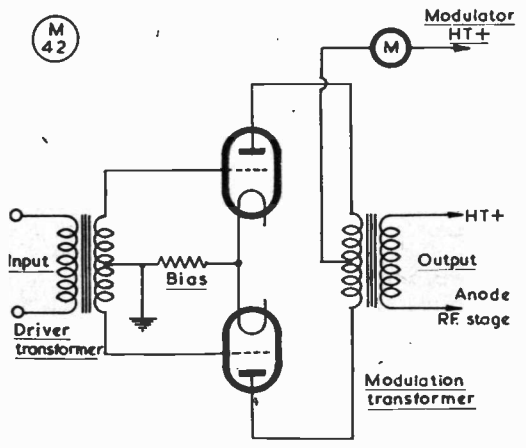


Fig. 4. One of the most widely used of audio power amplifiers in amateur working is where the valves are connected in push-pull and biassed Class-B.

form such amplifiers are known as Class-AB1. Both, however, produce power, and it is customary to couple them into circuit by means of transformers, as shown in Fig. 4.

A conventional line-up for a speech-amplifier/modulator having an output in the region of 40 watts of audio and employing a crystal microphone would consist of a 6J7 or similar pentode in Class-A resistance coupled to a 6J5 triode (also Class-A) transformer coupled to a pair of 6J5's in push-pull Class-AB1, transformer coupled to a pair of 6L6's in push-pull Class-AB2, the output being fed into a suitable modulation transformer, to plate, or plate-and-screen, modulate the RF power amplifier.

From what has been written, it can be seen that, to a great extent, whether or not a valve or pair of valves operate in Class-A. AB1, AB2 or B will depend very largely upon the setting of the grid bias. In fact, if the bias is not set too far back, Class-A operation is obtained at low input values and more nearly Class-B at high input. Such a method provides low distortion at moderate or low input, yet high anode efficiency at high input levels, thereby making it possible to effect economies in the size of the valves to employ.

The term Class-C is confined exclusively to RF amplification, and, beyond stating that such valves are biassed right back to two or three times cut-off, need not be considered in the present discussion.

(To be continued)

BRIMAR 807 MINIATURE

The type designation of the Brimar valve, known colloquially as "the new miniature 807," is 5B/251M. We shall shortly be publishing some designs incorporating this and other miniature types suitable for amateur-band transmitters.

INCREASED AERIAL HEIGHT — G9AED

The operators of G9AED, Belling & Lee, Ltd., say that the aerial height has now been increased to the 350-ft. level of the ITA mast at Lichfield. Transmitting times remain as previously announced, and reports on reception are requested.

NOT OK IN CALL BOOK

FRED'S UNWANTED VISITORS

By G3COI

FRED had never been particularly bothered with visitors. For one thing, he kept his QTH a dark secret and always gave a slightly phoney one when in QSO. His QSL cards were devoid of information and he did not appear in the *Call Book* by his own request. His aerials were made of 64 gauge wire and were cunningly sited in order to be invisible to the most searching eye. Consequently, our opening sentence is not surprising. To the Amateur Radio transmitting enthusiast, the reason for these precautions is not hard to find—the avoidance of visits from irate TV set owners, viewers or addicts.

However, when a station is operated an hour before breakfast, an hour at lunch and then from tea-time till exhaustion *every day*, it is inevitable that some astute listener (by hook or by loop) is going to track it down.

Fred was lounging in his wicker QSO-chair one Sunday morning, idly sending CQ on his bug key and gazing vacantly at the wax which was oozing from one of his PA power supply transformers when he was aroused by a variation in the lamination clatter it was emitting. His practised (and bloodshot) eye ran over the meters to see what was amiss and sure enough, the aerial current was varying between three and eight amps. The owner/operator started to perspire with apprehension, for any trouble that developed within his rig imbued him with a fear of being QRT for a period of indefinite length. He rose from his seat, panic gnawing at his vitals. His brain became a madness of jumbled diagnoses. Blindly, he stumbled through the ruck of 1155 parts and bits of wire to the trapdoor and slid down the shack ladder, oblivious of the wood splinters that pierced his feverish hands. He headed for the wilderness that had once been a garden, to the place where hung (craftily) his 80-metre 64g. long-wire, thinking that perhaps a wandering bee had alighted thereon and was causing variable loading.

As he approached the profusely growing *eifelwort* (a little-known weed which reaches gigantic proportions under suitable conditions) he heard voices.

"Well, I suppose this is the thing that spreads all those whiskers, Bert. It's really amazing what he does with ten watts . . . if you can swallow that stuff he gives out over the air."

It was a youth, dressed in a tight, rather shabby, suit adorned with soldering iron burns, who was addressing a companion, a tall, pale, bespectacled body trimming his nails with a pair of sidecutters.

Fred approached them with feigned casualness, trying to still his gasping breath. (He was badly out of condition due to an excess of a well known brand of small cigarettes and two recent DX contests.

"You chaps looking for anything?", he inquired with a forced smile. The intruders did not reply but stared rather rudely at Fred while they inspected his unprepossessing appearance—the screwdriver and handbrace protuding from a hole in his ancient sports jacket, the coax holding up his flux-stained trousers, the club badges hooked on to a decrepit pullover, the QSL card pressed into service as a hole filler on top of a shoe, and the grubby marks left round his ears by rubber padded ex-Govt. 'phones.

". . Fear of being QRT for an indefinite period . ."

"We want to see your rig, old man," said Shabby Suit firmly, eschewing formalities. His companion brandished his sidecutters rather menacingly. "Why, certainly," quavered the owner/operator, backing slightly, "but I am rather tied up at the moment, perhaps some other time . . ."

"It doesn't matter, old man," said Shabby Suit looking at his friend with a snigger, "we'll see it anyway. After you, Bert." So the oddly assorted trio went up to the shack and soon Fred overcame his reluctance and began to wax technical in his most boring 80-metre fashion. However, his unwelcome visitors did not pay much attention to Fred but carried on a muttered conversation between themselves as they inspected everything the shack could offer. It was growing dark when they eventually left, which they did rather hurriedly when Fred mentioned casually that he thought he was suffering from the first stages of an infectious disease—typhoid, or something.

Back in the shack, Fred cranked up his apparatus to see if his earlier trouble had magically disappeared. Alas, to cut a short story shorter, it was a *week* before he was back on the air— his guests had stealthily removed several vital parts, their larceny being facilitated by the "openwork" construction of the rig and that pair of sidecutters to which we cunningly drew your attention earlier.

The thing is: Even if you do happen to find out where Fred lives, don't call on him. He has bought a shot gun.

VHF BANDS

A. J. DEVON

IT would certainly be true to say, this month, that activity has not been reflected by conditions, which, on some occasions during the period, have been quite good for GDX. This was over the mild spells early in the month, and about Christmas time. However, the regulars were always on and, though the volume of correspondence is, as always at this time of year, well down on the average, we have enough to show that the VHF flag is still flying.

Some figures on activity, extracted from the correspondence, are interesting: Between November 22 and December 16, G3JWQ (Ripley, Derbys.) worked 42 different stations over most of England; in approximately the same period, G3KHA (Bristol) heard or worked a total of 50S; G3FIH (Nr. Bath) shows 31 worked; and, from the listener clip, we find that SWL Cox (London, S.W.18) heard 58 stations in all, with 56S logged by SWL Drybrough in Coventry during November 19-December 13. In case anyone should say "Oh, yes, the same stations," the fact is that there are only *nine* that appear in both lists! They are: G2AIW, G2HCG, G3DLU, G3FAN, G3IOO, G3WW, G5BM, G5YV and G6NB.

Therefore, this analysis of the two SWL lists proves that there were over 100 different stations on the two-metre air at some time between November 22 and December 14—to which your A.J.D. could add another dozen or so not included in either of the SWL logs. All this seems to substantiate the statement made in this space last month (which has been challenged, incidentally) that the band is never as dead as it is sometimes made out to be; our adjuration still is to keep on letting out CQ's.

New High Total

Since the earliest days, G3WW (Wimblington, Cambs.) has been one of the most active stations on the two-metre band—his first QSO was with G2XV (Cambridge) on May, 22, 1949, and there can be few reading this who have not heard or worked him on numerous occasions in the last 6½ years. Having recently checked his two-metre log, G3WW finds that he can now claim a grand total of 770 different call-signs worked since he started operations. About another 20S appear under the heading of "got away."

This is a magnificent total, putting him well over 100 ahead of G5DS (Surbiton), who hitherto has been the high scorer in the "number of different stations worked" category. It is also of great interest (to your A.J.D., if nobody else) to see how closely G3WW's figures agree with our own estimate of potentially active stations on two metres.

Contest in March

On the next page, you will find the rules for the "U.K. Two-Band VHF Contest," to take place in March. Though titled "U.K." because the listings will mainly be of G's, the Contest is, of course, also open to all or any operators in Eire and Northern Europe who care to take part. (The main all-European event is scheduled for July, as already announced). The level of the European participation will naturally be governed entirely by conditions; if they are good, and the Northern Europeans are coming through, it will add to the interest and usefulness of the Contest. On the other hand, if conditions are GDX only, there should still be a high level of Contest activity on both VHF bands.

The rules, to which much time and thought have been given, are designed to stimulate activity on both bands; while being comprehensive and, we hope, concise, they are also intended to reduce to a minimum the "office work" for those entering. In fact, QSO's take the normal form—RST, QTH and name as usually given over the air—and the business of working out points to claim can all be done afterwards, at leisure.

Not only do we hope for a good turn-out for this Contest—which will be by way of being a curtain raiser for the VHF DX season—but we also hope that stations equipped for both bands will try an entry under Rule 2(c). In the past, it has always been accepted practice to separate 144 and 430 mc. In the present state of the art, however, and with conditions, results and operating practices as we now know them on these two bands, it seems to us that there is no longer any good reason for separation. As we all know, on the DX communication bands, multi-band working under Contest conditions is the usual procedure. So the idea is to try it for this Contest, to see how things work out from the point of view of those taking part.

In any case, all operators have a choice under Rule 2 as to how they will devote their energies—and publication of the rules well in advance will give plenty of time for preparation and working out tactics. The fact that cross-banding and schedule-making (but during the Contest *only*) are permitted will, we hope, add to the interest and excitement of the event, in that any station entered under Rule 2(c) will have to be very smartly operated to make full use of the opportunities—it is partly for this reason that the idea has been introduced of a station manned by two or more operators.

Finally, on the subject of this first Two-Band Contest, may your A.J.D. suggest that any criticism of the rules be kept for *after* the event, and be sent in with your entry. It will then constitute valuable advice based upon practical experience, and so can be used in formulating the rules for the All-European Contest in July.

Station Reports

G2AHY (Crowthorne, Berks.) is about most evenings 1815-1900, and on Saturday and Sunday mornings, with phone only, frequency 145.34 or 145.12 mc; he runs 20 watts and a 4-ele Yagi, but has a 4/4 in prospect. G2AHY worked 20 stations during the period, and goes up two in All-Time Counties. And we hope that the non-appearance of calls h/w lists again this month will not deter him (and others) from sending them in regularly, as we can always extract a lot of useful information, even if pressure on space prevents their being published.

G3CCH (Scunthorpe) also moves in the All-Time table, while Vernon of G5MR remarks that the year-end was a disappointment as regards availability of contacts because, otherwise, 1955 has been a very good one for G5MR.

G3JWQ (Ripley) raised 17 stations new to him in the three months to December 16, and now stands at 116S in the total of different stations worked, but has as yet made no claim for the All-Time. G3WW found several good evenings during the period, and mentions contacts with many stations, including G3IEX for Suffolk.

G3JHM (Worthing, Sx.) has 131S worked and says he is looking forward to the Contest; he and G3GDR are still in contact on 70 centimetres, and at the G3JHM end it is hoped shortly to have a QQVO6-40 as a straight PA on the 430 mc band; he gives F3JN (Paris) as now active on 434.9 mc, with gear also in hand for 25 cm. CC.

CC or SEO

G3JHM, who has also completed a tripler to 1290 mc after the G3HBW design, suggests that we

SHORT WAVE MAGAZINE

U.K. TWO-BAND VHF CONTEST

RULES

(1) The duration of the Contest will be 1500 GMT March 10 to 2359 GMT March 11, 1956. There will, however, be a break-period between 0200 and 0700 GMT on March 11, when no Contest activity may take place.

(2) Bands used will be 144 and/or 430 mc, CW or phone, and the Contest will be open to participants in either of three divisions:

(a) Two Metres only,
(b) 70 Centimetres only,
(c) Both these Bands combined.

(3) Place lists will be compiled for each of these divisions; thus, there will be a winner in each division, with the leading operator in 2(c) named as "Victor Ludorum."

(4) Scoring system *(both bands)*:

(a) One point for each station worked within a radius of 50 miles (A).
(b) Two points, 50-100 miles (B),
(c) Four points, 100-150 miles (C),
(d) Six points, 150-200 miles (D),
(e) Ten points for all stations worked over 250 miles (E).

0200 GMT on March 11 will be the "change hour." Any station worked before this time can be worked again after 0700 to score. A station can be worked to score on both bands, in both sessions.

(5) Cross-banding to score will be permitted, but for half-points only. Portable, mobile or multi-operator working (two or more operators at one station) will be allowed, provided only that the same call-sign is used throughout the Contest. Schedule-making is permitted, provided this is only done over the air during the Contest.

(6) A contact completed to score must include signal reports, QTH and operator's name. No code group, serial number or NGR will be necessary. Reports should be given simply as RST for CW, and RS for phone. The general call "CQ Contest" should be used.

(7) Logs must be set out *strictly* in the following form:

Band	Station Call		Location		Name			
Date	Time	Station Worked	Report Rec'vd.	Report Given	His Name	QTH	Distance Letter	Points Claimed

(Note: The "Distance Letter" in column 8 will be either A, B, C, D, or E, as given in Rule 4.)

A bold line should be drawn right across the log sheet at the change hour, 0200 GMT, March 11. The log should be summarised by showing:

(i) Total of stations worked under A, B, C, D, and E distance heads before the change hour (by bands, if entering under Rule 2(c)),
(ii) Totals under these heads after the change hour, by bands,
(iii) Total points claimed for (each) band worked,
(iv) Grand total of points claimed.

A brief description of equipment used should be included,

with any comments on the Contest the entrant may care to make.

(8) SWL entries, for separate listing, will be accepted if set out as in Rule 7, omitting col. 4 and treating col. 3 as "Heard."

(9) Logs, addressed only A. J. Devon, "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1, should be posted to reach us by the closing date — Monday, March 26. Results in full will appear in the May issue of SHORT WAVE MAGAZINE.

(10) It is a condition of entry that the decision of the Managing Editor of SHORT WAVE MAGAZINE on the results of the Contest will be accepted as final. At his discretion, Certificates of Merit may be awarded to the leading operators in each division.

should fix a band—say, 1296-1314 mc, since this can be tripled from 430 mc—for crystal-controlled working on 25 centimetres. He is one of those who consider that SEO equipment should be "put to rest," even on 1200 mc. While we would agree the general principle that CC transmitters and converters capable of taking CW should always be used on the VHF bands, including 1200 mc, the first step, surely, is to get *activity*, and communication (even if only local) before getting round to doing things in the more difficult way.

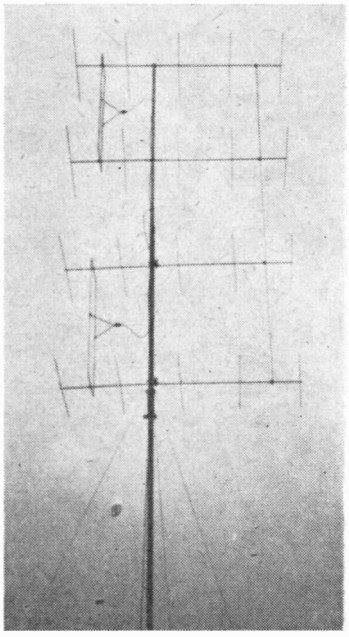
The whole situation just now on 25 cm is much as it was 20 years ago on five metres; the more advanced workers could see quite clearly that CC was the only answer for effective results outside the local area, but the business of crystal controlled transmitters and stabilised receivers looked in those days on 56 mc just as difficult as it now appears on 1200 mc, particularly on the receiving side. The first thing was to get people going on the new band—just as we are attempting to do on 25 cm. Indeed, it was through these columns, pre-war and post-war, that the arguments were fully ventilated, and the conclusion reached that we must have something much better than SEO equipment if real results were to be achieved. But it was only practicable to put this forward when the occupancy of the 5-metre band was such as to make it worth while for the operators able to adopt the more advanced techniques. At the moment, we are somewhat in the dark as to the propagation characteristics of the 1200 mc band as it would be used by amateurs. If there were fifty, or even twenty, stations across the country able and willing to equip themselves for CC operation on 25 cm, with double-conversion receivers and high-gain beam systems, ready to carry out tests over long-distance paths, we would do everything possible to encourage development along these lines; but at the moment there are not, and before going for the more difficult techniques (which we know, in advance, will give results much superior to SEO equipment) it seems to us that it is necessary to get many more people actively interested in the 25 cm band. The way to do this is to simplify the gear. And, as on the other VHF bands, the thing to remember is that it is much easier to transmit a crystal-controlled signal than to receive one! While ideas and suggestions as to the receiving side on 1200 mc have already been discussed in SHORT WAVE MAGAZINE, it is not yet clear what will be the best line to follow.

The West Country

We welcome G3KPT (Bristol, 4) to the two-metre air, he having been licensed since we first mentioned "SWL Farrance" on p.483 of the November issue; as G3KPT, he has made a good start, with 16S worked and another 17 stations heard in the month to December 12. He runs 15w. to an 832 and, at the moment, is on an indoor beam; he scores for the county of Somerset, and would be glad not only to have contacts but SWL reports as well.

Also in the Knowle district of Bristol is G3KHA, who worked 22S and heard 28 others in the period November 20 to December 14; he is active most evenings between 1815 and 1900, and after TV, and has phone. G3JGJ (Plympton, S. Devon) now has an all-metal 16-element stack at a height of 58 ft., mounted on a steel tower, and is also operational on 70 cm, though without result so far; a schedule with G2ADZ has proved abortive. A number of GDX stations were heard or worked during December; G3JGJ would like to arrange SWL or transmitting schedules with anyone interested, in the London direction on two metres, and at nearer distances on 70 cm.

More than half the 32 stations worked by G3F1H (Combe Down, Nr. Bath) during the month were G3-plus-3's, with G3GJZ for Suffolk as best DX; other interesting contacts were with G3FKO, of Bath, when signing GW3FKO/P from locations in Pembs. and Carms. This was during a spell of low activity, and it is a certainty that many stations in the London area missed a



The 24-element two-metre array now in use at G5KW, London, W.3, after G2HCG, who is using a similar beam. This design was shown, fully assembled, at the recent Amateur Radio Exhibition.

TWO METRES

ALL-TIME COUNTIES WORKED LIST

Starting Figure, 14

From Fixed QTH Only

Worked	Station
75	G5YV
70	G6NB, G6XM
68	G3BW
66	G3IUD (302)
65	G3CCH
64	G5BD (435)
63	EI2W (258), G3GHO
62	G3BLP (630)
60	G2OI (402), G3DMU
59	G2FJR (427), G3EHY, G4SA
58	G8OU
57	G8SB
56	G3WW (770), G5DS (654)
55	G2HDZ, G2HIF, G5BM, GW5MQ
54	G3IOO
53	G2AJ (519), G2HDZ (416), G3FAN, G4CI
52	G2NH, G6RH, G6XX, GW2ADZ
50	G3ABA, G3GSE (518)
49	G5MA
48	G6TA (487)
47	G5ML, G5WP
46	G3HAZ (315), G4HT (476), G5BY, G6YU (205)
45	G2XC, G5JU
44	G3BJQ, G3BK, G3FIH, G8DA
43	G2AHP (500), G3BA, G3COJ, G3HWJ, G4RO, G5DF
42	G2DVD, G3BNC, G3DLU*, GM3EGW (146)
41	G2FQP, G3DO, G3HBW, G3WS (255), G6CI (184)
40	G2DD, G3CGQ, G8KL
39	G2IQ, G3GBO (434), G3VM, G8IL (325)
38	G2FCL (234), G3APY, G8VN (190)
37	G2FNW, G2FZU (180), G3DLU, G3DVK (175), G3IER
	G2DCI (155), G2HOP (161), G3CXD, G3IIT, G6CB (312), G8IP
	G3FZL, G3FYY (235), G3HCU (224), G5MR (305)
	G2CZS (243), G3AEP, G3BKQ, G8IC
33	G3HHY (125), GC3EBK

chance, because GW3FKO/P worked G3KEQ (Sanderstead, Sy.) three times from West Wales.

With his responsibilities at Sutton Coldfield, G3BA has been rather limited in his activities; however, he is on from the old QTH at Daventry when he can get down there. In the meantime, work is divided between building gear for the move to the permanent QTH at Sutton Coldfield in the summer; getting ready for 70 cm; and trying new circuits and valves on two metres. One very interesting experience has been with the QVO6-20, which will give 25w. RF output on two metres, with double that in push-pull, making both the 832 and 829B replaceable with QVO6-20's.

Worked	Station
32	G2FVD, G8QY, G8VR
31	G3HXO, G5RP
30	G3CKQ (122), G3FRY, G3GOP (208), G3GVF (129), G3IRA, G5NF, GM3DIQ, GW8UH
29	G3AGS, G3AKU, G3FIJ (194)
28	G2CIW*, G3ITF, G8DL, GM3BDA
27	G3CVO (231), G3DAH, G3ISA (160), G6GR, GI3GQB, GW3GWA
26	G3CFR (125), G3SM (211), G4LX, G4MR (189)
25	G3JMA, G3JXN (191), G5SK, G6PJ
24	G3FD, G3FXG, G3FXR
23	G3CWW (260), G3HSD, G3JHM (131), G3YH, G5PY
22	G2DRA, G3AGR (135), G3ASG (150), G3BPM, G3HIL, G5AM, G8NM
21	G2AOL (110), G3DVQ, G3IWJ, G6XY
20	G2BRR, G3EYV, G3IOE, GC2FZC
19	G3FEX (118), G3GCX, G5LQ (176)
18	G2AHY, G3DBP, G3JGY, GC2CNC
17	G3EGG
16	G3FRE
15	G3IWA
14	G2DHV, G3CYY

Note: Figures in brackets after call are number of different stations worked on Two Metres. Starting figure for this classification, 100 stations worked. QSL cards are not required to verify for entry into this Table. On working 14C or more, a list showing stations and counties should be sent, and thereafter added to as more counties are worked.

* New QTH

TWO METRES

COUNTIES WORKED SINCE SEPTEMBER 1, 1955

Starting Figure, 14

From Home QTH only

Worked	Station
34	G3GPT
32	G3JZG
31	G3WW
29	G3IOO, G5BM
27	G3JWQ
26	G3FIH
24	G3DLU
23	G8VN
21	G3CKQ, G3DO
20	G3BJQ, G3HWJ, G5DS
19	G3JXN
18	G3WS
17	G3ITF, G3KHA
16	G3BW
15	G3IEX
14	G3IRA

This Annual Counties Worked Table opened on September 1st, 1955 and will run for the 12 months to August 31st, 1956. All operators who work 14 or more Counties on Two Metres are eligible for entry in the Table. The first list sent should give stations worked for the counties claimed; thereafter, additional claims need show only counties worked as they accrue. QSL cards are not required for entry in this Table.

Happy New Year

And with that we come to the end of it for 1955, a year during which much has happened and a great deal achieved on the VHF bands. As ever, there is still plenty to be done, particularly on 1200 mc, on which band the pattern of things is not yet as clear as on 144/430 mc.

May 1956 be as successful a year for us all, with EDX and GDX in due season, and for this you have the good wishes of your A.J.D.—who would also like to hear from you, for the February issue, by **Monday, January 16,** for a certainty, addressed: A. J. Devon, "VHF Bands," *Short Wave Magazine,* 55 Victoria Street, London, S.W.1. With you again on February 3, all being well.

The Monofil

AID TO BETTER OPERATING

J. N. WALKER (G5JU)

This original and versatile unit, simple to construct and straightforward in its application, can be shown to be capable of no less than six useful functions in the average station—as a CW monitor, variable audio oscillator, CW filter, code practice buzzer, phone monitor and local-station BC receiver. As our contributor explains, if one or other of these is thought unnecessary, the associated circuitry can be eliminated. As an operator aid, the most important applications of the Monofil are for monitoring and, in particular, its use as a sharp-tuning CW filter.—Editor.

THIS somewhat unusual piece of equipment is versatile in its applications and the one unit can be built to carry out, actually, four separate functions—although only in rare cases will all four uses be required. Some may decide to leave out this or that feature, but as any deletions will in any case be of a minor nature, it has been thought well to describe the complete unit as constructed by the writer. Some additions are also feasible, of which more later.

The basic unit makes use of two valves and a germanium diode. The valves must be high slope types and, for convenience, two EF50's have been chosen. There are a number of others which will undoubtedly work equally well, examples being the 6AC7 (1852) and 6SH7 in the octal range; Z77, EF91, and 6AM6 in the B7G range; and the EF54.

Again, whilst full constructional details and a suitable layout are given, there is no reason why the individual constructor should not choose a different shape or size for the unit, making it small and compact or large and bulky, as availability of components and fancy dictate. There are no worries about feedback, RF currents, short wiring, or any of the other points which usually have to be taken care of when building more elaborate equipment.

Applications

The unit was constructed primarily with the idea in mind of producing a monitor, for CW signals, capable of being used with *any* transmitter and to be quite separate from the said transmitter and also from the receiver used in association with it. By "quite separate" is meant *no* interconnecting leads, *no* relay contacts to be wired in, and *no* frequency-conscious circuits. When, after some time spent experimenting, this requirement was achieved, it was realised that, with a little more work, the instrument could be made to perform other functions, and that without spoiling its performance in the original purpose. These additional functions include an audio oscillator of variable frequency and amplitude (useful for checking speech equipment generally); a Morse code practice oscillator; and, last, but by no means least, a sharp tuning filter for CW reception. In the latter application, the unit is of course used in conjunction with the station receiver.

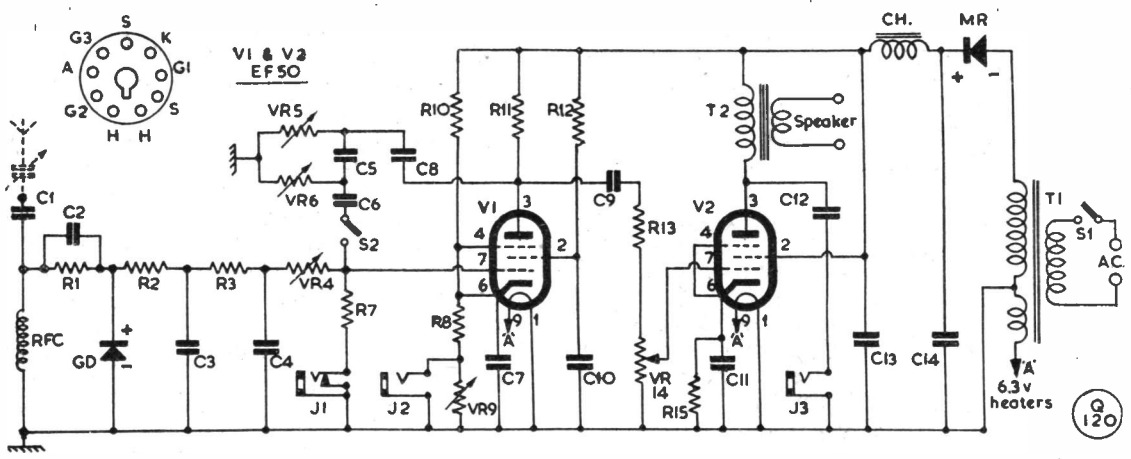
A small mains power unit is included so that the whole can be operated in any one of its functions without an external power supply being required.

Circuit

The full circuit is given overleaf and it will be seen that the first valve is employed as an oscillator for the first three functions and as a regenerative amplifier for the fourth. This oscillator is of the resistance-capacity phase-shift type, which is too well-known to merit a description of its mode of operation. The other valve acts as a straightforward high gain amplifier and gives an output sufficient for a small speaker if desired, a jack for telephones also being provided.

With normal bias on V1, oscillation is readily obtained over a range of audio frequencies dependent on certain component values, and adjustment can be made, as explained later, to suit individual requirements, should this be found necessary. One of the controls (VR9) is a potentiometer (more correctly a variable resistance) which enables the bias applied to the grid of V1 to be increased to a value at which oscillation ceases. A jack (J2) is fitted in parallel with VR9 so that, with a key plugged in, the make and break of the contacts causes oscillation to start and stop, when the instrument becomes a useful code practice oscillator.

Another jack (J1) enables a signal to be fed into the grid of V1 from an external source. When VR9 is adjusted so that oscillation just ceases, the circuit becomes a highly regenerative amplifier responding sharply to a frequency closely agreeing with the natural frequency of the amplifier but considerably attenuating all others. Hence the whole becomes a most effective filter for CW signals with the advantage that, instead of the sometimes severe insertion



Circuit complete of the "Monofil," as described by G5JU in his article. It has a number of useful practical applications and, being in no way frequency-sensitive or liable to pick up hum, it is easy to build. All values are given in the table.

loss common with the LC type of filter, additional amplification is available if wanted.

And finally to the small assembly, consisting of RF choke, germanium rectifier and decoupling network. A lead is arranged to pick up a small amount of energy from the transmitter or aerial and this appears as a voltage across the RF choke, being then rectified and applied as a *positive* bias through the network to the grid of V1.

With no RF present, V1 is set, by adjustment of VR9, so that oscillation does not occur. Application of RF results in the negative bias being partially cancelled out and an audible note is generated. This note is adjustable as regards pitch and amplitude, but it does not, of course, give any indication of the actual tone quality of the transmitted signal as radiated, other than that if bad key clicks are present they will be reproduced in the output of the "Monofil."

The diode detector is surprisingly sensitive and a very small amount of RF energy suffices. One point to watch is that too much pick-up results in excessive positive bias and the circuit will not then oscillate. If the unit is used in this way on several bands, it will be an advantage to fit a series variable condenser—both sides being insulated from the chassis, of course. This is shown in the circuit in dotted lines.

Note About Variable Resistances

A study of the parts list will show that practically all the components specified are readily available — in fact, most readers will probably have a large percentage of them on hand. But there is one exception—the ganged potentiometer comprising VR4, VR5, and VR6. Whilst the writer generally avoids using surplus components, this is a case where there is practically no alternative, since a similar component is only available commercially to special order.

Whilst preferable if it can be obtained, a three-gang potentiometer is not essential, as

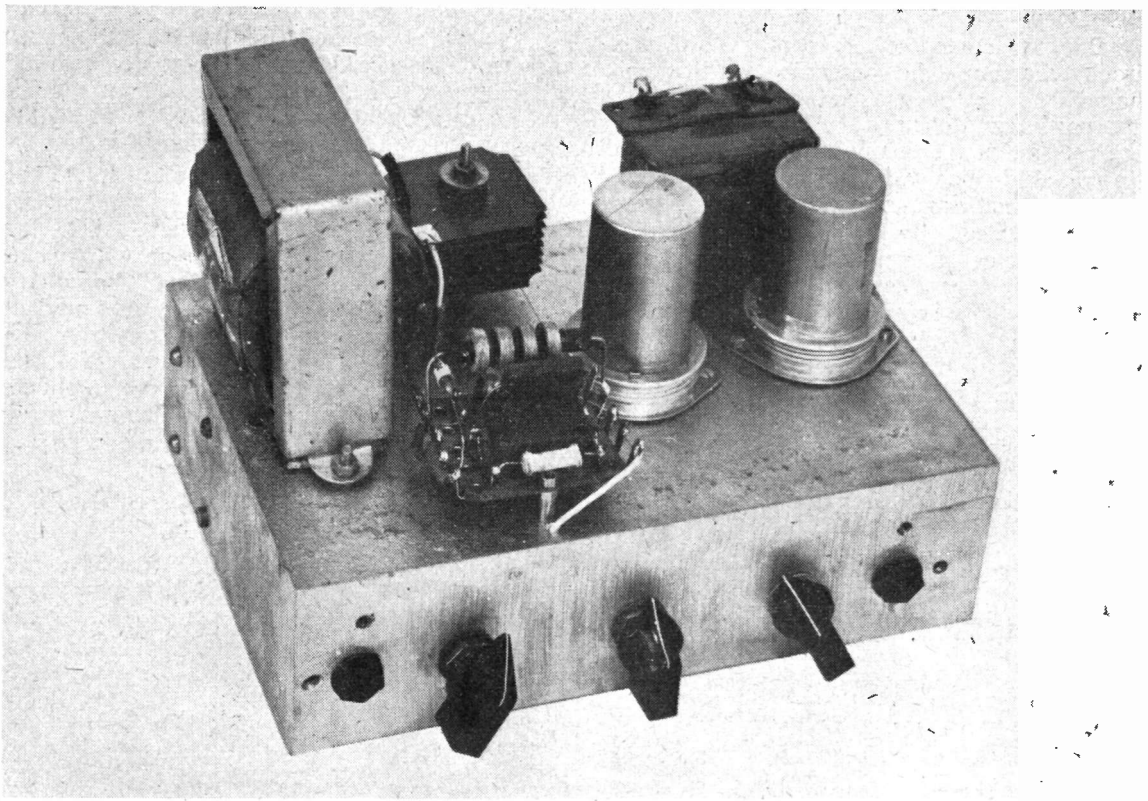
Table of Values

Circuit of the "Monofil"

C1	= .0003 μF moulded mica	VR4, VR5, VR6	= 100,000 ohms ganged potentiometers (*but see text*)
C2, C3, C5, C6, C8. C9	= .001 μF moulded mica	R7, R13	= 1 megohm, ½ watt
C4, C12	= .01 μF mica or paper	R8, R15	= 300 ohms, ½ watt
C7, C11	= 25 to 50 μF, 12 or 25 volt, electrolytic	VR9	= 5,000 ohms, w/w potentiometer
C10	= 0.1 to 4 μF, paper or electrolytic	R10	= 100,000 ohms, ½ watt
C13, C14	= 8 or 16 μF, 250 volts or more wkg, electrolytic	R11	= 22,000 ohms, ½ watt
R1, R2, R3	= 47,000 ohms, ½ watt	R12	= 33,000 ohms, ½ watt
		VR14	= 0.5 megohm potentiometer

LIST OF PARTS

Chassis, *Cat. No.* 643, and Cabinet, *Cat. No.* 644	*Eddystone*
Knobs, *Cat. No.* 841	*Eddystone*
RF Choke, *Cat. No.* 1010	*Eddystone*
Transformer T1, usual mains input, outputs 180/200v. 30 mA and 6.3v. 1 amp. (pre-amplifier type)	
Metal Rectifier (MR) to suit transformer (half-wave type)	
Germanium Diode (GD), type GEX34	*Osram*
Jacks, type P72	*Igranic*
Output Transformer (T2) to match 7,000 ohms to 3-ohm speaker	
Valveholders, B9G	
Valves, EF50	*Mullard*
Switch S1 (and S2 if used), SP toggle	



The "Monofil," as designed and built by G5JU, removed from its cabinet. As explained in the text, it can be made to perform a number of useful functions, not least of which is that of a variable frequency audio oscillator.

there is very little difference in operation if a fixed resistor is used in the VR4 position, so the requirement reduces to a twin 100,000 ohm potentiometer. If this is unobtainable, a twin 50,000 ohm one can be made to serve, using a combination of fixed and variable resistance, with some reduction in the frequency range. Finally, if all else fails, two separate 100,000 ohm potentiometers can be employed, in which case it is suggested they are mounted above the chassis where more room is available. It will only be necessary to keep the two controls roughly in step when adjusting the note and, in fact, a finer degree of control will probably result.

Other Points

As described, the frequency covered ranges from 200 cycles to 5000 cycles per second—these are very approximate figures as the components are wide tolerance (plus or minus 20%) and the exact coverage will be found to vary accordingly. The main point is that this range covers the 800 to 1200 cycle section generally used for CW operation and Morse practice, whilst the total range is also quite a useful one for testing speech equipment. Those who would like to extend the range at the low frequency end can easily do so by increasing the value of C5, C6 and C8 to say ·002 μF.

In the parts list, the specification for C10 is somewhat elastic, the reason being that it has only to act as a moderately effective audio frequency by-pass. It can be either a paper or electrolytic type and the higher the capacity the better, but a paper one of 0·1 μF (but preferably 0·25 or 0·5 μF) will still give satisfactory operation.

The output transformer is of the common inexpensive type used generally with a 6V6 or similar valve in a broadcast receiver — any available transformer will serve as accurate matching (important when quality is the aim) does not much matter in this particular case. Similarly, any speaker of a suitable impedance will fill the bill.

Cover

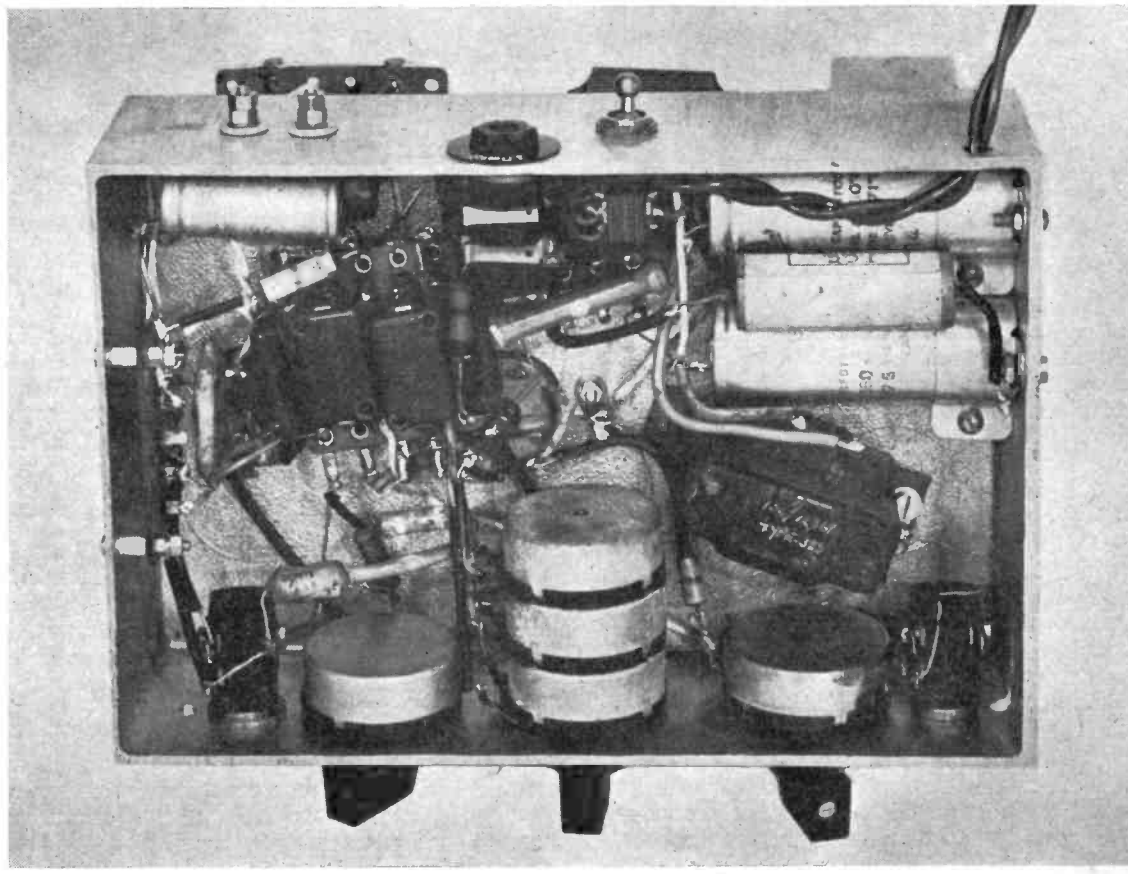
Construction

Taking together the photographs and the circuit diagram, the intending constructor should be able to go ahead without meeting any particular difficulty. All that is really required is that the components are fitted into the available space without fouling each other, hence no exact dimensional drawing is necessary or provided. Possibly the photograph of the underside of the chassis gives the impression that there is a tendency to overcrowd components, but this is not really the case.

The large valveholder holes should first receive attention, followed by the holes in the walls of the chassis. At the rear are the mains on/off switch, input jack J1, and two terminals, one at least insulated, for loudspeaker connections. By the way, if a 2½ in. diameter monitor type of speaker is used, it can well be mounted on the wall of the cabinet.

On the front wall are the three potentiometers and jacks J2 and J3. According to the constructor's individual interests, not all of these components may be called for and hints on minor modifications are given later.

Next, the power supply units should be mounted, not forgetting holes in the chassis to accommodate the various leads. Also, for the benefit of those not familiar with metal rectifiers, the lead from the HT secondary winding goes to that side of the rectifier marked black or green, output being taken from the red side. The mains transformer is of the type sold for use with television pre-amplifiers and similar equipment. The one shown in the photograph is certainly a little on the large side physically and a smaller one would be better. An HT voltage of between 180 and 200 is

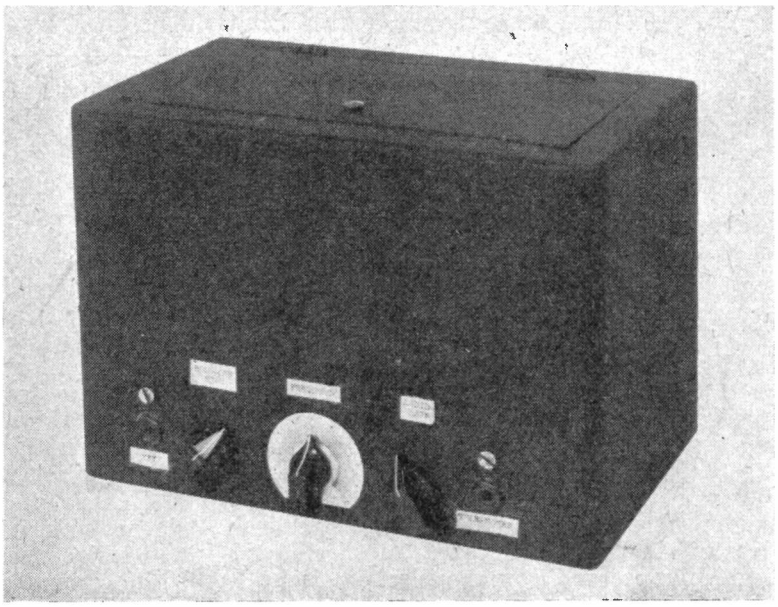


Under-view of the "Monofil." Layout is not in any way critical and though a ganged potentiometer assembly is shown, this can be simplified, as explained in the text. The "Monofil" as described here is self-powered, using a metal rectifier.

ample—more is likely to lead to a lack of smoothness in operation of the oscillator valve.

Any small smoothing choke capable of carrying 20 mA or more and of suitable dimensions can be pressed into service. If no objection is taken to a slight hum in the output, a 1000 or 2000 ohm resistor (1 or 2 watt rating) can be substituted for the choke, especially if higher capacity smoothing condensers are used.

Forgetting for the moment the network of resistors and capacitors shown to the left of V1 in the circuit diagram, most of the wiring can then be completed. Tag strips here and there help to hold the small components firmly and to keep the wiring neat.



The " Monofil " in its cabinet, with controls. The key jack is at left, the first knob beside it controls hold-off bias, the scaled knob is for audio frequency variation, the right-hand knob is for audio gain, and beside it is the phone jack. A piece of equipment such as the " Monofil " can be built up in any convenient way.

The three mica condensers C5, C6 and C8 forming the phase-shift network, together with the coupling capacity C9, are mounted on a group board, the latter then being fixed on pillars in a position clear of the resistors and of the valveholder wiring below, so to speak looking down on the underside. It is then an easy matter to complete the wiring associated with these components and with the ganged potentiometer.

Finally, there is the RF network which is dealt with in a similar way to the foregoing. The choke, resistors R1 and R2, condensers C1, C2 and C3 and the germanium diode are all fitted to a group board and the various interconnections made, leaving only tags for connecting to earth (a tag beneath a fixing bolt), to the pick-up wire, and to R3, which latter is below the chassis. To give bias in the correct sense, that side of the diode painted red is connected to R1/C2.

Possible Variations

The foregoing description relates to the " Monofil " as a whole and built to fulfil all four original functions. But possibly some readers will consider constructing it for one or two particular purposes, in which case various simplifications can be made.

Obviously the RF diode assembly is only required for the CW monitoring application, and it can be omitted for the other three. There is then no necessity for C4 and one end of R4 should be returned to chassis.

For purely audio oscillator work, potentiometer VR9 and R10 can be left out, and the same applies to jack J2 when there is no intention of keying the oscillator.

Finally, R7 and jack J1 are not required if the unit is not going to be used, in conjunction with a receiver, as an audio filter for CW operation. But this is possibly one of its most useful functions where the interest is CW working.

Incidentally, this is as good a place as any to mention some possible additions. Four primary functions have already been stated, but there are two more for those seeking still greater versatility! If the circuit around V1 is broken, either between C6 and grid or between C8 and anode, it is no longer an oscillator, but becomes a straightforward amplifier. So if a switch (with screened leads) is fitted to break the circuit as suggested, and the RF assembly retained, a useful 'phone monitor results, again without any need for tuning or for connecting to other equipment.

The " final final " use (unless someone thinks up yet another !) is to substitute a tuned circuit for the RF choke, attach some sort of aerial, and then one has quite a good little broadcast receiver for local stations. Coming to that, there is hardly any need to remove the choke—

it is only necessary to arrange a tuned circuit covering the broadcast bands, and feed in a signal from it. Preferably the special coils made for use with germanium crystal detectors should be chosen, as the separate low impedance winding feeding the crystal enables a reasonable degree of selectivity to be achieved.

Operation

Returning, after these diversions, to the original features, the differences in operation can be explained in a few words. As a Morse practice set, the tone is adjusted to near the 1000-cycle mark, volume adjusted to suit, then VR9 backed off until oscillation ceases, when the key can be plugged in and operated. By the way, this jack is wired up so that it remains open circuit when the plug is withdrawn.

As an audio oscillator, VR9 is rotated to minimum resistance. Output at low impedance is available from the speaker terminals, and at high impedance from the telephone jack J3, for feeding into a speech amplifier or other equipment. The output waveform is not truly sinusoidal, but it is good enough for most practical applications.

For CW work, a lead with a plug at each end is made up. One plug goes to the telephone jack on the receiver, the other to J1 on the unit. Either telephones or loudspeaker can be used to render the signals audible. The hold-off control VR9 is set a little beyond the point where oscillation ceases. The signal fed in should have a tone around the 1000 cycle mark (as is usual anyway) by adjustment of the receiver and then the frequency control in the "Monofil" rotated to bring the response to resonance. When this occurs, the wanted signal will peak up considerably, with noise and interference dropping away. The operator will soon learn the niceties of adjustment of both "Monofil" and receiver controls, which will bring any given signal up to maximum intelligibility.

Lastly, there is the CW monitoring application, when it is simply a matter of backing off the bias until oscillation ceases and adjusting the amount of RF pick-up until a clean note results when the transmitter key is pressed. It will be well to try adjusting the audio note as at the lower and higher audio frequencies there may be some delay in oscillation commencing.

EXPERIMENTAL COLOUR TELEVISION EQUIPMENT

AT ALEXANDRA PALACE

Prepared by the Engineering Division of the BBC, this Paper is published on the authority of Sir Harold Bishop, Director of Technical Services, British Broadcasting Corporation.
—EDITOR.

THE BBC has installed experimental colour television equipment at the London Station at Alexandra Palace, for a series of experimental tests of colour television transmission systems. These tests started on October 10, and at the present time a particular type of signal, based on the American "N.T.S.C. Standard," is being radiated. It is important to understand how it has come about that this system is the first to be tested.

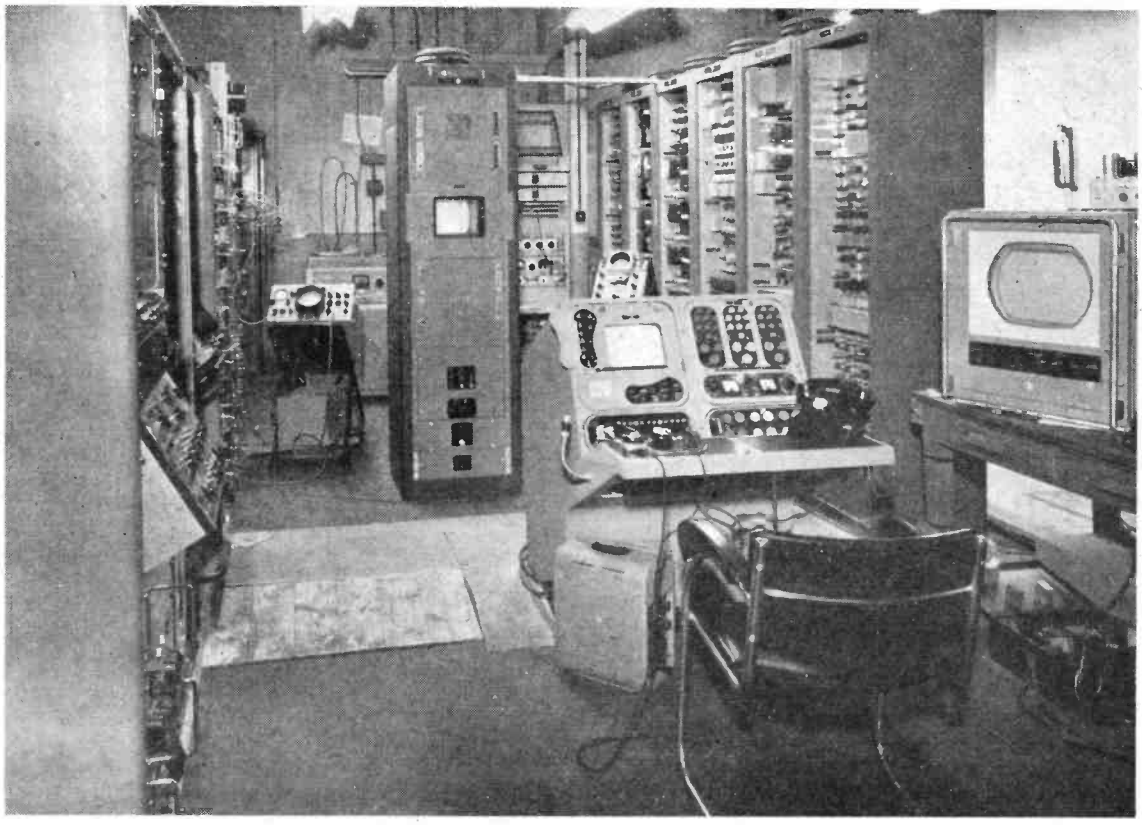
In December, 1953, the F.C.C. approved for public service in the U.S.A. the colour television standards recommended by the National Television Systems Committee (N.T.S.C.). The principal features of the N.T.S.C. signal which need concern us here are:

(1) The colour signal is transmitted in the same radio frequency channel and by the same transmitters as carry the established monochrome service.

(2) It is claimed that the system is "compatible," *i.e.*, that existing monochrome receivers can produce a monochrome version of the colour picture, which is as good as if the picture had originated from a normal monochrome camera.

(3) It is further claimed that the standards are such as to allow for considerable future development in the quality of the colour picture, in the same way as the original specification for the monochrome television service has allowed a continuous improvement in quality over the course of the years.

In this country the BBC has operated since 1936 (except for the war period) a well-established and successful monochrome service employing 405 lines, 50 frames per second interlaced. The advent of the N.T.S.C. colour system naturally aroused interest in the question as to whether this system would show the same advantages here when modified to suit British television standards. Since the scanning and transmission standards of the U.S.A. and this country differ in important ways, there was no *a priori* reason to answer the question affirmatively, and work was therefore started on the problem in the BBC Research Laboratories and in certain industrial organisations.



General view of the colour studio control room at the BBC's Alexandra Palace TV transmitting station. On the left is the film scanner, on the right power supply and pulse generation equipment. The central control console carries the three-tube colour picture monitor and on the extreme right is a BBC colour receiver for checking the picture as radiated.

Work in the Laboratories has now reached the stage where practical transmission equipment is available, and, with the agreement of the G.P.O. and the co-operation of the radio industry, the investigation will be extended to a wider field. The results of these investigations will be at the disposal of the Television Advisory Committee, which has been asked by the Postmaster-General to report on the whole field of colour television.

The equipment at Alexandra Palace generates a modified N.T.S.C. type of colour signal, and its purpose is:

(1) To explore the degree of compatibility of the system by making observations on some thousands of black/white receivers.

(2) To see whether the system is capable of producing a consistently good quality colour picture.

The tests in connection with the first question are already proceeding, and it is hoped to provide a statistical answer in due course. Naturally, since colour pictures are being transmitted, some experience and knowledge is being obtained on the second point, but no wide-scale observations are yet taking place because sufficient colour receivers are not yet available.

It cannot be emphasised too strongly that the work is entirely experimental with the sole object of obtaining data which, in due course, will be studied by the Television Advisory Committee, the Industry and the BBC.

The test transmissions, which take place outside normal programme hours and have no entertainment value, are in no sense a public service and do not indicate that the start of such a service is imminent. The BBC has no definite plans for the introduction of such a service; there are many difficult technical problems to be solved before this can be contemplated.

The N.T.S.C. Type of Colour Signal

As the equipment at Alexandra Palace has been designed on the basis of the N.T.S.C. signal, a brief description of the essential features of the latter will be given for the information of those who are not acquainted with the principles on which it is based.

Because of the physical make-up of the human eye, the sensation produced by practically all the

colours encountered in real life can be reproduced by the additive mixture of red, green and blue light. Therefore, it is a common feature of all colour television systems (with any pretensions to accurate colour reproduction) that the receiver employs coloured lights of red, green and blue, whose intensities are controlled by three separate signals from the transmitter. The N.T.S.C. signal transmits these three signals as: *(a)* A luminance (brightness) component, and *(b)* A chrominance (colour) component, having two separate parts.

The luminance component is the same as that which would be produced by a panchromatic monochrome television camera looking at the same scene, and this signal therefore produces a normal monochrome representation of the coloured scene on a standard monochrome receiver.

The chrominance component consists of two colour-difference signals which, in the simplest terms, may be said to convey the hue and degree of saturation of the colour information. In the colour receiver, these three signals representing brightness, hue and saturation are combined to produce the required intensity from each of the red, green and blue lights. The fact that a monochrome receiver and a colour receiver can simultaneously produce each its own version of the scene from the same signal gives the N.T.S.C. system its valuable feature of "compatibility."

It would be possible to transmit the chrominance signal quite independently of the luminance signal, and in this case the compatibility would be virtually perfect. However, the second unique feature of the N.T.S.C. signal is that the two components have been combined in such a way that they occupy the *same total bandwidth* as that used by the equivalent monochrome signal. Due to the manner in which the human eye perceives colour, the separation of luminance and chrominance enables the bandwidth of the chrominance signal to be reduced to about one-third of that of the luminance. Further saving of bandwidth is achieved by placing this reduced bandwidth information at the upper end of the luminance band in such a way that the inevitable interference ("cross-talk") between the two signals has a minimum effect on the compatible picture on the monochrome receiver. The actual mechanism, by which this band sharing takes place, employs a colour sub-carrier (in the British version 2.66 mc) which is simultaneously modulated in amplitude and phase by the two colour difference signals, the carrier itself being suppressed so that the chrominance signal exists only when colour is present in the scene being transmitted. The colour sub-carrier is an odd multiple of half the line scanning frequency, and, under these circumstances, the visibility of the best pattern produced between it and the scanning lines is a minimum.

This ingenious combination of band saving, band sharing, suppressed carrier modulation and "frequency interleaving," is claimed in the U.S.A. to produce an adequately compatible signal. Whether or not such is the case in the British version applied to typical domestic receivers in this country is the chief matter under investigation at the present time.

Equipment at Alexandra Palace

The main items of equipment installed at Alexandra Palace are:

(1)	**Colour slide and film scanner**	Designed and made by Research Department, Engineering Division, BBC
(2)	**Colour camera**	Designed and made by Marconi's Wireless Telegraph Company Limited
(3)	**Signal coding equipment**	
(4)	**Colour picture monitors**	
(5)	**Colour test equipment**	

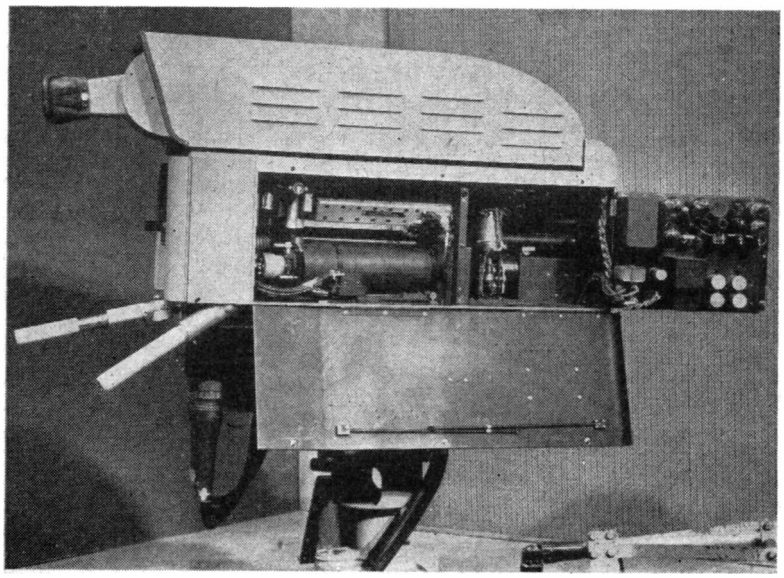
Colour Slide and Film Scanner. The colour slide and film scanner is the source of the pictures which are being transmitted for the present series of tests of the compatibility of the N.T.S.C. signal. It produces pictures from slides either 3¼ ins. x 2¼ ins. or 2 ins. x 2 ins., or from 16 mm. film, by selection of the appropriate optical system.

The scanner employs the flying spot principle, and the source of light is therefore a cathode ray tube of which the phosphor emits light as evenly as can be achieved over the whole of the visible spectrum. The light from the raster on the face of the scanning tube is passed either through the slide or the film as desired, and the coloured image so produced is then split into three separate parts, which represent respectively the red, green and blue information in the picture. This colour analysis process is performed by a combination of dichroic mirrors, coloured filters, plane mirrors and lenses. The three colour separation pictures, which emerge from the analyser as three physically separate rays of light, are then focussed each on to a photo-multiplier tube which turns the intensity of the light, which is varying in accordance with the scene being scanned, into corresponding electric voltages. The three voltages are then passed through three separate and identical chains of equipment which supply gamma correction, correction for the distortion introduced by the finite decay time of the light from the scanning tube phosphor, and equalisation for aperture loss—exactly as in the case of a monochrome flying spot scanner.

The film transport mechanism is a standard intermittent motion 16 mm. projector with a "pull-down" time of about 4 milliseconds. Since the time available for "pull-down" is only 1.4 milliseconds if all the lines of the television picture are to contain information, some picture information is inevitably lost. This loss occurs at the top and bottom of the picture, where about 15 lines are presented as black. In order to preserve the usual aspect ratio of 4 : 3, an equivalent area at the sides of the picture is also black. The picture therefore appears as in a black frame, but this disadvantage is accepted because the arrangement permits of a simple and efficient optical system. Synchronism between the film motion and the television picture repetition rate is achieved in a simple way by supplying power to the synchronous motor of the film transport mechanism by amplifying the 50 c/s component of the frame pulses.

The photograph of the scanner shows the principal mechanical features. At the bottom right of the right-hand cubicle is a large rectangular box

containing the scanning tube. The recessed three-spoked handle moves the scanning tube physically for focussing the image. The optical system contained in the drum in the middle left deflects the light from the raster either into the slide holder immediately above or into the film scanning mechanism at the right. The rectangular box at the top left, which is on pivots, contains the colour analysing filters and the three photo-multiplier tubes. It is shown in the slide scanning position: for film it is swung over to the right so that it accepts light emerging from the film scanner through the funnel-shaped outlet above the transport mechanism. The rack on the left contains power supplies, a control panel and a monochrome picture monitor. A further cubicle (not shown) contains the electronic equipment associated with the red, green and blue separation signals.



Side view of the three-tube colour camera, used in the BBC's experimental colour work, showing one of the camera tubes and the associated amplifiers.

The Colour Camera. Coloured light entering the lens of the camera is split into three colour separation images by a colour analyser, similar in principle to that used in the slide and film scanner. In place of the three photo-multiplier cells are three image orthicon camera tubes of a type developed specifically for colour work. These tubes produce the three colour separation signals in electrical form. Each of the tubes is supplied with the necessary scanning waveforms and electrode potentials, just as in the case of the single-tube monochrome camera. It will be realised that the output of each tube is a separate picture, of which not only the transfer-characteristic between light input and voltage output must be maintained in a precise manner for the three signals, but the geometry of the three pictures must be the same within very close limits, so that any particular detail of the picture occurs at the same point in the scanning cycle of all three.

The signals from the tubes are amplified in the camera and transmitted to the control room over three identical cables. In the control room, each signal is gamma corrected and equalised in a manner very similar to that used in monochrome equipments employing the same type of camera tube, and finally emerges as a colour separation signal of the same form as that produced by the slide and film scanner.

The photograph shows a general view of the camera. The control desk of the camera is seen in the foreground of the photograph of the control room. The three sets of controls — one for each camera tube — can be clearly seen. The electronic equipment for the camera is mounted in the cubicle nearest to the control desk.

Signal Coding Equipment. The signal coding equipment includes the special colour waveform generating equipment and the "encoder," in which the luminance and chrominance signals are formed from the incoming three-colour information.

The "master" frequency, from which all the other scanning and pulse waveforms are derived, is obtained from a temperature-controlled crystal oscillator, the frequency of which is 2.6578125 mc ± 8 c/s. This frequency is multiplied and divided to produce the usual double-line frequency of 20,250 c.p.s. from which the standard 405-line interlaced waveform is generated. (It will be noted that the frame repetition rate is asynchronous with respect to mains frequency, in contrast to the existing monochrome service in which synchronous working is almost always employed.) Multiple outputs of line and frame trigger pulses, mixed synchronising pulses and mixed suppression pulses are available.

The input to the encoder consists of the three gamma corrected colour separation signals (red, green and blue), which are produced by either the slide and film scanner or by the camera. The encoder may be considered as performing a single linear transformation of the three incoming signals—red, green and blue—to the other three quantities, Y, I and Q, of which Y is the luminance signal. The colour sub-carrier is then modulated by the I and Q signals in such a way that the amplitude of the resultant signal conveys the saturation information and the phase conveys the hue. In the absence of colour information, the sub-carrier is suppressed. The complete chrominance signal is added to the luminance, which is, of course, in video form. Finally, the synchronising waveform is added to produce the complete waveform. The synchronising waveform is of the normal type, except that a "burst" of nine cycles of the colour sub-carrier is added in the suppression period following every line

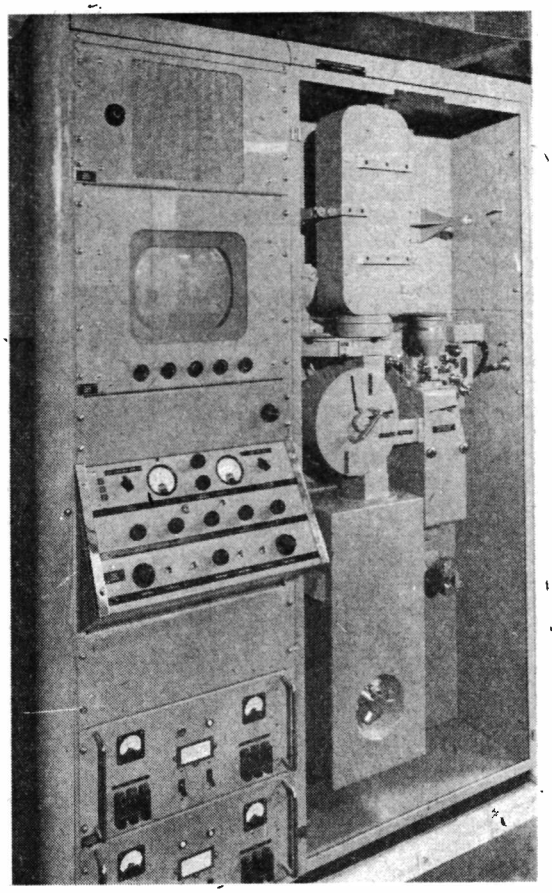
synchronising pulse. This "burst" is used at the receiver to synchronise a sub-carrier generator which is needed for detection of the quadrature modulated chrominance signal.

The waveform generator and the encoder are mounted in the two cubicles adjacent to the camera control equipment. The three other cubicles in the background at the right supply power for the whole of the equipment, with the exception of the slide and film scanner.

Colour Picture Monitors. There are two colour picture monitors. One employs three separate tubes, the phosphors of which emit, respectively, red, blue and green light. The application of the colour separation signals to the grids of these tubes produces three colour separation images, which are combined optically by dichroic mirrors to produce a direct viewed colour picture. This method brings with it the attendant difficulty of superimposing the three separate images accurately — just as in the colour cameras. However, up to the present, this method produces the best pictures and its complication is worthwhile in a monitor intended for technical purposes. This monitor is seen in the centre of the photograph of the control room.

The other monitor uses a 15-in. R.C.A. shadow-mask tri-colour tube (which has been described extensively in the technical literature). Since the monitor incorporates its own decoder, the input signal is of the N.T.S.C. type, and the unit is therefore used for general checking and monitoring of the transmitted signal. It can be seen on the extreme right of the photograph of the control room.

Colour Test Equipment. The complicated nature of the N.T.S.C. signal requires special test signals and measuring apparatus to ensure that its specification is met. The main signal for this purpose, "colour bars," is generated electronically and produces on the picture monitor seven vertical strips which, from left to right are: white, yellow, cyan (blue-green), green, magenta (purple), red and blue. These signals represent saturated colours for which the amplitude and phase of the colour sub-carrier are known. The amplitude is measured in the usual way with a waveform monitor; the phase is measured by a special piece of test equipment known as a Colour Signal Analyser. Distortion occurring in the transmission of the signal after it has left the encoder can, of course, be measured similarly.



Colour television scanning equipment for showing slides and 16 mm. film.

Other electronically-generated signals, such as "dots" and a grid pattern of lines covering the whole picture, are provided for the purpose of adjusting the picture monitors. The camera and slide and film scanner have a series of special test cards for the alignment of the apparatus.

NEW CLUB FORMATIONS

We are informed that it is proposed to revitalise the Bury Radio Society. To this end, a meeting has been arranged at the George Hotel, Kay Gardens, Bury, for 8.0 p.m. on Tuesday, January 31, when it is hoped that all interested — transmitters and SWL's alike—will attend. Arrangements are in the hands of J. E. Hodgkins, G3EJF, 24, Beryl Avenue, Tottington, Nr. Bury, Lancs.

A new club is also being formed in Liverpool, to be known as the ATC, 7/F Sqdn. Radio Club, with G3JMQ/A as its temporary call-sign, operating on 40 and 80 metres. Enquiries from boys over 14 will be welcome any Tuesday or Thursday evening, 7.30 to 9.0 p.m., at Dingle Vale School, Dingle, Liverpool, 8, or direct to: C. S. Cotter, G3JMQ, 19 Homer Street, Dingle.

The Midlands group of the British Amateur Television Club was inaugurated at a meeting held in Birmingham on December 8. The next meeting is on Thursday, January 12, at 194 Aston Brook Street, Birmingham, 6. The hon. secretary of the new group is F. J. Rawle, 16 Kings Road, New Oscott, Sutton Coldfield.

NEW "RADIO AMATEUR HANDBOOK"

The 1956 edition of one of the best sellers in the field of Amateur Radio literature—*The Radio Amateur's Handbook*, published by the American Radio Relay League—will be available direct from us, from stock, towards the end of February. The format and the price, at 31s., post free, remain unchanged, and orders can be accepted now, addressed to: **The** Publications Department, Short Wave Magazine, **Ltd.**, 55 Victoria Street, London, S.W.1.

Going After DX

NOTES FOR NOVICES

PART II

By THE OLD TIMER

This is the second of a short series of articles, intended specifically for the newcomer, on the general subject of DX working on the communication bands. The first part appeared in our December issue.—Editor.

LET us start with a very brief summary of the advice contained in Part I, which may be stated thus: Don't call CQ (except as a trial on a "dead" band); Don't use long calls; Match your speed to the other station; and *Listen*!

The last word is the most important of all, and we make no apology for plugging away at it. Practically all new DX is worked by the man who *listens*—even on a very unpromising band—until he hears something unusual. Then he calls it, and it very often happens that he has been the only one to hear it, all the others having been occupied in calling CQ's or working other stations at the time.

You will very rarely find yourself working a new country as the result of a CQ call. It *does* happen, particularly under bad conditions when the band seems to be empty and you may even, in fact, have it on your own. Then, if the rare DX station happens to be the one that is doing a bit of listening, you will be lucky.

VFO Technique

How to call, when to call and *where* to call! The last is possibly the most important. If you are still in the novice stage and going after the ordinary run-of-the-mill DX (W's, ZS's, VK's and so on) there is no objection to replying to a CQ on the same frequency as the caller. You *must* have facilities for "netting" — swinging your VFO on to his frequency without having power on the rest of the transmitter. It is worth spending quite a lot of time on this. Your VFO local radiation should not be so strong that it paralyses the front end of your receiver under these conditions; neither should it be so weak that you have difficulty in finding its beat when the band is full of good signals.

Next, you must be certain that there is no "pulling effect" in your transmitter; meaning that when you have tuned your VFO to zero-beat with the DX station you are about to call, then your transmitter, when you put the power on, must come up *dead* on that frequency. Even two or three kilocycles on either side is not good enough.

If you are waiting for a CQ to finish, with your VFO in readiness, all you have to do is to get in a quick call immediately he signs and says "K." No preamble, no "dah-de-dah-de-dah"—just the other fellow's call three or four times, and your own three or four times, at the same speed as he was sending his CQ. If you have a good signal, and he was not a rare station, then you have a very good chance of getting him on such a call, and there is nothing wrong with the technique of calling on his frequency.

The Rare Ones

Such procedure would, however, be quite hopeless in dealing with a station in one of the more sought-after countries. You should be aware that if he has a strong signal, a CQ call from him might well produce fifty replies, of which perhaps forty would be on his own frequency . . . that is about the percentage of unskilled operators on these occasions! Logically, therefore, his own frequency is the very *worst* place on which to call—the QRM will be thickest there.

There are two alternatives. You either take a chance and call him, say, five kilocycles above or below—hopefully—or you pass him up the first time and try to find out where *he* is listening. If you can hear the station he is working, you are hot on the trail. Net carefully on to this station, and immediately he signs for the last time (meaning when he has got through all the "73, Pse QSL, QRU nw, GN OM . . . SK")—after that SK you may try a quick call to the DX station. This will often pay dividends, but only if you are dead on the frequency of his previous QSO, and only if you get in there without the slightest pause.

Don't blot your copybook by butting in before the other fellow has finished sending, or you may be blacklisted for good as a "basher" and you may never work that much-desired rare one.

You may possibly be unlucky at this technique for another reason. When some people send "SK" they don't really mean it! When the station you were following signed off like that, if the DX station hadn't already said Good-Bye and 73 to him, then he will probably come back and do so, and in doing it will make such a quick change-over that he won't hear

your call. It would have been better if the station working him had *not* sent "SK," but only "AR." He should only have sent "SK" if the contact was really finished and he didn't intend to listen there any more. But you can't be sure of these things. Therefore, listen to both sides of the QSO and make up your mind when it really has finished before getting in.

Detective Work

When you encounter one of those super-rareties such as a DX expedition that is putting a new country on the air for the first and possibly last time, you need all your wits about you. He will be giving out very short and snappy QSO's and will probably only reply to very quick calls. So you may find it difficult to identify any station that he is working. You must keep on trying, and if you can hear two QSO's, so much the better. You will know by then whether the rare one is listening above his frequency, below it, or alternately above and below. (Yes, many of them do that!) Whatever he is doing, you will be wasting your time if you give him a call in the wrong place. And those hopefuls who go on calling him for three minutes at a time are completely out of the running—even if he happened to hear one of them, he wouldn't bother with them, because they are making it obvious that they have no idea how to handle a snappy contact, and the DX station has no intention of doing anything else.

Blocking the Channel

You have already been warned not to call a rare station on his own frequency, but this doesn't stop others from doing it, and your main difficulty may be to hear *him*, owing to all the misguided individuals calling on his frequency while he is actually transmitting. There's no answer to this except to keep listening, hoping to identify him through a crack.

So Good Luck to you, and may you win your fair share of the prizes until our final instalment appears next month.

(To be continued)

MULLARD TRANSMITTER-RECEIVER GNE. 510

The Mullard GNE.510 is an HF radiotelephone comprising a 40-watt transmitter and a sensitive receiver, both covering the frequency range 1.5 to 12.5 mc. In addition to radiotelephony, facilities are provided for CW and MCW operation.

The GNE.510 has been designed to meet the need for a compact transmitter-receiver which can be worked from a wide variety of power supplies, and which is easy to operate and service. Such an equipment will find applications overseas, where it can be used by post and telegraph authorities, police, civil engineering projects such as surveys and railways, and for defence, in both fixed and mobile *roles*.

A number of different power units are available, so that the equipment can be worked from 12 volts DC, 24 volts DC, 110 volts DC, 220 volts DC, and 100-125/200-250 volts AC. The transmitter, receiver and power unit are contained in a cabinet 20in. x 14½in. x 7in. Shock absorbers are provided, for vehicle mounting. The front panel is hinged to open outward and downward, and as all chassis are mounted on the rear of this panel, the entire equipment is exposed for servicing in the open position.

The transmitter is designed to operate on eight crystal controlled frequencies. All tuning is pre-set for each channel and circuits are ganged to the crystal selector switch. No tuning is necessary, therefore, when changing frequency, except perhaps for slight adjustment of the aerial circuit. Provision is made for a VFO unit, which plugs into the crystal sockets.

The receiver is continuously tunable over the same frequency range as the transmitter. Controls have been kept to a minimum for ease of operation. They consist of a wave-change switch, tuning knob, a volume control, and on-off switches for power, BFO. and loudspeaker.

Technical Description

Transmitter: A low-power beam tetrode type QVO3-12 is employed as a Pierce crystal oscillator. Above 4 mc this is followed by a second QVO3-12 functioning as a frequency multiplier. The final stage consists of two QVO6-20 power tetrodes in parallel, operating Class-C.

Tuning is carried out by means of pre-set circuits in the multiplier and final amplifier anode circuits. The PA tank is of the pi-section type, in which input and output capacities as well as the inductance value can be selected. Channel switching is accomplished by ganged switches which select the appropriate crystal, multiplier circuit and final amplifier taps.

High-level anode and screen modulation is employed. The modulator consists of two EF91 voltage amplifying stages, followed by a pair of QVO6-20 tetrodes in push-pull. (The modulator can also be used separately.)

Receiver: The receiver is a nine-valve superhet (465 kc IF), employing miniature battery valves in all but the RF amplifier stage. The frequency coverage is 1.5-12.5 mc in three bands. The circuit consists of: RF EF95, mixer DK91, oscillator DF92, two IF amplifiers (DF91), AF amplifier and detector (DAF91) and push-pull output stage (two DL93's). The BFO is a DAF91, and there is one germanium diode for AGC.

Altogether, the GNE.510, though designed for commercial purposes, would make a nice band-switching assembly for the 1.8, 3.5 and 7.0 mc amateur bands—fixed or mobile working.

HIGH QUALITY SOUND REPRODUCTION

AT a recent meeting of the British Institution of Radio Engineers, Mr. H. J. Leak (of H. J. Leak & Co., Ltd., well known in the field of high-fidelity amplifiers) gave a lecture-demonstration on a new method of sound reproduction.

Briefly, the system involves the use of balanced push-pull *electrostatic*—as distinct from electro-magnetic—speakers. These are quite suitable for domestic use with quality amplifiers capable of the usual 10 watts audio output. It is claimed that the system as demonstrated represents an advance in quality of reproduction comparable with that attained when, in 1925, the old horn speakers gave way to the moving-coil type, and again in 1945, when the importance of linear, low distortion audio amplifiers was understood and their design became practicable.

The requirement for perfect reproduction without harmonic, sub-harmonic or inter-modulation distortion is the electrical vibration of an infinitely stiff, massless plate. This is the essence of the electrostatic speaker. Instead of a moving coil actuated by a changing magnetic field, the plate is moved by changing electrostatic fields.

However, at the lower frequencies the plate area must increase until at 40 c.p.s. it would need to be about 100 sq. feet. This is not practicable domestically; hence the best way of reproducing the bass is still by using the moving-coil principle. It can be shown that the most satisfactory instrument for frequencies below 1,000 c.p.s. is the "15-inch speaker" in a cabinet, which has a 12-inch diaphragm.

Meeting the Requirement

From the engineering point of view, the theoretical attractiveness of having uniform drive over a large diaphragm area is such that much work has been devoted to it for many years on both sides of the Atlantic. As a result, the balanced push-pull electrostatic speaker has been evolved with a performance markedly superior to any other type. As demonstrated by Mr. Leak, the speaker is essentially a sheet of tough plastic material, with negligible thermal co-efficients, coated with an extremely thin film of conducting material, a fraction of 1/1000th of an inch thick. This is the diaphragm, which is held by insulating spacers equidistant between two rigid plates, acoustically transparent, to provide the polarising voltages. The whole assembly is formed into an arc in the horizontal plane.

As regards transient distortion, it can be expected that this balanced push-pull arrangement will give better transient response than any other form of loudspeaker—with the possible exception of the Ionophone, which is a gaseous discharge device. The frequency response of the electrostatic speaker, with its smooth and gentle undulations, confirms the impression that the transient response will be extraordinarily good. The high frequency response is well maintained off the axis, because of the curved construction in the horizontal plane. In the vertical plane, the response is more directional, calling for a final shape like a hemisphere, which would give a better and more even directional pattern in both planes. The acoustic output of the balanced push-pull electrostatic speaker is of the same order as from conventional cone speakers. Its sensitivity is therefore satisfactory.

This new loudspeaker will be manufactured as a complete unit with its own polarising potential built in, and including a matching transformer and cross-over network. Its cost, complete, will be about £17, and it will be suitable for connection to the 15-ohm output of the usual audio amplifier, for operation in conjunction with the 15-inch bass reproducing speaker previously mentioned.

CARDS IN THE BOX

Cards are held in our QSL Bureau for the operators listed below, for whom we have no forwarding address. Please send a stamped, self-addressed envelope, with name and call-sign, to BCM/QSL, London, W.C.1. If publication of the call-sign/address is required, that should be mentioned at the same time. Notes on the operation of "BCM/QSL" appeared on p.551 of our December issue.

G2HAF, 3HOP, 3JXX, 3KOJ, 3RL, 4FI, GD4IA, GM3KJF, GW2ACW.

"TOP BAND SPECIAL"

It should be noted that in this article, by G5JU, in our November issue, the bottom side of the PA grid meter in the circuit diagram on p.459 should, of course, go to the bias line immediately below. As shown, V4 is not biassed off.

"BBC HANDBOOK, 1956"

This is a guide to the work and organisation of the BBC, and as such is full of interesting statistics. For instance, who would know that the BBC broadcasts regularly in 43 languages (*not* including English, Welsh and Gaelic!) and that the average cost of a TV programme-hour is £2,188—to say nothing of the fact that nearly one-third of the adult population of the U.K. view certain of these programmes. Some other unexpected figures are that the daily audience for "The Archers" is 9 million and that the *Radio Times*, selling 8 million copies a week, holds the world record for weekly journal sales. The BBC employs over 13,500 people and spends £1 million a year on land-line circuits alone.

All these matters are fully discussed in *BBC Handbook, 1956*, which is a 288-page compilation, well illustrated, costing 5s.

NEXT MOBILE RALLY

Responsibility for organising the next Mobile Rally has been undertaken by the Northampton Short Wave Club. It is arranged for Sunday, April 8, near Northampton, and full details will appear in our March issue.

NEW QTH's

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

G3DEC, R. H. Coates, 8a Crookham Road, London, S.W.6.

G3GBO, D. T. Bradford *(VQ4EV),* 9 Oxford Gardens, Denham (Bucks.), nr. Uxbridge, Middlesex.

G3IQB, M. Balister, 1175a Finchley Road, London, N.W.11.

G3IUZ, H. R. Davis, Oldeacre, Yatton, Nr. Bristol, Somerset.

G3JEA, E. J. Alban, 85 Inverness Terrace, Bayswater, London, W.2.

G3JKU, J. J. Forbes, 8 Castletown Road, West Kensington, London, W.14.

G3JMQ/A, 7/F (1st City of Liverpool) Sqdn., ATC Club, RAFARS, Dingle Vale Secondary School, Liverpool, 8.

G3JNY, S. Ellis, Braeside, Hillcrest Mount, Townville, Castleford, Yorks.

G3JTP, F/Lt. E. Oldham, DFC, 5 Round Acre, Nabs Head Lane, Samlesbury, Nr. Preston, Lancs.

G3JWA, E. A. Emerton, 25 Ravensworth Road, Mottingham, London, S.E.9.

G3KEC, J. M. Garner, 28 Donsby Road, Aintree, Liverpool, 9.

G3KFC, F. W. Clasby, 78 Selby Road, Orrell Park, Liverpool, 9.

G3KGR, R. W. Lupton, 5 Tollgate Road, Andover, Hants. *(Tel.: Andover 3302).*

G3KHR, J. W. Fox, 110 Hurst Road, Erith, Kent.

G3KIZ, St. Columba's School, Roundwood Road, Wythenshawe, Manchester, 22.

G3KKJ, A. Shannon, 1 Orcades Green, Walney Island, Barrow-in-Furness, Lancs.

G3KMA, R. Balister, 1175a Finchley Road, London, N.W.11.

G3KMM, J. L. Crowther *(ex-VS6DB),* 70 Walmersley Road, Bury, Lancs.

GM3KNX, J. McGregor, 54 Albion Street, Coatbridge, Lanarkshire.

GM3KPD, A. M. Coutts, 43 Parkhead Loan, Edinburgh, 11.

G3KPH, F. J. Coulson, 37 George Street, Whitby, Yorkshire.

G3KPT, G. V. Farrance, 297 Wells Road, Knowle, Bristol, 4.

G3KQE, D. Heathcote, 11 Cannon Street, Atherton, Manchester, Lancs.

G3KQK, T. A. Dugdale, Millmoor Farm, Noman's Heath, Malpas, Cheshire.

G3KQM, R. Austin, Piggotts Cotts., Abridge Road, Abridge, Nr. Romford, Essex.

G3KQN, J. R. Walton, 142 Norton Road, Stockton-on-Tees, Co. Durham.

G3KQZ, P. F. Bernal, A.R.I.C.S., 21 Holders Hill Avenue, Hendon, London, N.W.4. *(Tel.: SUNnyhill 2993).*

G3KRU, H. Gates, 6 Birchdale Gardens, Chadwell Heath, Romford, Essex.

GM3KSA, R. E. Dean, 36 Douglas Street, Motherwell, Lanarkshire.

CHANGE OF ADDRESS

EI8L, A. K. Jackson, 41 Garville Avenue, Rathgar, Dublin, Eire.

EI9A, D. F. Cornwall, Newmarket Road, Kanturk, Co. Cork, Eire.

G2AIH, N. G. Hyde, Grad.Brit. I.R.E., 114 Tattenham Grove, Epsom Downs, Surrey. *(Tel.: Burgh Heath 2995).*

G2FWM, J. Woodhouse, 35 Lammack Road, Blackburn, Lancs.

G2HHV, J. Spivey, Bryn-Gwyn, Mortimer Terrace, Healey, Batley, Yorkshire.

G3ARX, C. E. Wilkinson, Hedgeend, Sea Road, Anderby, Nr. Skegness, Lincs.

G3BEX, J. Short, 177 Upper Shoreham Road, Shoreham-by-Sea, Sussex.

G3BXY, T. Murnane, 40 Regnum Estate, Shaw, Newbury, Berks.

G3CSE, C. W. Smith, 61 Mollison Road, Hessle, East Yorkshire.

G3DFF, R. J. Barrett *(ex-VS6AQ),* 66 Walton Avenue, North Cheam, Surrey.

G3DII, J. Bell, Ennerdale, Greenfield Road, Stafford, Staffs.

GM3DVX, J. Gorrie, 33 Ulster Drive, Edinburgh, 8. *(Tel.: Edinburgh ABB 3743).*

G3DXA, C. J. Godden, Frantfield, Plot No. 111, Brimley Road, Cambridge.

G3EGH, K. M. Hodgson, 15 Normoss Avenue, Normoss, Blackpool, Lancs.

GM3GHU, D. Melville, c/o Anderson, 48 Sythrum Crescent, Glenrothes, Fife.

GD3GMH, G. M. Holt, Cronk Ville, Hillberry Road, Onchan.

G3GNR, R. E. Short, 177 Upper Shoreham Road, Shoreham-by-Sea, Sussex.

G3HIM, I. D. Piggott, 36 Robin Hood Lane, Hall Green, Birmingham, 28.

G3HQT, P. J. Ball, 6 Tintern Street, Clapham, London, S.W.4.

G3IND, D. H. Boyles, 70 Northwood Gardens, Ilford, Essex.

G3IVA, H. I. Wright, Rest Harrow, Hart Road, Harlow, Essex.

G3JLB, L. Belger, 103 Whitehill Road, Gravesend, Kent. *(Tel.: Gravesend 4694).*

GM3JRP, R. Pollock, 3 Rayne Place, Drumchapel, Glasgow.

G3JYJ, E. Jackson, 2 Madden Avenue, Chatham, Kent.

G3JYV, D. A. R. Tilcock, 67 Fleming Mead, Mitcham, Surrey.

GM4GX, F. W. Cole, Top Flat, 172 Market Street, Aberdeen.

G5FI, G. R. Scott-Farnie, 307 Grenville House, Dolphin Square, London, S.W.1.

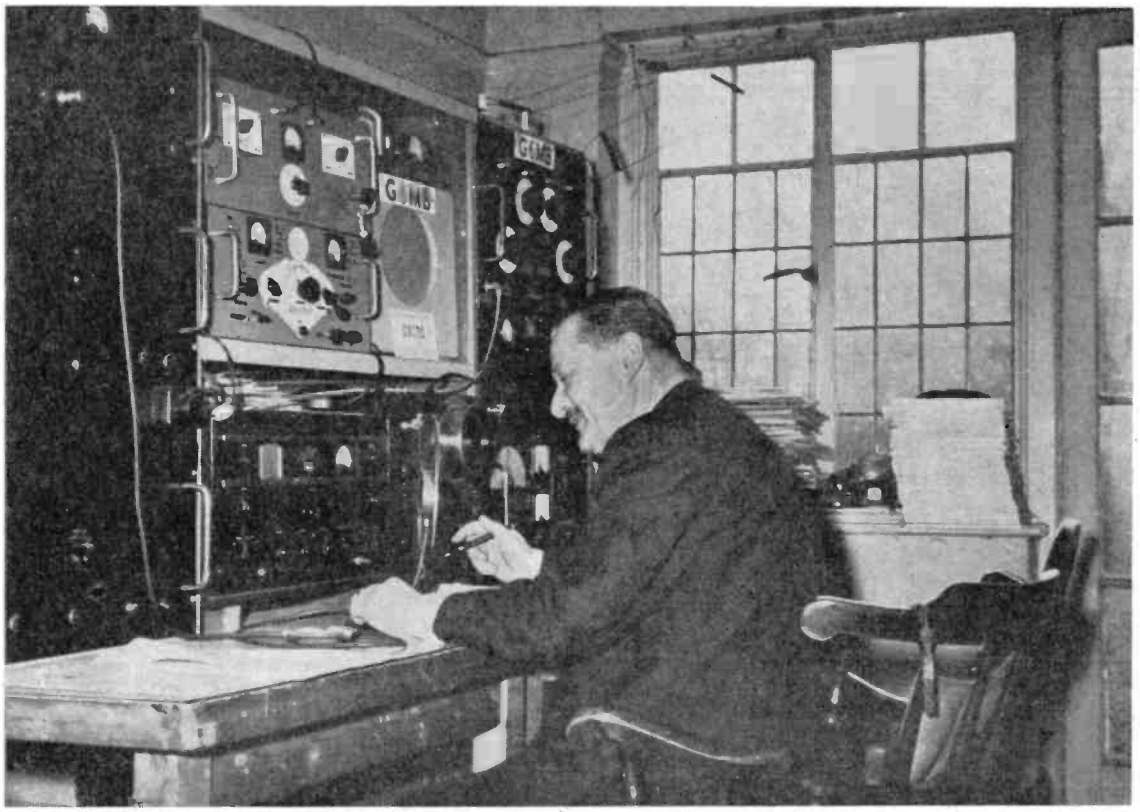
G5KW, Maj. K. E. Ellis, 49 Long Drive, East Acton, London, W.3. *(Tel.: Shepherd's Bush 4309).*

G5ML, F. W. Miles, Broomlands, Stonleigh Road, Blackdown, Nr. Leamington Spa, Warks.

G6WK, W. J. Wicks, 8 Chestnut Close, Barra Hall Road, Hayes, Middlesex.

The Other Man's Station

G6MB



STATION G6MB is owned and operated by F. Hicks-Arnold, Sixty-Four, Garrick Close, Walton-on-Thames, Surrey, and is well known on the amateur bands. G6MB himself is entitled to be called a real Old Timer, for he was first licensed in 1913, for transmission over the strictly limited distance of 50 yards! The licence laid it down quite clearly and further stated that "the apparatus is to be attached to no aerial or earth other than short rods, with or without vanes"!

Experimental work was recommenced in 1920, and activity has continued ever since, including a period of some years spent in Malaya. On returning to England in 1936, the present call G6MB was issued, and has been heard in most parts of the globe at one time or another.

From the far side in our photograph, on the right of the operating position is a band-switched 150-watt transmitter, consisting of exciter unit running a Clapp VFO (EF91) into wide-band coupler stages (6AG7-6N7-6BW6-6BW6) giving ample drive to the 4D22 PA in the final stage. (For those who may not know, the 4D22 is a tetrode rated at 100 watts power output). This particular type is ideal for a pi-section PA tank circuit operated in the low-voltage (750v.) high-current (200 mA) mode.

The middle section of the right-hand rack is occupied by the "Antennamatch" unit, and above this are twin aerial matching networks, permitting the aerial to be tuned up on the "Antennamatch" and then selected at will by relay switching in the low-impedance link line. On the left-hand side are all the power supplies and a modulator using triode-connected 807's in Class-B.

Between the two enclosed racks can be seen the station main receiver, an AR88, with a 5-in. oscilloscope arranged to give modulation monitoring on all outgoing and incoming signals; change-over from one to the other is effected by relays operated by the master send-receive switch. Above the receiver is a portable transmitter for 80 and 160 metres, with a built-in modulator and keying monitor.

Aerials mainly in use at G6MB are a centre-fed 132-footer with open-wire feeders, and a pair of "Lazy-H's," 20 ft. by 20 ft. by 24 ft., these being used on the 20, 15 and 10-metre bands.

Although G6MB himself is an electronic engineer by profession, he still finds time for, not to say pleasure in, purely Amateur Radio activity, and is frequently to be heard either on the local 160-metre net or on the DX communication bands—and, of course, every Sunday at 10.0 a.m. on 3600 kc he reads the "news bulletin from GB2RS."

THE TENTH MCC

• *The Magazine Top-Band Club Contest* •

NOVEMBER 19-20 : 26-27, 1955

FOR the past three years we have had to record an entry of 28 Clubs, a very close finish, and a win for Neath and Port Talbot—but tradition has been broken, and not one of these three features is preserved in the 1955 Contest.

Entries totalled 33 (actually 34, but one was too late for adjudication), which is not quite the highest figure ever; it was 36 in 1950. **Surrey** (Croydon) win for the first time; and it could hardly be called a photo-finish. The winners are 16 points ahead of **Sheffield,** the runners-up, who, in their turn, are nine points ahead of **Nottingham,** the gallant third.

1st: Surrey Radio Contact Club, G3BFP (453)
2nd: Sheffield Amateur Radio Club, G4JW (437)
3rd: Amateur Radio Club of Nottingham. G3EKW (428)

The winning smile! After a succession of appearances in third place, Surrey Radio Contact Club take a first in the 1955 MCC, tenth of the series, with the very fine score of 453, putting them sixteen points ahead of Sheffield, in second position. The S.R.C.C. effort was sustained by, left to right: SWL Hislop, G3BFP, SWL Richardson, and G3IRP.

A very strongly-challenging fourth was **Hounslow,** with a score of 426 points, only two behind the third man. Then we have **Slade** with 416, followed by a very tightly-packed bunch of scores between 398 and 360 points, covering the places from sixth to seventeenth!

Naturally, scores are well up on last year's, because of the greater number of Clubs participating, but it is noticeable that the figures for non-Club contacts are substantially down on those of 1954.

The Winning Stations

G3BFP (Croydon) did the batting for the **S.R.C.C.** and put them on top for the first time. They were third in 1951, 1953 and 1954, but saved their all-out effort, it seems, for 1955. G3BFP was assisted by G3IRP and by SWL's Richardson and Hislop; he used a VFO-Cathode Follower-BA-PA rig, with 10 watts to the 807 in the final. The receiving equipment was an HRO and Q5'er, and the aerial a 132-ft. Marconi assisted by a counterpoise consisting of 100 feet of twin flex, normally used for an inter-com between shack and house!

The second place holders, **Sheffield** (G4JW) had G3DRE, G3HTE, G3JHC, G4JW, G5TO and G8KB as operators; for **Nottingham** (G3EKW), G3IQM and SWL Littlewood did the work. Their transmitter was VFO-BA-PA, the receivers CR100, RA-1B and a home-built double superhet, and the aerial a 264-ft. half-wave centre-fed wire, 30 feet high. Last year G3JW held fourth place and G3EKW twelfth, so both have made very satisfactory advances up the ladder this time.

The Scoring

There must have been a comparative scarcity of non-

Club stations on the band this time, and the Club points supplied the bulk of the scores all round. In 1954 the three top stations collected 96, 81 and 76 points respectively from "casual" contacts at one point each.

Compare those figures with the current ones of 63, 56 and 59. Regarding Club contacts—although we have received only 33 entries (*plus* Bradford Grammar School Radio Club's late arrival), there appear to have been 35 Clubs on the air for most of the period. From this it would seem that the maximum possible number of Club points (by working 34 Clubs at each of the four sessions) would be 408.

No one achieved this, but G3BFP collected 390 Club points, G4JW 381, and G3EKW 369, all of which figures represent a sizeable slice of the total available cake.

Several highly doubtful "Club" stations put in one single appearance, but as they obviously had no intention of entering, contacts with them have been reduced to one point, in the few cases where three have been claimed. Those who were more or less continuously active, however, have been allowed to count as three points, despite the absence of an entry from them; these include G3KEP **(Bradford Grammar School)** and G3GKQ **(Clitheroe)**, both worked by most of the contestants on more than one occasion. It is most unfortunate that the illness of G3KEP delayed Bradford's entry, with a claimed score of 232 points, which would have put them about 31st.

As in previous years, the slight scoring adjustments made by the judges did not have the effect of altering the final order. Quite a number of Clubs have retained their full score as submitted; some have been reduced by numbers varying between two and seven points. (These reductions were mostly for claiming three points on a non-Club contact, but in some cases were for wrongly-logged QTH's or for non-tallying RST reports.)

The shut-down at 1900 on each of the four days appears to have been more tidy this year—possibly because of a warning contained in the description of the 1954 event! By comparison with all past contests, this time there was very little ambiguity about "to Club or not to Club."

Operating and Behaviour

It was a great pleasure to go through 33 logs and the accompanying letters without finding one single complaint about operating standards, although one Club scribe does remark (rightly) that "all kinds of fists were heard." Two or three also stress the point that—as usual—there was too much crowding in a small part of the band, and that CQ's in the great open spaces above 1900 kc produced no results at all.

The judges heard some outstandingly slick operating at all of the sessions, but absolutely no "hogging." It was obvious from the variety of "fists" that many Clubs were using a whole group of operators—which is all to the good and in accordance with the spirit of the contest. At one time an outstanding operator might be heard on a particular station, obviously with all the clues on Contest procedure; a little later, the operating from that same station was, well—*not* so hot! No Club should hand over the whole thing to its one "ace" operator and leave it to him to win the event for them—they might want someone to replace him in next year's event after he has been posted overseas, lost interest, or got married!

TABLE I

POSITIONS AND SCORES

	CLUB	CALL	POINTS
1.	Surrey (Croydon)	G3BFP	453
2.	Sheffield	G4JW	437
3.	Nottingham	G3EKW	428
4.	Hounslow	G3JVL	426
5.	Slade	G3JBN	416
6.	Wirral	G3CSG	398
7.	Chester	G3GIZ/A	394
8.	Thanet	G3DOE	388
9.	Sutton and Cheam	G2BOF/A	387
10.	Cheltenham	G3GPW	386
11.	Clifton	G3GHN	385
12.	BTH, Rugby Nottingham University	G3BXF G3JKO	383
14.	Stourbridge	G3KLT/A	381
15.	Salisbury	G3FKF/A	376
16.	Newark	G3ELJ	373
17.	Mitcham	G3KKZ	360
18.	Grimsby	G3IYT	348
19.	Stoke-on-Trent Warrington	G3GBU G8TR	343
21.	North Kent	G3ENT/A	335
22.	Grafton	G3AFT	334
23.	Edgware	G3ASR	318
24.	Ilkeston	G3JSZ	309
25.	Bristol	G3GIS/A	278
26.	Scarborough	G4BP	271
27.	Liverpool	G3AHD/A	267
28.	Wrexham	GW3IHL	251
29.	Torbay	G3GDW	243
30.	Walsall	G2FPR	240
31.	Neath and Port Talbot	GW2AVV	202
32.	Wellingborough	G3KQH/A	146
33.	Ravensbourne	G3HEV	78

Comments

"The most tiring part of it was re-writing the log afterwards" . . . **(Surrey).** "Must find somebody else to help operating next year" . . . **(Hounslow,** G3JVL). "New times an improvement on last

year's" . . . **(Wirral).** "Operating standards of Clubs are steadily improving, due to this annual event" . . . **(Cheltenham).**

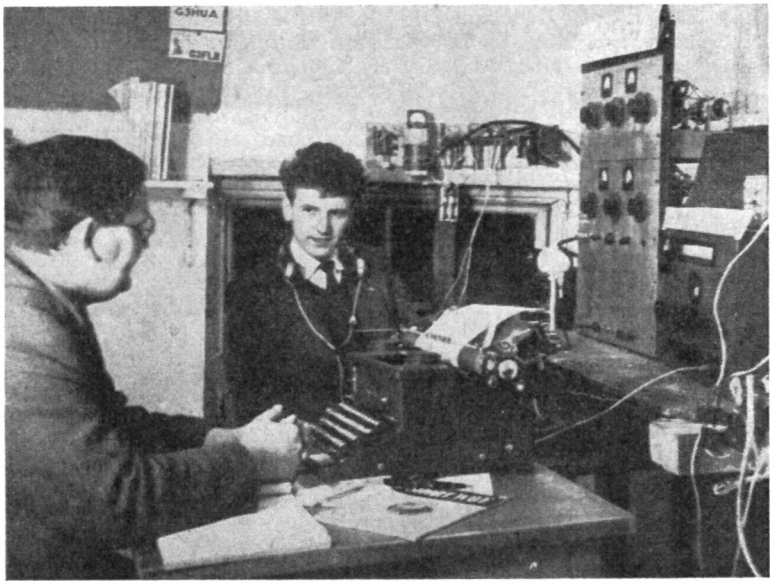
"Our first attempt, and we enjoyed every minute" . . . **(Newark).** "We know that our score will not gain us a place, but we are entirely satisfied with the results" . . . **(Stoke-on-Trent).** "Much more friendly, with no pushing" . . . **(Grimsby).** "Times and rules met with complete agreement" . . . **(Clifton).**

Tense Moments

Various odd incidents were recorded, including the collapse of an aerial and the drenching of a receiver by the too-enthusiastic tea-maker. One Club worked another one twice by mistake, and was advised that "the log-keeper has now been shot." At **Sutton,** G2AYC set out grimly in a cold fog to trace the source of terrible commutator QRM—just as the scent was getting really hot, the noise stopped.

Neath and Port Talbot, who have won this contest three times and been second on two occasions, had to use, in their own words, a "mediocre QTH in place of the superb location usually enjoyed." They also suffered from a serious shortage of operators, but they had a very good time and hope MCC is continued in its present form. And knowing that they were without any of their usual advantages, their entry was in the best spirit.

Grafton and others still wish that we could publish a list of competing Clubs beforehand. The reason why this is *not* done is that we should need to know the entries some weeks in advance, and time has shown that many Clubs who will enter without any formalities just cannot be bothered to fill in forms and notify us beforehand. In some of the very early MCC's we learnt this by experience; it is just not possible to know before the Contest starts who will be in for it. In fact, a published list can only cause confusion, as it cannot be finalised; local arrangements may have to be changed at the last moment, and the organisers must accept entries right up to the starting post. In any case, there has been hardly any doubt about things this year.



The Amateur Radio Club of Nottingham were placed third in this year's MCC — a very creditable performance by one of the newer Clubs to enter the Contest. Here we see G3IQM with the honorary secretary, SWL Littlewood.

Wellingborough suffered from traffic and electrical noises, their premises being situated in the centre of a busy market town. They, too, did not hope for a high position in the table, but enjoyed the contest, the general comradeship that prevailed, and they commend the successful efforts of their crumpet-toasters!

Shortcomings

Why no entries from GM or GI? They would have been extremely welcome. One or two private GM stations were worked, but not by very many of the competing Clubs. There was not a smell of a GI, GC or GD station throughout the whole period, although some OK's (one was a "Klub") showed up in the evenings and were promptly snapped up by those Clubs that were quick on the draw.

Several Clubs mention, without undue complaint, that the clash on the Saturday with the Amateur Radio Exhibition was inconvenient. as it tended to denude them of operators and made things difficult. (We will try to avoid this in next year's event).

TABLE II

ROLL OF HONOUR, 1946-1955

Year	1st	2nd	3rd	Total Entries
1946	Coventry	Cheltenham	Grafton	20
1947	West Cornwall	Warrington	Coventry	14
1948	Rhigos	Coventry	Wirral	28
1949	Rhigos	Neath	Coventry	25
1950	Rhigos	Neath	Coventry	36
1951	Coventry	West Cornwall	Surrey	28
1952	Chester / Neath	—	Clifton	28
1953	Neath	Chester	Surrey / Salisbury	28
1954	Neath	Clifton	Surrey	28
1955	Surrey	Sheffield	Nottingham	34

Others suggest that they would like the hours to be even later, so that the DX would really be coming in during the final sixty minutes or so. This, too, is worth considering, though the majority of Clubs express themselves as completely satisfied with the hours. (One or two suggest that a reduction from four to three hours per session would liven things up a bit—especially if the entry is heavy).

Statistics

We have to thank the hon. treasurer of **Salisbury** for the following interesting facts and figures: Between 1949 and 1955, 74 different Clubs have taken part; of these, 19 entered only once. Five Clubs dropped out this year, but eight new ones appeared.

Since last February 59 different Clubs have reported in our "Month with the Clubs" feature; of these, only 14 operated in this current Contest, compared with 19 who did operate but have not sent in activity reports.

And now some statistics of our own: One of the biggest pull-ups (as between 1954 and 1955) was **Slade,** who jumped from 23rd to 5th. **Nottingham** advanced from 12th to 3rd, **Chester** from 20th to 7th. The only spectacular fall was **Neath**—from 1st to 31st—but this is explained by their previous comment about having to exchange QTH's—from excellent to poor. It was good to welcome **Wrexham** (GW3IHL) as a representative of North Wales, and also to see new faces from **Ilkeston, Newark, Mitcham** and **Grimsby.**

Logging Standards

A few Clubs neglected to read the rules, particularly the paragraph concerning the writing-up of logs, and could justifiably have been disqualified. The judges would, however, like to compliment the following on their extremely neat and well-presented logs: **N.U.R.S., Warrington, Clifton, Liverpool, North Kent, Slade,** and **Nottingham.** The real beauty-prize for logs should be divided between **North Kent** and **Slade,** both of which were a joy to check and entailed no eye-strain or exasperation.

Many others, of course, were perfectly tidy and obeyed all the rules, but those quoted were something out of the ordinary and a pleasure to behold. And anyone faced with 30 or more logs to check would realise how helpful to the judges a tidy entry can be.

We also have to thank the following for sending in detailed check logs, which were invaluable in one or two cases of difficulty: G3HAL (Winslow), G3JVU (Gravesend), G6VC (Northfleet), G3DOP (Coventry) and G5MR (Hythe).

And, finally, we must acknowledge an "apology for absence" from **Medway,** who hope to be back in the fray next year.

Club Secretaries are asked to note that next month's deadline for the usual Club reports is **Friday, January 13.** Address them to "Club Secretary," *Short Wave Magazine,* 55 Victoria Street, London, S.W.1.

SINCERE THANKS

Once again, we would like to take an inch of space to thank all those many readers who have been good enough to send us their greetings for the season of the year. The office was heavily decorated with cards and calendars before this issue went to press, and readers can be assured that they were all much appreciated.

ECHOES FROM THE PAST

Known all over the world as VS1AA, and originator of the single-wire fed aerial described as the "VS1AA" (sometimes called the "G2BI," who was the first to use it in this country), Jim MacIntosh is now GM3IAA, of Broom Park, Cradlehall, Inverness. Reproduced below is a letter from him, dated early in December:

"I was particularly interested in the *Pioneers of Early Broadcasting* item, with its accompanying photograph, on p.478 of your issue for November, 1955. I served for a short time, during my training period, under Lieut. (as he then was) Donisthorpe, and assisted in the experiments in 1916, which doubtless culminated in the inauguration of the broadcasting service you mention. This assistance consisted of reading items from one of the local Worcester newspapers—speaking into a kind of trumpet arrangement, presumably the microphone! The transmitting gear was laid out on a table and constituted an awe-inspiring sight. On one occasion, a phone call from the receiving end, somewhere in Worcester, suggested that the matter transmitted might well be livened up by some reference to the columns dealing with local scandal!

"Our main training at the Diglis Wireless Training Centre (W.T.C.) was connected with interception and direction finding, and ultimately our section was posted overseas to Cairo; the D/F station was located at Mena, near the Great Pyramid of Cheops. Other stations were at Larnaca (Cyprus), at El-Arish, Bir-Salem and finally at Damascus. The technical officer was Lieut. T. L. Eckersley (brother of P.P.E.), and I shall always be grateful to him for his skill and patience. Those were the days, with so much unlimited territory to explore, when short waves meant 200 metres!

"If any old members of No. 2 GHQ, Wireless Obvervation Group, Royal Engineers, 2nd Echelon E.E.F., should happen to read this, I would be delighted to hear from them.

"In conclusion, I might add that our standard text book in 1916 was *The Elementary Principles of Wireless Telegraphy,* by R. D. Bungay—my copy is still in my possession."

INCREASED POSTAL CHARGES

With this issue, we are faced with considerably increased postal charges. Though ordinary letter rates are not affected, practically everything else sent by post is, and we would again remind correspondents that any letter to which a reply is expected *must* be accompanied by a stamped addressed envelope.

SMALL ADVERTISEMENTS

9d. per word, minimum charge 12/-. No series discount; all charges payable with order. Insertions of radio interest only accepted. Add 25% for Bold Face (Heavy Type). No responsibility accepted for errors. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, S.W.1.

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WANTED : BC-610 Hallicrafters, ET-4336 Transmitters and spare parts for same. Best prices. —P.C.A. Radio, Beavor Lane, Hammersmith, W.6.

QSL's and **LOGS** by **MINERVA.** The best there are.—Samples from Minerva Press, 48 Queen's Road, Brentwood, Essex.

LEARN IT AS YOU DO IT.—We provide practical equipment combined with instruction in Radio, Television, Electricity, Mechanics, Chemistry, Photography, etc.—Write for full details to E.M.I. Institutes, Dept. SW47, London, W.4.

WANTED : **TUNING UNITS** TN17, TN18, TN19 and R54/APR4 ; £50 each offered.—Box 1383, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

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RUBBER STAMP QSL Card Call-Sign, BRS. etc. Samples free.—G2FSR, 2 Parkhill Road, Chingford, E.4.

APPOINTMENTS

FERRANTI, LIMITED, have vacancies for Skilled Radio Mechanics, preferably with Radar experience, for a variety of work in production and research departments. Good opportunities exist, especially for those who have, or are willing to study for, the City and Guilds Certificates.—Please write, giving details of career to date, to the Personnel Officer, Ferranti, Limited, Ferry Road, Edinburgh, 5, quoting Ref. RM/113.

RADIO OFFICERS required for the POSTS AND TELEGRAPHS DEPARTMENT, NIGERIAN FEDERAL GOVERNMENT, for one tour of 12/24 months in the first instance. Candidates may be appointed *(a)* On agreement with prospect of permanent and pensionable employment in the salary scale (including expatriation pay) £750, rising to £1,284 a year, or *(b)* On contract terms with salary scale (including expatriation pay) £810, rising to £1,386 a year, with gratuity at the rate of £100/£150 a year. Outfit allowance up to £60. Free passages for officer and wife. Assistance towards cost of children's passages and assistance up to £150 a year for their maintenance in U.K. Liberal leave on full salary. Candidates must have recent experience in operating wireless and direction-finding ground stations for air services, and possess a P.M.G. Certificate in radio telegraphy, an air operator's certificate, or equivalent service qualification. They must also have a thorough grounding in I.C.A.O. codes and procedures.—Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/41111/SQ.

SMALL ADVERTISEMENTS, APPOINTMENTS—*continued*

LOCUST OFFICER (PART-TIME RADIO DUTIES) required by the DESERT LOCUST CONTROL, EAST AFRICA HIGH COMMISSION for one tour of 12-36 months in the first instance. Salary scale (including inducement pay and a variable cost of living allowance according to posting) £772, rising to £1,476 a year, with gratuity on termination of service. Outfit allowance £30. Free passages. Liberal leave on full salary. Candidates should have practical and preferably field experience of the maintenance and operation of low and medium power HF transmitter-receivers (currently American BC610 and British Redifon GR49 and Army Type 19 Sets) and petrol-electric generators. They should be capable of carrying out field repairs to such equipment under desert conditions.—Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/41331/SQ.

WANTED IMMEDIATELY for Central London Government Surplus Radio Shop: Radio and TV Engineer, fully conversant with radio surplus equipment, with the ability to convert such equipment and to draw circuit diagrams. After a 12-month proving period, a directorship will be offered to successful applicant.—Write, in first instance, age, qualifications and salary required to Box 1645, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

READERS' ADVERTISEMENTS

3d. per word, min. charge 5/-, payable with order. Box Numbers 1/6 extra. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, S.W.1.

813 VALVES, guaranteed new ex-equipment, complete with base, 41/- including postage. —G3GFD, 13 Thornbury Grove, Bradford, 3, Yorks.

HANDBOOK or Circuit Diagram of Receiver BC-348J, to purchase or borrow. — Merron, Lynwood, Felbridge, East Grinstead, Sussex.

BENDIX RA1B, immaculate, with 350 100mA power pack. Ideal Tx/Rx supply, £10 or near offer.—Box 1646, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

AR88D, £35; AR77, £20; NC98, £65; seven valve cans, caps, CR100, 7/6.—Box 1642, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Webb's 150-watt Tx in six standard chassis and panels, complete in 6ft. rack. Includes: PA 2/4304-CA in P/P, all bands; Exciter, 807 CO, 807 BA, set bands; Sp. amp. 6J5, L63, two KT66 in P/P; Mod., two TZ40 in P/P, with UM3; Power Pack, giving 400v. and 600v.; Power Pack, giving 1000v.; Webb's VFO on 3.5 mc; Variac, D104 mike. All in perfect condition. No reasonable offer refused. Buyer collects.—Offers to: J. N. Piper, Station Hotel, St. Andrews, Fifeshire.

HRO Rx FOR SALE. Three coils covering 10, 20, 40 and 80 metres. Also a host of components, transformers, chokes, meters, racks suitable for Tx construction. What offers?—Write: G. Carpenter, 86 Locket Road, Harrow, Middx.

SMALL ADVERTISEMENTS, READERS—*continued*

JERSEY HOLIDAY.—Near sea, town centre. Ham shack. Photographic dark-room. — Write brochure: GC3KPO, The Lincoln, 3 Saviour's Road, St. Helier, Jersey, C.I.

RADIOCRAFT 25-watt Tx, £6 10s.; 15-watt Modulator, £7 10s.; R1155B, £7. Or exchange lot for Eddystone 640 or similar Receiver.—Box 1643, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

HAMMARLUND Super Pro, 1250 kc-40 mc, good condition, less power pack, maker's manual, £18. Delivered London area.—Box 1644, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED URGENTLY: Any Tx Components for 150w. phone Tx, Rotary Type Inductor, HV Tank Condensers; Speech, Modulator Components; or complete; Xtal mike; new 813 valve, also base; 1000v. power pack, or parts; 866 Rectifiers; good VFO.—Details anything you have to clear at reasonable price: Lee, 218 Cavendish Road, Bispham, Blackpool.

B2 XMITTER, Receiver and P/Pack, complete in wooden case, with coils and manual, £15 (o.n.o.). Also Labgear E5023B Pi-network coil turret and E5026 wide-band multiplier (both new, unused). Offers?—30 Priory Terrace, Stamford, Lincs.

BC-342, excellent condition, £17 10s.; 6V6/807 Tx, plug-in coils, £5; 550-650-750v. power pack, £4; UM1, new, unused, 50/-; RF26 unit, 30/-; 95 *Short Wave Magazines*, 1947-54, 70/-.—Crossan, 8 Pine Ave., West Wickham, Kent.

G3GBO/VQ4EV SELLING UP: HRO Senior, good order, 50 kc-30 mc; also 38-47 mc coil. Power pack, speaker, handbook, £23; 3in. Oscilloscope, time base, vert. amplifier and power pack, £7 10s.; power pack, 500v. 200 mA, rack-mounting, £4. Transformers, chokes, capacitors; 580v. 250 mA, 350v. 100 mA, 6.3v. 20 A power pack on rack-mounting chassis; not wired; £5. 6ft. rack (19in.) with chassis and several used panels, £1; Rx units, Type 18 (two), 10/- each. *Short Wave Magazines, RSGB Bulletins*, many valves, CRT's and components. State your requirements. No reasonable offers refused. — Call/write: 9 Oxford Gardens, Denham, Uxbridge, Middx. *(Phone Denham 2019).*

358X cabinet, hinged lid, chassis, tuning scale with spin drive, 3-gang condenser. Ideal build transmitter. Best offer.—SWL, 244 Ballards Lane, London, N.12. *(Hillside 4321.)*

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HELP. Urgently required, MCR1 receiver with or without power pack. Details and price to.—Miller, 48 Kings Road, Clacton-on-Sea, Essex.

FOR SALE: Panda, in excellent condition, regularly heard on air, for sale for first £90.—Cliff Metcalfe, G3DQ, Carr Farm, Flamborough, E. Yorks. *(Tel. 346.)*

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SMALL ADVERTISEMENTS, READERS—*continued*

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