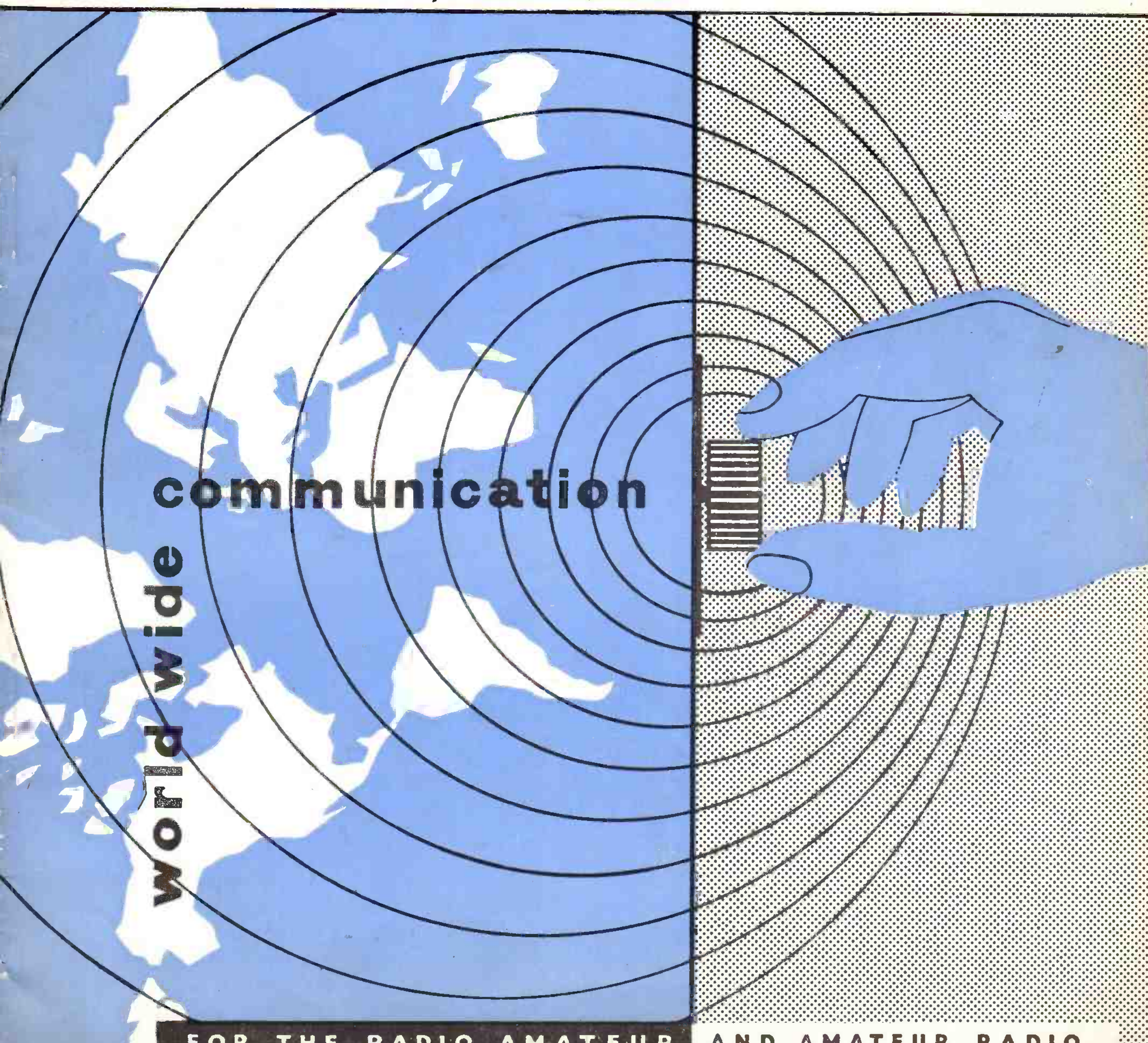
The SHORT WAVE Magazine

2/6

VOL. XVI JANUARY, 1959 NUMBER 11



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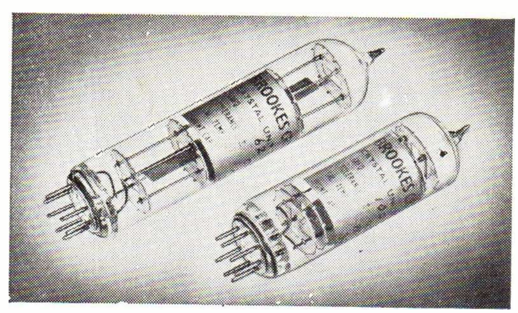

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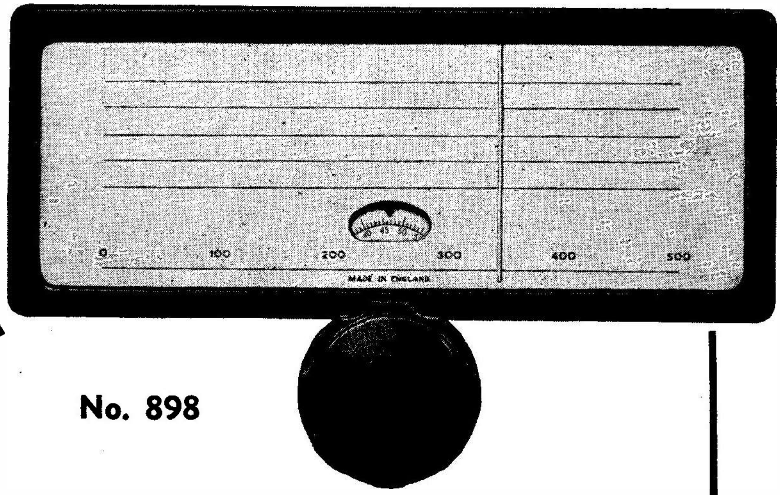

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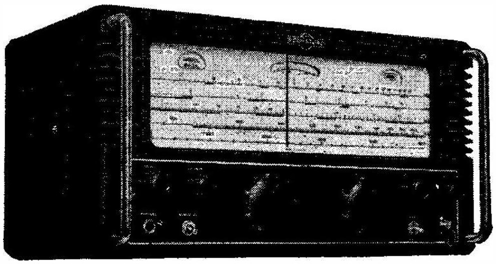

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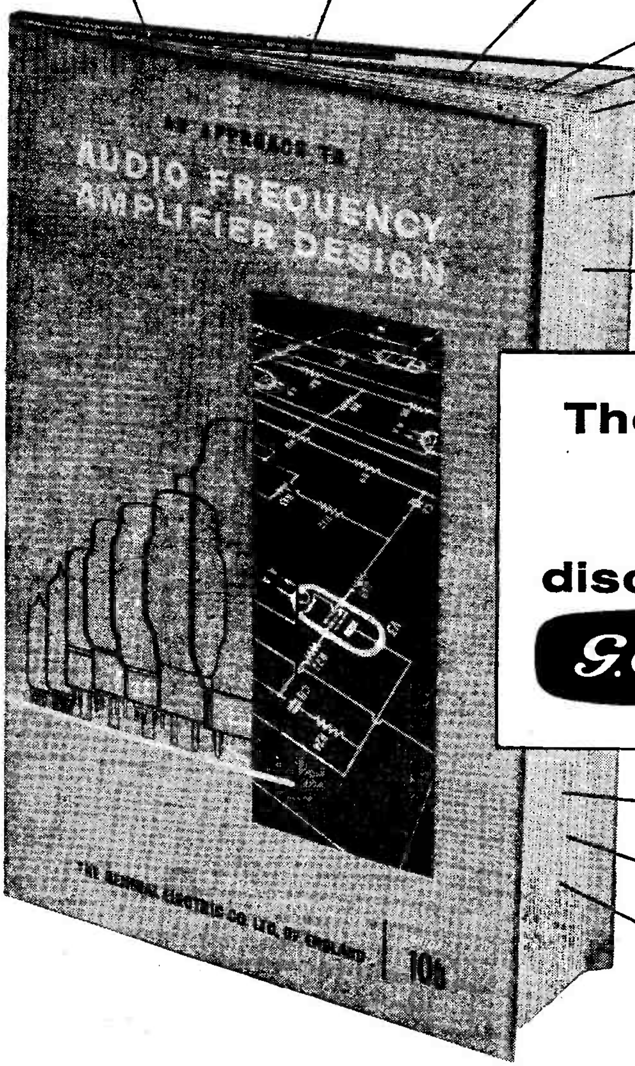

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VOL. XVI JANUARY, 1959 No. 185

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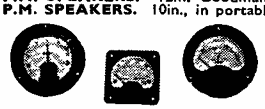

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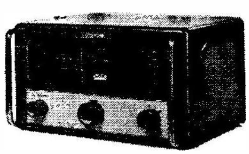

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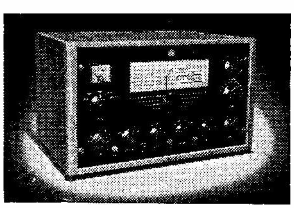

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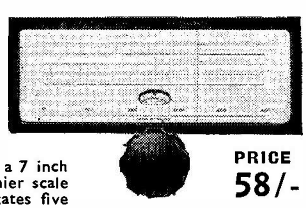

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The SHORT-WAVE Magazine

EDITORIAL

Balloon *By a most regrettable combination of circumstances, which should have been foreseen and could have been avoided, U.K. amateurs have become involved in what has turned out to be a publicity stunt stage-managed by a " national newspaper," so called. Here, we are not in the least concerned with whatever the objectives may have been in setting a manned balloon in free flight across the Atlantic. If they wish to, there is no reason why people should not embark on an adventure of this sort — however futile, ill-advised and devoid of any possibly useful scientific outcome it may be.*

What we are concerned about, however, is the radio aspect of this particular expedition. In the first place, it is only too evident that a totally inexperienced operator was given, at too late a stage in the planning, a commitment far beyond his capacity to handle. This is no reflection on him personally — licenced for a matter of a few days only, having little technical knowledge and no operating experience, he was faced, in circumstances of great difficulty, by unfamiliar apparatus with which he was supposed to work a complicated schedule.

Secondly, though from the outset there can hardly have been any doubt that the radio plan was conceived largely for its possible publicity value to the newspaper concerned, the P.M.G. was nevertheless prepared, apparently, to authorise for this purpose third-party traffic handling on amateur channels, under special callsigns, and using a coded message procedure at that! This cuts right across the whole meaning and intention of the radio amateur licence as we know it in the U.K., and makes complete nonsense of the regulations. (This aspect of the matter is being raised in the House of Commons as soon as possible after the re-assembly of Parliament on January 20).

Thirdly, having regard to the sort of publicity the expedition was getting, it was inevitable that the U.K. amateurs who accepted these G7 callsigns and undertook the listening watch would find themselves being described as " specially selected hams " (sic) *— a distinction which, in this context, they will probably be very willing to forget as quickly as possible!*

Finally, whatever the outcome of the expedition may be — and one must hope for the sake of its occupants that the balloon will eventually land safely somewhere (though at the moment of writing there is no news of it) — the handling of the radio commitment reflects no credit on anybody.

And none of this is, in any sense, being " wise after the event " — these views were outlined to one of the organisers of the expedition on November 28 *last, a fortnight before the balloon finally took off.*

Austin Forsyth
G6FO.

SSB Transmitter for Twenty and Eighty

GENERAL DESIGN, CONSTRUCTION AND SETTING UP

C. J. SALVAGE (G3HRO)

With SSB activity ever on the increase, this article will be of considerable interest to those who want to get going on Sideband. The author has been very successful with the design discussed here.—Editor.

THE most significant development in Amateur Radio communication practice during the past 3-4 years has been the increased use of Single Sideband transmission. This system is being found to be more effective than AM in many respects, the following being the main advantages:

(1) No carrier is transmitted, thus obviating power wastage in the PA,
(2) One sideband only is radiated, thus the transmission occupies half the bandwidth of a normal AM signal,
(3) Because of the reduced bandwidth in transmission, the receiver can be operated in a more selective condition,
(4) The phase distortion associated with double-sideband or AM phone is entirely absent,
(5) Multiple QSO's on a common frequency, with voice control, are possible.

Assuming the same PA is used either for normal AM or for SSB suppressed carrier, the latter gives a gain up to 9 dB over AM, equivalent to a power increase of 8 times. This is more than is given by most effective beams, and represents a considerable step-up in talk power! As will be seen, SSB has all the advantages, except perhaps in the actual construction of a transmitter—but this can be done successfully if taken step-by-step, the one here described being the writer's first attempt at a rig of this type.

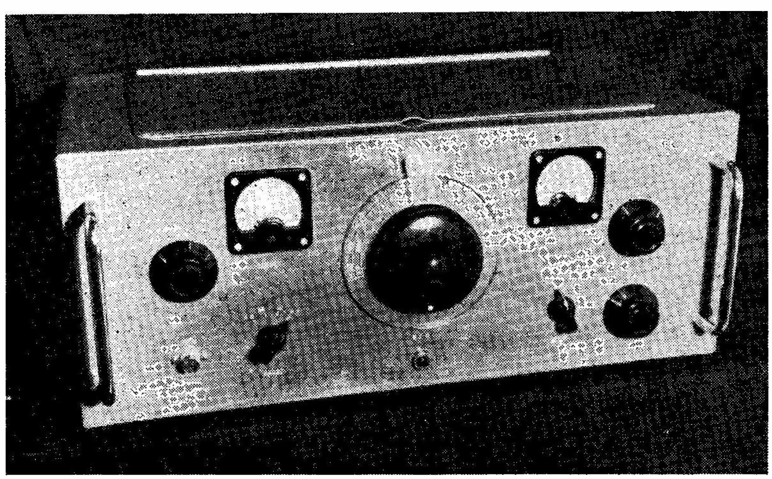
Using the phasing principle, it was constructed three years ago, since when many modifications have been made. But the transmitter as described here has been in operation, unaltered, for the last year and has given a very good account of itself; one of its main features is its ease of operation.

Circuit Description

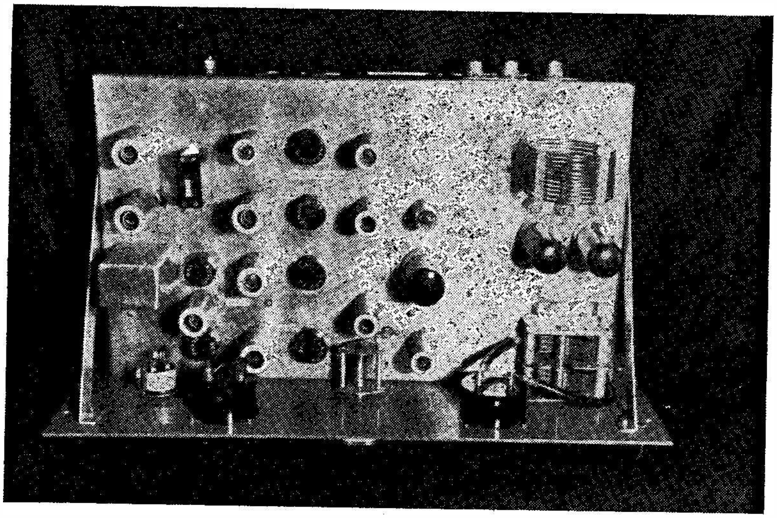
Transmitter: For simplicity this circuit is divided into three parts, as follows: Fig. 1, 9 mc exciter, which is directly connected to Fig. 2, the frequency changer and power amplifier, both being operated by Fig. 3, the voice control circuit. Fig. 1 shows the crystal microphone input to the audio amplifier, consisting of V1 (12AX7) followed by V2 (12AU7), half of which is used for additional audio amplification and half as crystal oscillator at approximately 9 mc, this being fed to the RF phase shift network; the purpose of this network is to produce two RF outputs at 9 mc, displaced by 90°. (Any crystal in the 9 mc region is suitable for this oscillator.)

The audio output from V2 is passed to a step-down transformer, T1, though anything similar would do; actually an SCR-522 driver transformer, parallel fed, is now used for T1, as the first transformer put in developed an open circuit due to excessive current flow through the high resistance winding. The secondary of T1 is fed to the audio phasing network, which consists of a close tolerance resistance-condenser arrangement, on the lines of the unit described in the October 1955 issue of *Short Wave Magazine*.

The audio amplifier and associated network



General view of the 20/80 metre SSB transmitter discussed in the text. The central Muirhead-type dial is the VFO control, on C45 in Fig. 2. All other circuits are fixed-tuned for the SSB areas of either the 20- or 80-metre bands, the VFO control being for small frequency changes only. One meter is switched for plate current readings, and the other is an RF meter on the PA side.



Layout of the SSB transmitter above-chassis, with the RF output section on the right. The switched PA coil L15 is in position, the valves being the Brimar miniature 807's. The circuit of the frequency changer and RF section is given in Fig. 2.

are designed to give a frequency response of 300-3,000 cycles, and after passing through V3 emerge as two audio outputs displaced by 90°.

These two audio outputs are taken to the reversal switch S1 for "Sideband Selection" — the reason for this being that on 20 metres the upper sideband is transmitted while on Eighty the lower sideband is used; this switch is operated automatically by the band-change control.

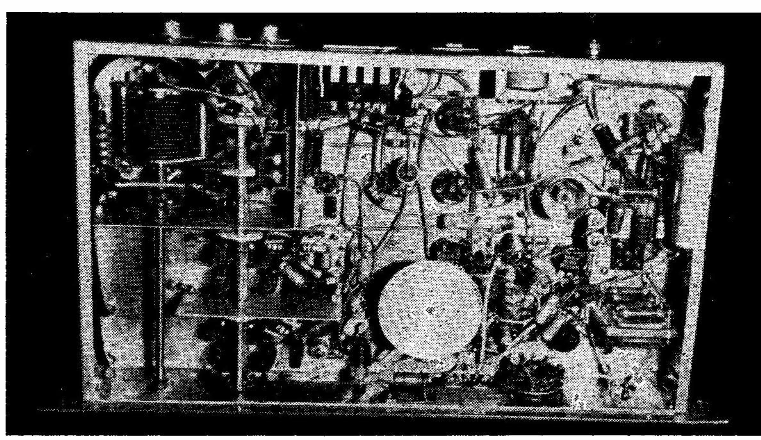
The two RF outputs and the two audio outputs are combined at the Balanced Modulator; here the carriers are balanced out and a 9 mc SSB suppressed carrier signal is produced.

RF Drive: Fig. 2, shows the VFO in a conventional Hartley circuit using V6 (6AM6): the grid circuit has a tuning range of 2563-2688 kc, the plate circuit doubling to 5126-5376 kc, using a self-resonant slug-tuned coil at L14.

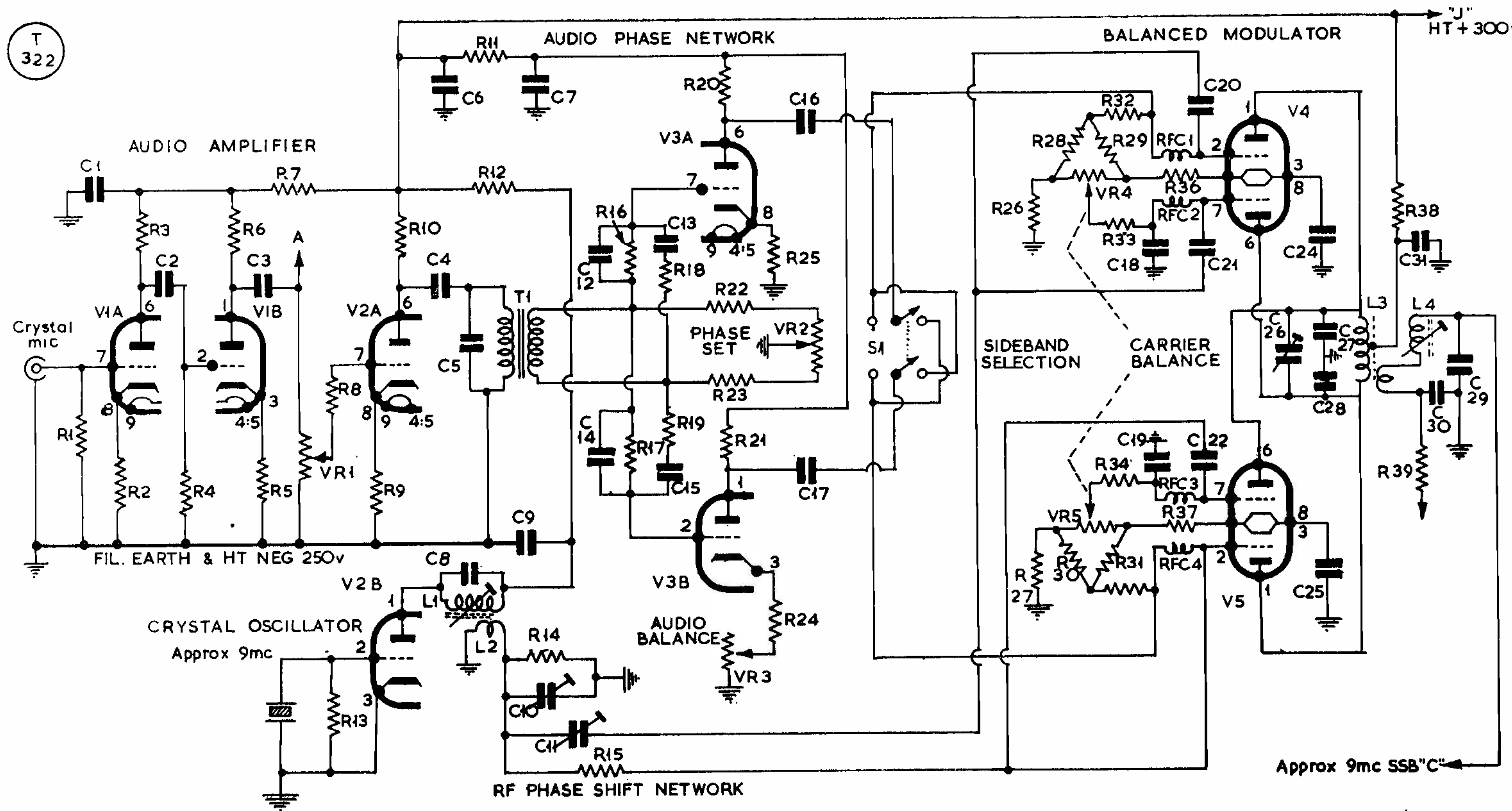
The 5 mc VFO output is mixed, in V7, with the 9 mc SSB signal from the exciter, and, by additive or subtractive mixing, frequencies within the ranges 3·6 - 3·8 mc or 14·1 - 14·35 mc are produced; these are selected by S2 and passed to the appropriate wideband coupling coils L5/6/7/8 and thence to V9, this being a buffer amplifier feeding wideband coupling coils which form the grid circuit for the PA.

The PA stage, V10 and V11, consists of two Brimar 5B/255M's in parallel (these are the miniature version of the 807, and are just as rugged). The plate circuit is a conventional pi-network through M2, an RF meter, to S8 where a path through L16 to an 80-metre output — or L19 for 20-metre output—is obtained, both being at 75 ohms impedance. L17 is made to resonate at about 3·79 mc when tuned by C65 and likewise L18 resonates at near-enough 14·30 mc when tuned by C65; these frequencies are in the neighbourhood of maximum SSB activity on the 80- and 20-metre bands.

The relay activated by the voice control circuit has two functions—in the "receive" position it shorts the PA network to ground and prevents incoming signals being absorbed. In the "transmit" position, *i.e.* with the relay coil energised, receiver input is shorted to ground, thus preventing overloading of the Rx. As an additional precaution against receiver overload, V12, a neon bulb, is connected as shown in Fig. 2 and prevents excessive voltage build-up across L17, or L18, depending on the band in use. If the circuit is properly adjusted, it will be found that no reduction in received signal is caused, as compared with direct connection of aerial to receiver.



Under-chassis view of the G3HRO transmitter for SSB working on the 14/3.5 mc bands. The circular disc is of aluminium, beneath which is the VFO coil L13 (see Fig. 2); this disc is to prevent calibration change when the chassis is slid into its cabinet.



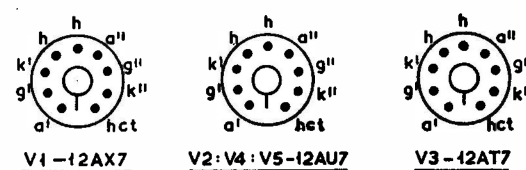


Fig. 1. The SSB exciter unit designed by G3HRO, the generating frequency being 9 mc; by appropriate choice of VFO coverage, in the 5 mc range, operation is obtained either on 14 mc, by additive mixing, or on 3.8 mc by using the "difference frequency." Sideband selection is by switch S1, and the method of balancing out the carrier is explained in the text.

Voice Control: From Fig. 3 it will be seen that the plates of V13, V15 and V16 are at ground potential, the cathodes being connected to a negative 150-volt line. In the "receive" condition V16 is conducting as its grid is maintained only slightly negative (one or two volts) with respect to its cathode by the resistance network R71, R74, R75; thus, current flows in the anode circuit, producing a voltage drop across R72; pin 5, negative with respect to ground, is connected to the transmitter and mutes it by over-biassing of V7 and V9.

In the "transmit" condition, *i.e.*, when the microphone is energised, audio is picked off the plate of V1B *via* C3, passed to the "Sensitivity" control VR6, then to V13A where it is amplified and rectified by the diode V14A; this produces positive bias on the grid of V15, causing it to conduct, thereby producing a voltage drop across R71. Pin 5 therefore becomes negative with respect to ground, and is applied to:

(1) R74, to grid of V16 to increase the negative bias on Pin 1 to cut-off; this valve then becomes non-conducting, and the muting bias on the RF section of the transmitter is eliminated; (2) Receiver for muting; the crystal rectifier is incorporated to prevent normal AVC voltages from the receiver upsetting the normal "flip-flop" condition of V15 and V16. When V16 conducts, it also energises the relay in Fig. 2, which causes receiver input to be grounded.

So that the speaker will not trigger-off the transmitter by energising the microphone on direct pick-up, thus completing the VOX cycle (always an irritating possibility on voice-control working) a non-tripping circuit is incorporated. This consists of a small pentode output transformer, T2, the low-resistance winding of which is connected to the 3-ohm output from the receiver, the secondary being taken to V13B. Here the audio is amplified and rectified by the diode V14B which produces an equal and opposite voltage to that developed by V14A, thus causing no change in the potential on the grid of V15, so maintaining the circuit in the "receive" condition.

In practice, the microphone can be held on the grille of the speaker at full volume without the transmitter being actuated. The "threshold" control is for producing a condition under which audio back from the speaker will not trigger the transmitter, but normal speech input to the microphone will do so.

Table of Values

Fig. 1. Exciter Section

C1, C6, C7	= 8 μF
C2, C3, C4	= .005 μF
C5	= .001 μF
C8	= 50 μμF
C9	= .01 μF
C10, C11	= 82 μμF (condensers to have reactance of 220 ohms at crystal frequency)
C12	= 2430 μμF ± 1%
C13	= 4860 μμF ± 1%
C14	= 607.5 μμF ± 1%
C15	= 1215 μμF ± 1%
C16, C17, C18, C19	= .05 μF
C20, C21, C22, C23	= 50 μμF
C24, C25	= .002 μF
C26	= 30 μμF
C27, C28	= 33 μμF
C29	= 47 μμF
C30, C31	= .005 μF
R1	= 1 megohm ½ watt
R2, R5	= 2,200 ohms ½ watt
R3	= 100,000 ohms ½ watt
R4	= 220,000 ohms ½ watt
R6, R8, R13	= 47,000 ohms ½ watt
R7, R12	= 10,000 ohms ½ watt
R9	= 750 ohms ½ watt
R10	= 15,000 ohms ½ watt
R11	= 10,000 ohms 1 watt
R14, R15	= 220 ohms ± 5% ½ watt
R16, R17	= 133,300 ohms ± 1% ½ watt
R18, R19	= 100,000 ohms ± 1% ½ watt
R20, R21	= 22,000 ohms ½ watt
R22	= 430 ohms ± 5% ½ watt
R23	= 1,600 ohms ± 5% ½ watt
R24	= 250 ohms ½ watt
R25	= 500 ohms ½ watt
R26, R27	= 5,000 ohms 3 watt
R28, R29, R30, R31	= 2,000 ohms ½ watt
R32, R33, R34, R35	= 100,000 ohms ½ watt
R36, R37	= 200 ohms ½ watt
R38	= 1,000 ohms 1 watt w/w
R39	= 150,000 ohms ½ watt
VR1	= 1 megohm carbon
VR2	= 100 ohms w/w
VR3	= 500 ohms w/w
VR4, VR5	= 500 ohms w/w
RFC 1, 2, 3, 4	= 1.5 mH
T1	= 1 : 1.5/2 step down
S1	= Double pole change over
L1, 2, 3, 4	= *See text*
V1	= Brimar 12AX7
V2, V4, V5	= Brimar 12AU7
V3	= Brimar 12AT7

All condensers 300 volt working.

General Points

Netting is carried out by closing S11; this partially eliminates the muting on the transmitter driver stages and enables the VFO to be brought to zero beat with the receiver, adjusted as for CW working.

Having once netted, S11 is returned to the "open" position. When the microphone is spoken into the (1) Receiver is muted, as already described; (2) Transmitter is energised, and (3) Aerial changed to "transmit" condition.

A pause in speech, or to take a breath, is sufficient to return the receiver to the "receive" condition; this is quite useful, to check if the channel is still clear, or to enable another station to break in.

This method of calling is quite normal—one just waits for the operator of the wanted

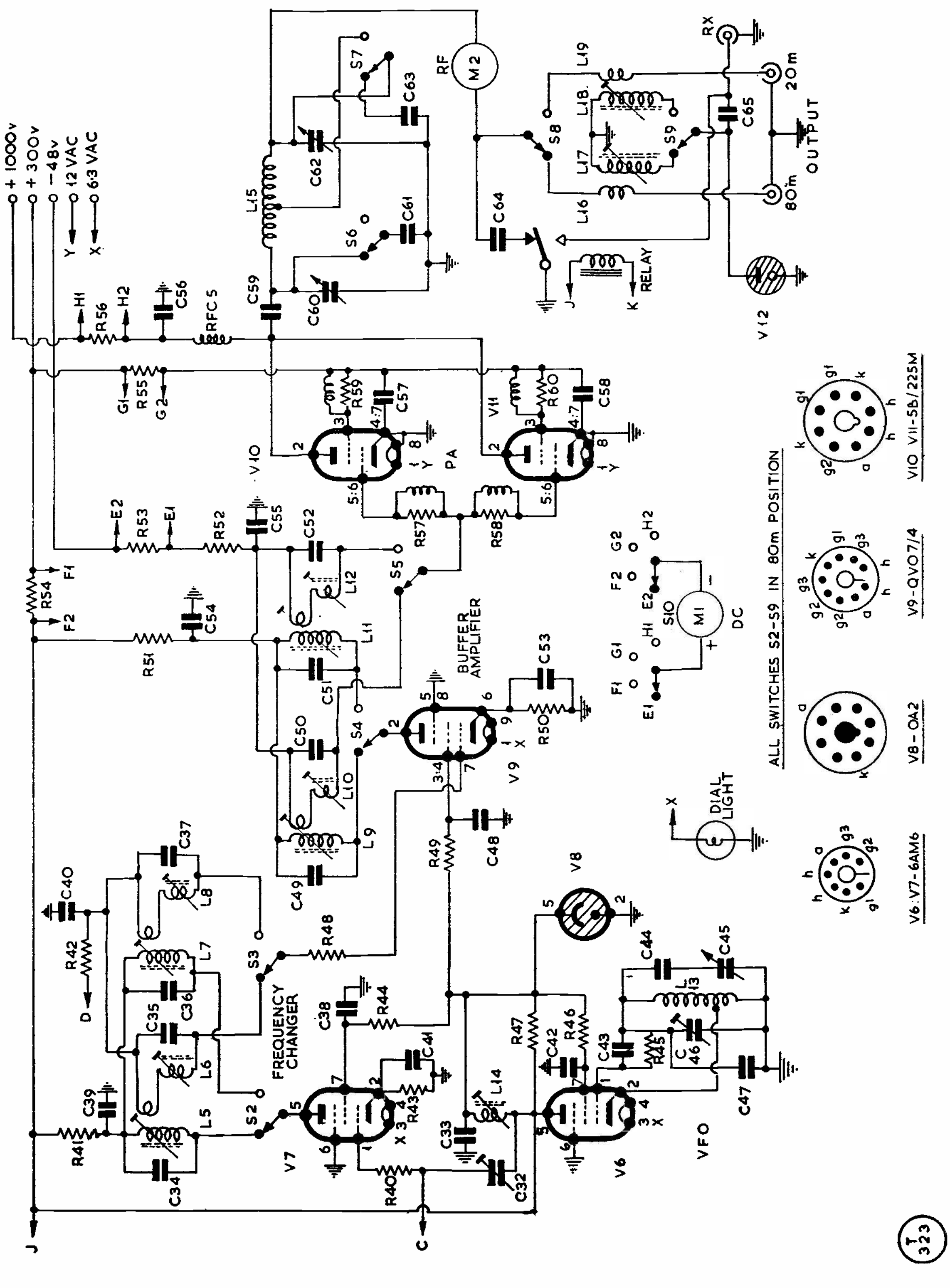

+ 1000v
+ 300v
- 48v
12 VAC
6·3 VAC
FREQUENCY CHANGER
BUFFER AMPLIFIER
PA
VFO
OUTPUT
20m
80m
RX
RELAY
DIAL LIGHT
DC
RF
ALL SWITCHES S2-S9 IN 80m POSITION
V6·V7-6AM6
V8-OA2
V9-QVO7/4
V10 V11-5B/225M
T 323

Fig. 2. Circuit of the frequency changer and RF power amplifier for the SSB transmitter described by G3HRO. Sideband output is given in the SSB areas of the 20- and 80-metre bands, and the design incorporates VOX control — see Fig. 3.
(Note: Base diagram V10, V11 should read 5B/255M, and V9, QV04-7)

station to take a breath and is accepted procedure. This method of voice-control can, of course, be substituted by a "press-to-talk" system which is much simpler to construct.

The PA runs at 1,000 volts DC, the quiescent current being about 20 mA for the two valves; indicated peaks of 250 mA are produced on normal speech, though peaks of approximately twice this amplitude occur, being too "fast" for the meter to indicate.

Table of Values

Fig. 2. Frequency Changer and RF Amplifier

C32	30 $\mu\mu$F Philips trimmer
C33, C38, C39, C40, C41, C42, C48, C53, C54, C55, C57, C58, C34, C35, C43, C49	.01 μF
C50	100 $\mu\mu$F
C36, C37, C51, C52	33 $\mu\mu$F
C44	Silver mica 55 $\mu\mu$F
C45	VFO control 100 $\mu\mu$F
C46	Pre-set 50 $\mu\mu$F
C47	230 $\mu\mu$F; 100 $\mu\mu$F silver mica with 130 $\mu\mu$F ceramic
C56	.002 μF 1,000v. working
C59	.002 μF 2,000v. working
C60	Wide space 250 $\mu\mu$F
C61	150 $\mu\mu$F 1,500v. working
C62	800 $\mu\mu$F
C63	700 $\mu\mu$F
C64	.001 ceramic
C65	15 $\mu\mu$F
R40	400 ohms ½ watt
R41	20,000 ohms 1 watt
R42	220,000 ohms ½ watt
R43	800 ohms ½ watt
R44, R46	270 ohms ½ watt
R45	50,000 ohms ½ watt
R47	15,000 ohms 1 watt
R48	50 ohms ½ watt
R49	600 ohms ½ watt
R50	500 ohms ½ watt
R51, R52	100 ohms ½ watt
R53	15 mA shunt
R54	150 mA shunt
R55	50 mA shunt
R56	250 mA shunt
R57, R58	100 ohms ½ watt, wound with 15 turns 18g. enam.
R59, R60	100 ohms ½ watt, wound with 12 turns 18g. enam.
RFC5	2.5 mH transmitting type
S2 and S3	Two pole two way ceramic
S4 and S5	Two pole two way ceramic
S6 and S7	Two pole two way ceramic
S8 and S9	Two pole two way ceramic
S10	Two pole four way (Yaxley)
M1	5 mA DC
M2	0.5 amp RF shunted with 18g. wire
Relay	3,500 ohms
V6, V7	Brimar 6AM6
V8	Brimar OA2
V9	Mullard QV04-7
V10, V11	Brimar 5B/255M
V12	Neon indicator lamp with resistor removed

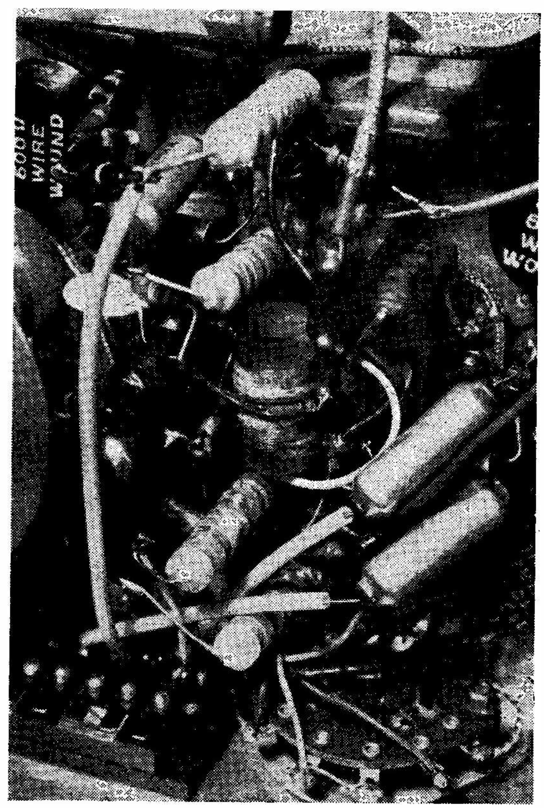
All condensers 300 volt working unless otherwise specified.

An 0-5 mA meter is incorporated, and, with shunts, is switched by S10 to read: (1) Grid drive, 15 mA full scale; (2) Driver stages, 150 mA; (3) PA screen current, 50 mA; and (4) PA anode current, 250 mA.

Construction

The front panel is 19ins. by 7½ins. of 14g. aluminium, and lay-out is quite simple — *see* photographs. Microphone input is at the left, with the audio gain control VR1 (incorporating S11 above). The left-hand meter is the 5 mA movement, with its selection switch S10 below.

At centre is the VFO control, consisting of a Muirhead slow-motion dial, driving C45; the outer ring of the drive is made of ⅛in. thick perspex, and is calibrated by marking on the back of the disc. To the right of the main dial is the RF meter with bandswitch beneath; the pi-tank tuning condensers are on the extreme right. Two marks appearing by each of these knobs give the tuned-up settings for 80 and 20



Arrangement of the balanced modulator, the circuit of which is given in Fig. 1. The L3, L4 coil assembly is at centre, and the sideband selector switch S1 at lower right; this switch, actuated by a link from the band-switch S2-S9, is made of ⅛-in. paxolin with six phosphor-bronze fingers.

TABLE 1

COIL WINDING DATA

COIL	FORMER	WIRE	WINDING	REMARKS
L1	½" Polystyrene with slug	28 SWG enamel	22 turns	Turns wire diam. spaced.
L2		22 SWG PVC covered	2 turns	Wound earthy end of L1.
L3	½" Polystyrene rod	30 SWG enamel	30 turns	Close wound, centre tapped.
L4	½" Polystyrene with slug	30 SWG enamel	18 turns	Bottom lead to coil covered with fine PVC sleeving, two turns taken round centre of L3 and then back to C30.
L5	½" Polystyrene with slug	30 SWG enamel	40 turns	Close wound.
L6	½" Polystyrene with slug	30 SWG enamel	37 turns	Bottom lead to coil 10 turns link round earthy end of L5.
L7	½" Polystyrene with slug	24 SWG enamel	15 turns	Turns wire diam. spaced.
L8	½" Polystyrene with slug	24 SWG enamel	14 turns	Turns wire diam. spaced: bottom lead to coil 3 turns link on earthy end of L7.
L9	½" Polystyrene with slug	30 SWG enamel	37 turns	Close wound.
L10	½" Polystyrene with slug	30 SWG enamel	30 turns	Bottom lead to coil 10 turns link round earthy end of L9.
L11	½" Polystyrene with slug	24 SWG enamel	13 turns	Turns wire diam. spaced.
L12	½" Polystyrene with slug	24 SWG enamel	11 turns	Turns wire diam. spaced: bottom lead to coil 3 turns link on earthy end of L11.
L13	1" Polystyrene rod	22 SWG enamel & SSC	24 turns	Close wound tapped 7 turns from bottom.
L14	½" Polystyrene with slug	38 SWG enamel	70 turns	Close wound.
L15	2½" diam. self supporting	14 SWG	11 turns	⅛" spacing tapped 5 turns from C59 end.
L16		24 SWG	4 turns	Wound over earth end of L17 but well insulated from same.
L17	⅜" bakelite with slug	38 SWG enamel	.65" long	Resonate in position to 3.79 mc with GDO.
L18	⅜" bakelite with slug	26 SWG	.50" long	Resonate in position to 14.30 mc with GDO.
L19		24 SWG	2 turns	Wound over earth end of L19 but well insulated from same.

All windings secured with Polystyrene cement.

metres. The panel was engraved, sprayed and afterwards characters filled in with white paint.

The above-chassis lay-out is seen in another photograph; at the top left is input stage 12AX7 (V1), with an 8·974 mc crystal to its right. The 522 driver transformer is at left, beside the panel brace.

In the interests of safety rubber covers were put on the 5 mA meter terminals, as these are 1,000 volts above chassis when reading PA current. On the extreme right is C62; above this is the pair of 5B/255M's, and above these again is the PA coil L15. This is made by winding the required amount of wire on a 2¼in. former (it will spring out to 2½ inches) then four pieces of insulating rod 1½ins. long and ¼ square are drilled with eleven holes slightly larger than the wire, with ⅛in. spacing between centres. These strips are wound on to the wire and adjusted to make an even coil.

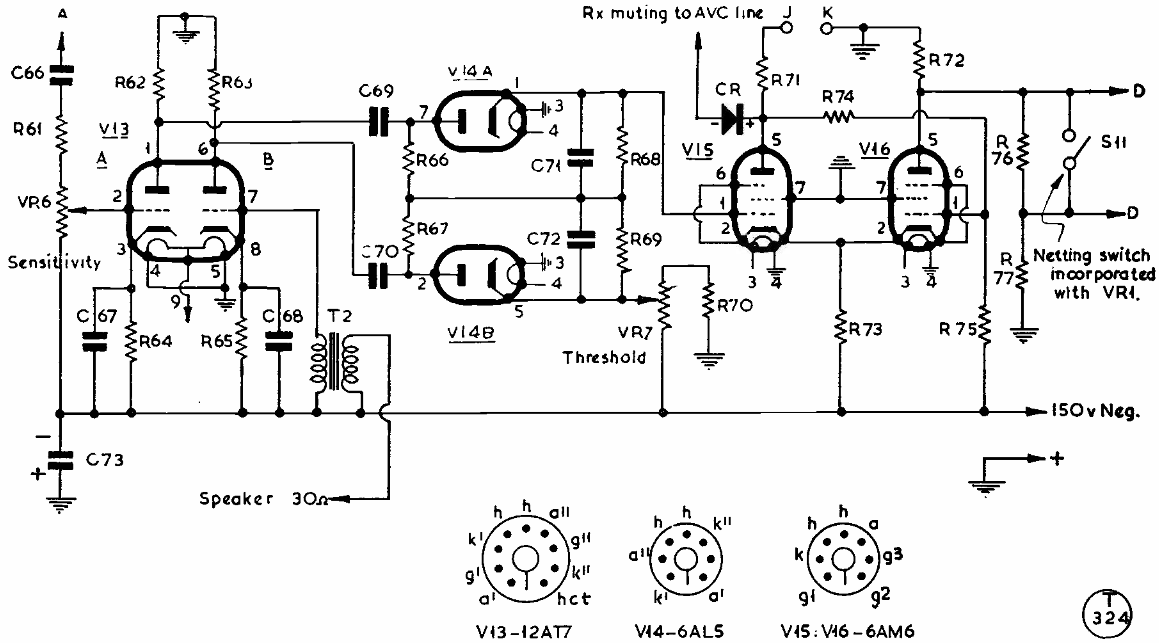


Fig. 3. Voice control circuit for the G3HRO SSB transmitter. Audio for the VOX unit is taken off the second speech amplifier stage by connecting point A in this circuit to the junction of C3/VR1 at V1B in Fig. 1.

The tap at 5 turns from the "hot" end is made by baring wire and soldering round a piece of 3/16in. wide copper strip. The coil can be made more rigid by applying polystyrene cement to its supports. Connections to the underside of the chassis are taken through three insulators made from ½in. insulating rod.

The general disposition of components under the chassis is shown in one photograph; in accordance with usual practice all heater and HT wires are screened. If a multiple-feed cable is used for power supplies, RFC's and by-pass condensers at the feed point are recommended, in order to avoid feed-back between adjacent leads. The chokes and condensers can be seen adjacent to the Jones power input socket.

The RFC's 1, 2, 3 and 4 were made especially small to fit in the Balanced Modulator section. They are wound on polythene core from RF cable 0·30in. in diameter, and just over 1-inch long; 5 small sections were made and wound with 38g. SCC wire.

The VFO coil L13 is under a circular unearthed aluminium disc — seen in one of the photographs—to prevent alteration in calibration when the chassis is slid into its cabinet. The VFO coil is constructed from 1in. diameter polystyrene rod about 2¼ins. long, with three

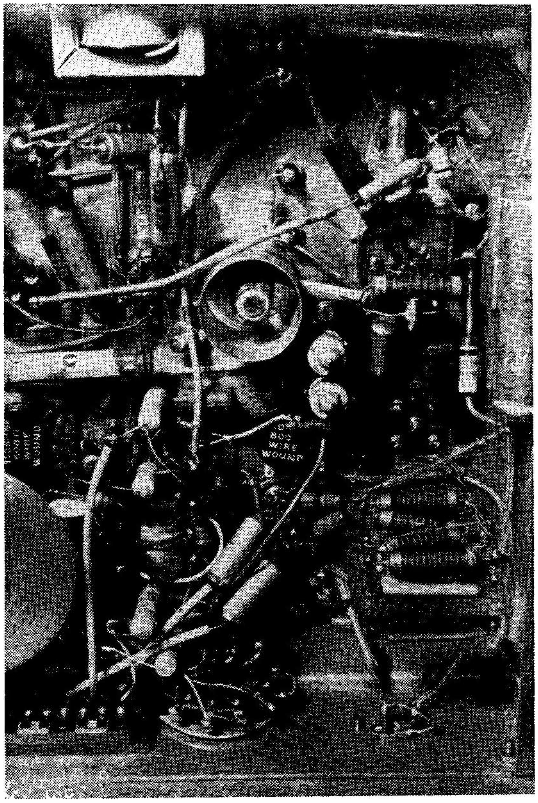
Table of Values

Fig. 3. Voice Control Circuit

C65	= .002 μF
C67, C68	= 2 μF 10 volt
C69, C70	= .01 μF
C71, C72	= .10 μF
C73	= 8 μF 200v. electrolytic
R61, R66, R67	= 220,000 ohms ½ watt
R62, R63, R71	= 33,000 ohms ½ watt
R64, R65	= 650 ohms ½ watt
R68, R69, R74	= 2.2 megohms ½ watt
R70	= 39,000 ohms ½ watt
R72	= 47,000 ohms ½ watt
R73	= 3,900 ohms ½ watt
R75	= 330,000 ohms ½ watt
R76	= 1.0 megohm ½ watt
R77	= 56,000 ohms ½ watt
VR6	= 500,000 ohms carbon
VR7	= 20,000 ohms carbon
T2	= Small Pentode output transformer
CR	= Germanium diode Brimar GD5 (should have backward resistance of 1 megohm)
S11	= Single pole switch on VR1
V13	= Brimar 12AT7
V14	= Brimar 6AL5
V15, V16	= Brimar 6AM6

copperwire pegs heated and pushed into the side to act as fixing points for the winding, which should be put on as tightly as possible and treated with a liberal coating of polystyrene cement. It is essential that the whole of the VFO be made as mechanically rigid as possible.

The swamping capacity C47 is made up of a 100 μμF mica and a 130 μμF ceramic condenser in parallel; this was found the best arrangement to get the necessary stability. The



Layout internally of the input and audio phase network. The microphone socket is at bottom right. L1, L2 are in the central screening can, near which are the two trimmers C10, C11 used in the RF phase-shift network — see Fig. 1.

need for high stability is particularly important with SSB for if an operator in a multiple QSO drifts about he becomes unpopular, as the other participants have to retune; with slight drift the voice becomes high or low pitched, and if drift is excessive speech is quite unintelligible.

The complete transmitter and voice control unit is housed in a cabinet supplied by Philpots Metal Works Ltd., of Loughborough.

Lining Up

All coils should be checked with a GDO and windings secured with polystyrene cement.

The audio amplifier, crystal oscillator and VFO can be checked in normal manner. The audio phase network can be adjusted by applying a variable audio frequency to T1, and connecting pins 2 and 7 of V3 to the X and Y plates of an oscilloscope. When correctly set up a circle will be displayed as the frequency is varied from 300 to 3,000 cycles; this test is best done *in situ*.

The whole exciter section can now be checked (the voice control being made inoperative) by listening on a receiver tuned to 9 mc; L3 and L4 are resonated to give maximum output. Next, adjust "Carrier Balance" VR4 and VR5 for minimum output. Now introduce a pure 1000-cycle tone to the microphone input and, with VR1 at minimum, gradually increase input and check pins 2 and 7 of V3 with a valve voltmeter; set VR2 and VR3 to get these voltages equal. Listen to the signal on the receiver (9 mc again) or observe the modulated output on an oscilloscope; adjust C10 and C11 until modulation is minimised, for which slight adjustments to VR2 and VR3 may be necessary. When correctly adjusted with the audio tone still on, the RF output should be a constant *unmodulated* carrier. It may not be possible to balance out modulation completely, but it should be reduced to the absolute minimum.

On the model, it was found that the RF phaseshift network controls C10 and C11 were the most critical to adjust.

Finally, the signal can be monitored with the receiver in its most sensitive condition to make sure that only the correct sideband is being produced. The frequency changer circuit, buffer and PA can be checked and when this has been done the voice control circuit is brought into operation.

For anyone not accustomed to setting up an SSB transmitter, these adjustments will seem complicated and a good deal of experiment on the bench will probably be necessary to get the required result—which is accurately to balance the modulator, as a first step, and then to ensure that the correct sideband can be selected. All these adjustments should be done on closed-circuit (dummy load), and it is undeniable that an oscilloscope is extremely helpful.

Power Supply

This is shown in Fig. 4 and follows conventional lines, with RF mains filtering. T1 is a standard 750-0-750 volt 250 mA transformer into a 5R4GY rectifier. A choke is *not* necessary and regulation is improved by not using one. One rectifier has been in service at G3HRO for three years, and has not suffered by being used in the circuit as shown. Delay in switching on HT is recommended, also a total resistance of 500 ohms per anode is necessary.

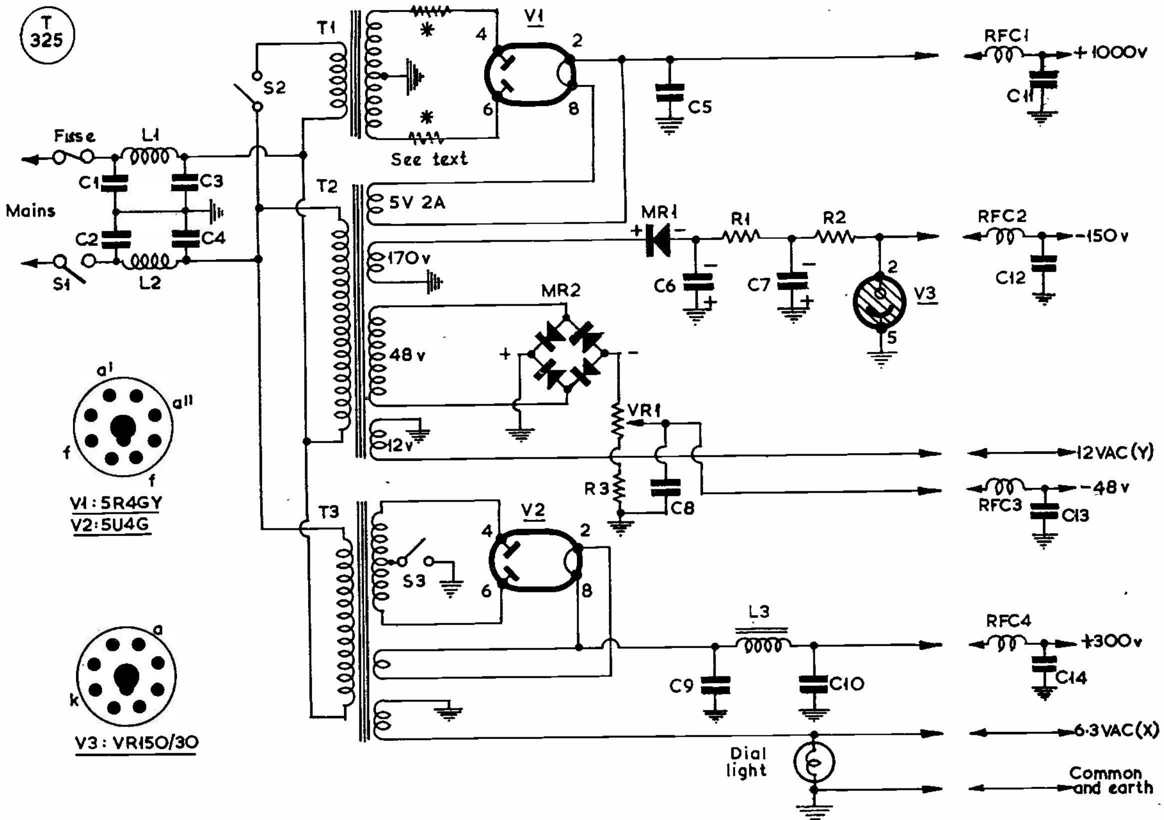


Fig. 4. The power supply unit for the SSB transmitter, giving all required outputs, including bias. It has been found that a smoothing choke is unnecessary in the main HT section, but surge-limiting resistors of about 500 ohms, rated at 30 watts, should be put in to protect the rectifier V1.

Table of Values

Fig. 4. Power Supply Unit

C1, C2, C3, C4	= 0.005 μF mica 500 volt	L1, L2	= 18 turns 14 swg round 1in. diam. former
C5	= 16 μF (8 + 8), paper, 1,000 volt	L3	= 10H at 250 mA
C6, C7	= 8 μF electrolytic 250 volt working	RFC'S 1, 2, 3, 4	= High value ½ watt resistor wound with 36g. SSC
C8	= 100 μF electrolytic 50 volt	T1	= 750-0-750 volt, 250 mA
C9, C10	= 8 μF paper 350 volt	T2	= 5v., 2a: 170v. 30 mA: 48v., 30 mA: 12v., 1a.
C11	= .002 μF mica 1,000 volt	T3	= 350-0-350 volt, 250 mA: 5v., 3a.: 6.3v., 5a.
C12, C13, C14	= .002 μF mica 350 volt	S1	= Mains on-off switch
R1, R2	= 1,000 ohms w/w	S2, S3	= Double pole single throw
R3	= 500 ohms w/w	V1	= Brimar 5R4GY
VR1	= 100 ohms w/w	V2	= Brimar 5U4G
MR1	= Brimar RM3	V3	= Brimar VR150/30
MR2	= Bridge rectifier 50 volt 100 mA		

Incidentally, both T2 and T3 are home-constructed transformers. The filter system RFC's 1, 2, 3, 4, with C11, C12, C13 and C14 is also recommended, and should be placed in the transmitter input, if a multi-core connecting cable is used, as with this design. The whole power unit is accommodated in a metal case 11¼in. x 7½in. x 10½in.

Results

Anyone who has listened to 80-metre SSB working will appreciate that such results are unobtainable on AM phone. These multi-ways on 80 metres often include G, GI, EI, SM, PA, DL, OZ and ON in one QSO. On 20 metres similar results are obtainable. In this connection, G3HRO was included in the first ever all-continent round table on SSB, in which all six continents were linked in one QSO, as reported in *Short Wave Magazine* for November 1956. When this transmitter was constructed three years ago SSB contacts on 20 metres were rare. Since then the picture has changed completely and it seems that in the future all phone transmission will be on SSB; it certainly has all the advantages over any other form of amateur telephony working!

SWL • • • • • •

NEW FEATURE FOR THE SHORT WAVE LISTENER

THE introduction of a new feature is always something of an experiment. "*SWL*" will be no exception, and the aim will be to develop it into the kind of feature that our SWL readers approve of most. They, in the long run, must be the arbiters of its contents, and this they can achieve not only by telling us, month by month, which articles interest them most, but also by writing in with their own results and experiences.

SWL's have been asking for more space as long as the *Magazine* staff can remember; now they will have it, in this bi-monthly feature, which will alternate with "SSB Topics" and should therefore appear in January, March, May, July, September and November.

Its scope—anything which is of interest to SWL's, *except* amateur-band DX results as such, already covered in "DX Commentary" every month. This leaves it pretty broad, including as it does the whole art of short-wave reception. Subdividing this, we visualise articles on Aerials, Receiver Circuitry, complete Receivers, conversions of Surplus receivers, together with hints on what to listen for, when to listen, how to listen and how to extract QSL cards from the stations heard.

We start, therefore, with an appeal to the SWL's who read this first instalment. Will they please tell us *(a)* What they think of it, and *(b)* What they most want to see in it. And will they also please tell us what kind of gear they are using at present, what they would like to use in the future, and what their general feelings are about the whole thing. This information will be put to good use, for we want to provide the SWL with the feature that *he* wants.

MAKE THE MOST OF THE SUN-SPOTS

Beginners in the field of short-wave listening may not realise that they are breaking into it at a unique time. Never before in history have conditions been so favourable for the transmission and reception of short-wave signals over long distances; and it could be that a similar opportunity will not occur again during our lifetime.

DX reception and transmission is dependent upon the ionosphere, that ionised layer many miles above the earth's surface which bends and reflects radio transmissions of certain frequencies. The state of the ionosphere is never static; it is turbulent and constantly changing, not only the nature of its "surface," but its height above the earth. The cause of all the changes is the sun and its powerful radiation which is continually swamping the earth, the other planets, and the interplanetary space between.

If the radiation from the sun were constant, the movement of the ionosphere would be a simple night-and-day variation; but the sun is far from constant, and the potency of its radiations and ionising effects varies, together with the number of "sunspots," over a cycle of roughly eleven years. With the maximum number of sunspots goes the maximum effect upon our ionosphere, an effect believed to be due mainly to ultra-violet light, X-rays and actual charged particles. And with the same effect goes yet another effect—that of "magnetic storms" over the surface of the earth, and most of all near the poles.

One could fill a book with details of the relation between the sunspot cycle and the conditions for radio communication on this earth but we have to condense this vast subject into a column or two of print. Sufficient to say, therefore, at this point, that a sunspot maximum coincides with a period of extremely good DX conditions on the HF bands—that is, on 14, 21 and 28 mc, known also as 20, 15 and 10 metres respectively.

The condition we have just gone through (earlier in 1958) is the *highest maximum ever recorded.* Radio conditions have only been recorded over the last three sunspot cycles, but the sunspot numbers themselves have been noted by astronomical observatories all over the world for more than a century, and it is an undoubted fact that the eleven-yearly *maxima* have been soaring to higher and higher numbers, with this present one incomparably the greatest recorded. (In the early 1800's some of the *maxima* were hardly higher than our last *minimum*—which means, translated into our special language, that the 21 mc and 28 mc bands would not have come to life at all over periods of 44 or 55 years!)

Here we are, then, in the middle of an extraordinarily favourable period for short-wave DX reception, which will probably persist, with seasonal variations, for another three years or so, after which the decline will become very noticeable and we shall return to the general level of conditions during years like 1953 and 1954. In such conditions the 160-, 80- and 40-metre bands will all be more interesting than they are at present, but 20 metres will be mediocre, and the shorter waves virtually useless for long periods.

Before this happens, there is a rich harvest of real DX to be fetched in, and SWL's will do well to make the most of the opportunity while it is with us. In particular, the 10-metre and 15-metre bands are liable to exhibit really freakish conditions every once in a while; if these bands are dull one day, don't give in; they may be phenomenal in less than twenty-four hours.

Another thing is to remember that the higher the MUF (Maximum Usable Frequency) rises, the higher the frequency of the "best band" at the time. In other words, on a day with a very high MUF, Ten will be *better* than Fifteen, and Fifteen better than Twenty. On days when the MUF is not so high, Fifteen may well be the best band, with Ten rather indifferent.

The MUF has recently been rising well above 40 mc, even on the Trans-Atlantic path, as many TV viewers will know. People in fringe areas who are tuned to Crystal Palace on 41.5 and 45 mc have been receiving stations in the U.S.A. far too "loud and clear" for their liking, and even police cars have been breaking through at considerable strength. On such days as those, Ten is invariably *terrific*. And if your receiving gear takes you up to 50 mc—the 6-metre band—you are quite likely to hear American amateur stations as far west as the Pacific coast of the U.S.A.

However, the main purpose of these notes is to impress upon you that this *present period is one that should not be missed*. The correct use of the various bands is another story, and a much longer one, which we will deal with in due course. Meanwhile, cover as many as you can—but try the highest frequencies first—just in case!

PLAN YOUR LISTENING

Success in short-wave listening depends upon many factors, but one of the most important is a kind of instinct for being on the spot at the right time. There are so many bands to choose from, and so many different times of day and night at which to listen, that it is easily possible (by consistently wrong thinking) to listen at almost any time without hearing anything worth while!

From this we learn the lesson that the converse must also be true, and that the operator who knows the best times to listen, and the bands on which to listen at those times, will be on the road to success.

During the winter evenings there is plenty of DX available on 14, 21 and 28 mc; it does not follow that all three bands are open on any given night, but they may well be. Assuming that you cover all three, and that you have a choice, you will find more unusual DX on 21 mc, more Europeans on 14 mc, and more U.S.A. stations on 28 mc! This is the general run of affairs just at present.

As the evening proceeds, 28 mc will fade right out, and so, later, will 21 mc, leaving 14 mc open until well after midnight, or possibly all night. The Europeans will have vanished, and sometimes even the ubiquitous North Americans will fade out, and then the band is a happy hunting ground for the less-common South American countries.

Earlier in the evening, there is no limit to the variety of DX on 21 mc, except that you will seldom find the Pacific area or any part of Oceania represented. For those you need a free morning, and you won't even have to get up early. Good signals from VK and ZL, and (if it's a good morning) from such countries as FK8, VR2, ZK1, ZK2 and the other rare ones can often be heard from 0830 onwards, lasting as late as 1100 GMT.

At the same time of day the 14 mc band may well be open to nearly all parts, and even 28 mc is likely to produce signals from the Far East and most parts of Africa.

The main advantage of morning listening, when you can do it, is that there are not many W's and VE's around; with all due respect to their excellent signals and operating, their numbers do clutter the bands up when they are on in force!

Afternoons are always interesting when conditions are good, on any one of the three bands. On 28 and 21 mc the W's are numerous, but, of course, 28 mc is a special case, because you can always listen in the 28000-28500 kc sector *without* encountering any W phones at all, and if the DX is there, you will hear it.

The Eighty- and Forty-metre bands, if you use them, are strictly for the late-night and early-morning listener just at present, if it's DX that you are after. A surprising amount of world-wide DX can be logged on Forty between midnight and 0700 GMT; likewise, some very interesting stuff can be heard on Eighty during the small hours. One-Sixty, or "Top Band," is a special case; real DX is rare up there, but the SWL who can copy CW has a good chance of hearing W's between 1800 and 1825 kc if he listens carefully over that sector for the next five or six Sunday mornings between 0500 and 0800. Don't expect strong signals—there will be plenty of those from the G's calling the W's—but look at all the weak CW you hear, and you will undoubtedly be able to log U.S.A. on Top Band.

To sum up, a specimen 24-hours listening table is given, which shows that, with average conditions,

SWL station of J. Edwards, Leeds, who listens almost exclusively outside the amateur bands — with what results, see next page.

SWL • • • • • •

continued

DX OPERATING TABLE

0001-0200:	World-wide on 14 mc, W's and South America on 7 mc.
0200-0400:	*as above.*
0400-0600:	World-wide on 14 mc, W's on 3·5 mc.
0600-0800:	Far East and VK on 21 mc, World-wide on 14 mc, W6 and W7 on 7 mc, W's on 3·5 mc, W's on 1·8 mc *(especially Sundays).*
0800-1000:	Oceania and Pacific on 28 mc, World-wide on 21 mc, Oceania on 14 mc.
1000-1200:	Far East, Oceania, Pacific on 21 mc.
1200-1400:	W's now arriving on 21 and 28 mc.
1400-1600:	Various on 28 and 21 mc.
1600-1800:	Mainly W's now on 28 mc, Various on 21 mc, Europeans fading out on 14 mc.
1800-2000:	World-wide, 14 mc and sometimes 21 mc.
2000-2200:	South America and Caribbean area, 14 and 21 mc.
2200-2359:	Various on both 14 and 7 mc.

you should be able to log worth-while DX at any time of day or night.

OFF THE AMATEUR BANDS

Most of the SWL's who read this feature will naturally be amateur-band enthusiasts; but the majority of them will have receivers which cover the vast frequency-ranges in between those bands, and some will even admit to spending a little time searching those wide open spaces.

J. Edwards, of Leeds, is one of the rare ones who spends practically *all* his time listening to ships and aircraft—CW only. He has been doing this since 1934, and since then he has amassed, in his own words, " five large volumes of QSL's from everything except a submarine (who wouldn't QSL!) and a balloon."

Some of his interesting pre-war QSL's were from the *Graf Zeppelin* (DENNE) and the *Hindenburg* (DEKKA). He heard *Discovery II* (VPSJ) many times on her South Polar voyage, and has an album of photographs as a souvenir. Tay Garnett, the film man, was heard during a world cruise on his yacht *Athene*—and there is a QSL to prove that.

Others include the German catapult ship *Westfalen,* which was anchored off the West African coast and used to catapult the mail planes off to South America—and also some of the said planes, heard while over the South Atlantic.

The collection also boasts letters from operators all over the world and from ships of most of the major lines; one whole volume is from operators of the American Dollar Line, one of whom used to call SWL Edwards at 0730 each morning, wherever the ship was at the time, which might be anywhere on the Seven Seas.

SWL Edwards always wanted a transmitter, and achieved his wish during the war, when he operated many stations, including TFJ, a 15-kilowatter in Iceland. Nowadays he listens mostly to aircraft over the Atlantic, and says that when one is overdue, things get pretty exciting.

The accompanying photograph of his gear shows *(bottom right)* the Light Programme set; above it is a Bendix, a stand-by for listening on two frequencies at once; above the table is another RA-1B, with combined S-meter and audio oscillator, and alongside is a Command Receiver. The map at the back is used for tracking aircraft. All the power packs are behind the loud-speaker at the bottom of the cabinet.

The straight key and the vibroplex are for practice only. All reception, at all times, has been on an indoor aerial tucked away round the wall, so—novices, take heed, and don't despair if an indoor wire is all that can be managed. SWL Edwards says he sometimes receives long-distance aircraft when the local airports have difficulty in hearing them!

If a sufficient number of readers show interest in this kind of short-wave listening, we will refer back to the subject and give further details of frequencies to listen on, but naturally it cannot be treated in the same way as amateur-band reception because of the absence of regular communication with the fellows at the other end.

Meanwhile, it is opportune to refer to a letter from P. A. Conway, of Birmingham, who listens mostly to ships and coast stations. He says that the New Zealand coastals are usually audible every morning and evening on one or other of the five shipping bands.

Other notable DX heard has included VPX2, Penang; VRT, Bermuda; VSI, Turks Island; ZNR, Aden Radio; ZEL24, Hong Kong; JOS, Nagasaki; and JZK3, Dutch New Guinea, all heard during the past few weeks.

SWL Conway says that it is possible to log around 200 countries; his own total stands at 131, with about 1200 different call-signs. One of the main difficulties is the identification of the call-signs one hears. For instance, one logs FLZ, and the block

MARINE FREQUENCY BANDS

Ship stations on R/T work in the bands 4063-4133, 8195-8265, 12330-12400, 16460-16530 and 22000-22070 kc. Coastal stations on R/T: 4368-4438, 8745-8815, 13130-13200, 17290-17360 and 22650-22720 kc. Ships, W/T, 4133-4238, 6200-6357, 8265-8476, 12405-12714 and 22070-22400 kc. An article entitled " Ships and Coast Stations " appeared on p.636 of the February, 1957, issue of SHORT WAVE MAGAZINE.

The Reinartz Loop

INDOOR RADIATING SYSTEM

H. TEE (G8UA)

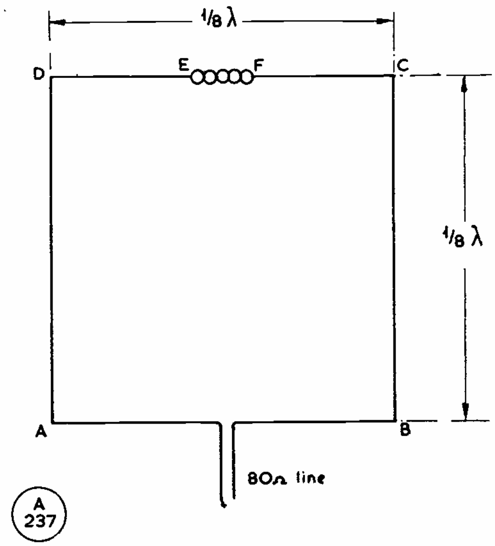
THIS aerial, although not a new idea—it was first devised by John Reinartz, W1QP, several years before the war—may be new to post-war amateurs. The writer recently found himself, because of building operations in the neighbourhood, restricted to a mere 33ft. dipole. Luckily, the house has a considerable roof-space, so it was decided to try indoor wires for 40-metre operation. The Reinartz half-wave loop has been easily the most successful. The drawing is self-explanatory — in effect a half-wave dipole, 67 feet long and fed by 80-ohm line, is bent into a square approximately 16ft. 9in. each side, with a gap of 8in. at the ends E and F, the loop being suspended horizontally by insulators at the corners, A, B, C and D. The aerial loads very satisfactorily by means of a swinging link into the PA tank coil.

With an 807 running at 65 watts input excellent results have been obtained with Europe, and in two months' operation on 7 mc a good number of early-morning contacts have been made with U.S.A.

Should space not be available for a perfect square the aerial still gives excellent results if arranged as a rectangle up to 20 feet on the long sides AB, CD with consequent reduction of the width required at BC and AD.

An interesting variation has been found with the 67ft. loop on the 14 mc band—if the gap at E-F is closed, the aerial becomes a complete loop and will take power on the higher frequency band; in fact, some good DX has been worked on 14 mc with this arrangement.

Although not attempted at G8UA, the Reinartz loop would appear to be an interesting arrangement for Top Band use—if space is available outdoors for a square of approximately 63 feet per side it might be worth a trial especially in cases where the location is inconvenient for the run of a full half-wave dipole.



Reinartz is an honoured name in radio, for he was one of the very early experimenters with RF circuits. It is not so well known that he also produced various aerial designs of which this, discussed by G8UA in the article, is one.

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allocation merely says "FAA-FZZ, France and Colonies," which doesn't tell one that FLZ is Saigon.

Finally, **P.** A. Conway says he will answer any queries received concerning Fixed or Coastal Station call-signs, as his 1300-page alphabetical call-sign list just about covers the lot!

The addresses of the two listeners whose specialised activities are detailed here are as follows:

J. Edwards, Flat A, 241 Hyde Park Road, Leeds 6;
P. A. Conway, 5, Fentham Road, Birchfields, Birmingham 6.

PHYSICAL SOCIETY'S EXHIBITION

We are asked to announce that the annual exhibition of the Physical Society will be held during January 19 to 22, in the Horticultural Halls, Vincent Square, Westminster, London, S.W.1.

". . . . Got rid of the bugs in my VFO . . . ."

DX COMMENTARY

JT1YL

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

FIRST, we must thank all the correspondents who passed on Christmas Greetings and general messages of goodwill, which were very much appreciated. It was a special pleasure to receive so many of them over the air as well as through the post, and we confess to a real thrill when working a station as remote as VR2DG (to take one example) and to hear "Thanks for the Commentary every month" as well as his Christmas wishes.

In return, your Commentator would like to wish *you* all the very best of everything (including DX) in 1959. It is undoubtedly going to be a very good year, DX-wise, if you'll pardon the expression; the Spring should be as good as any period we have yet been through, and after the usual falling-off in the Summer we ought to have another excellent patch. What happens after that is problematical, but it is most unlikely that conditions will fall off rapidly. We have hopes that gradually deteriorating conditions will also show a great reduction in the short-skip nuisance.

Meanwhile we have another very interesting period to report on, with the bands by no means as lively as they were a few weeks back, but still bursting at the seams with all kinds of good things. The happy man who can work efficiently on six bands, these days, has no fear of a dull moment, any time in the twenty-four hours.

CALLS HEARD, WORKED and QSL'd

DX Gossip

There were two surprise-packets last month, too late to catch this column. Contrary to everything that was being said at the time, FK8AS *did* get to the Wallis Islands, and signed FW8AS for a while, around November 13. And then the Juan Fernandez ("Robinson Crusoe Island") expedition materialised, with CEØZB and CEØZG handing out brand-new ones on CW and phone. We missed them both! (QSL's should be sent to R.C.C.H., Box 761, Santiago de Chile, enclosing a large s.a.e.).

Another crop will have turned up by the time you read this—they are getting into the habit of fixing these affairs at very short notice!—as follows: VQ3ERR (VQ4ERR) on SSB; HI8SKE (W2SKE, also on SSB); 3A2IU (CN8IU); and possibly VQ1ERR (VQ4ERR on the move again).

For January we are promised some more from Juan Fernandez with CEØZA on CW (14030, 21030 and 28030 kc) and SSB (14310 and 21410 kc), also CEØZB on AM phone (14100, 21200 and 28200 kc). The OK7HZ/M Expedition was to have set out on January 1, but we now understand that OK1HZ has had to go into hospital and that the whole thing will be held up until March.

VS4BA is getting out from Kuching, Sarawak . . . XW8AL is off the air until the New Year . . . JT1AA finally closed down after the *CQ* DX Contest . . . ET2US hopes to return to ET3 during March . . . LA3VB/P (said to be Jan Mayen) can now be definitely written off—he's a pirate . . . VS9AS still hopes to get into Oman and do some DX'ing from there . . . OY7ML is now on SSB (14303 kc) . . . MP4TAC is an elusive one in Trucial Oman; MP4DAA counts as the same territory . . . F2CB/FC is very active and in much demand.

AC4AX is still on, 1300-1500 GMT every Sunday, 14 mc . . . VQ4ERR promises activity from VQ9-land, but not until next August . . . DL7AH/LUX was there during the Contest . . . VK9LE (Cocos) and VS9MA are both on SSB now . . . FU8AE works CW in the mornings, around 14340 kc . . . VP2LS is OK, though not in the *Call Book* (Box 171, St. Lucia) . . . SM5WN/LA/P was on from Svalbard during the Contest . . . FF8AC/GN has now left Guinea; there's no one else there.

CR8AC is active again, and a character signing CR8AW has also been heard on 14050 kc . . . ZD8JP will be leaving Ascension, or has already left . . . Trinidade Island (PYØ) also seems devoid of population just at present . . . FB8CD hopes to be operating again from Comoro (14300 kc) . . . VP5FP is on Grand Turk Is., and says he will be active in January . . . UM8DX is working phone from that rare spot . . .

Exotic!

How would you like to work HK4AW, PJ2AQ, VK5MS, VR1A, VE3VU and YV5FL in consecutive QSO's? Or, for another selection, VK9AD, FG7XE, VK1PM and HK4DP? All on 14 mc phone, by the way. The catch is that these are extracts from the log of VS2DQ (Langkawi Island), who is at present on leave in the U.K. His chief regret is that G stations seem to be absolute rarities in Malaya these days (we could only find three of them in seven pages of his log). Perhaps he will have better luck when he returns, in the Spring — signing 9M2DQ!

QRP Records?

We recently worked W7FB on 21 mc, and his kilowatt-plus-beam outfit was producing the usual S9 signal. He asked us to QRX, and came up with 96 mW to a transistor, on which he was RST-329 and at least 60 per cent. readable. Apparently, Lloyd has tried this on quite a few DX stations and has worked Europe fairly frequently that way, but it is his best DX as yet. Nice going, too.

Top People

The current DXCC List (December *QST)* shows the top bracket shared by W1FH, W6AM and ZL2GX, all with 286 confirmed. Lots of credit to ZL2GX for getting himself into such an exclusive spot.

The top-ranking G stations are now G3AAM (280), G2PL (278), G4CP (274), G6ZO (263), G6RH (251) and G3HLS (250). Among other non-W stations with very high scores are KV4AA (284), PY2CK (282), ZL1HY (274) and LU6DJX and ZS6BW (270).

The "CQ" Contest (CW)

Both conditions and activity were *fantastic,* and scores of over one million are rumoured! Eighty and Forty were both better than in previous years, but one couldn't work them without losing literally thousands of points that might have come quicker on the other bands. Those who didn't enter for this Contest were the happiest of all—they could switch the receiver over five bands and hear choice DX coming in on all of them. In due course, our Five-Band Table will doubtless reflect this kind of activity.

Sad but Futile

The sad story, in brief, of ZL1ABZ (Kermadecs). He came on, originally, on 3·5 mc only, and on that band worked plenty of VK's and ZL's. Then sundry W's started cross-band skeds and most of them made good contacts. However, it transpired that quite a few of them were something short of an honest QSO, and things in some quarters were so tricky that ARRL decided that ZL1ABZ cards would not be accepted for DXCC purposes, and all claims were deleted (including, it seems, those VK's and ZL's who originally worked him solidly on Eighty). Now, as a result, ZL1ABZ announces that he will in no circumstances QSL *any* W or VE stations! (Even Amateur Radio gets quite like a Peace Conference at times!)

Magic Moments

Have you ever heard a station heterodyning its own signals—radiating pure CW but producing an audio beat? How's it done? We haven't the heart to hold up the answer until next month, so here it is, in brief. A certain European with a colossal slow chirp (a kind of "droop") was heard early one morning with a very strong round-the-world echo. Not the short/long path business, but a real second signal, such as

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	905	113	171	245	199	177	260	G3IGW	360	44	69	103	66	78	135
G3FXB	766	73	131	215	197	150	245	G3FPK	350	36	75	118	74	47	144
G5BZ	754	64	118	258	190	124	266	G3INR	336	46	60	131	62	37	141
G2DC	742	80	109	221	183	149	252	G3JZK	336	17	56	77	117	69	161
G3DO	666	24	47	241	179	175	268	G3LET	311	14	54	153	68	22	164
GW3AHN	629	16	55	194	224	140	250	G8DI	278	26	57	75	68	52	118
G3WL	545	41	92	176	129	107	206	MP4BBW (Phone)	276	1	5	88	117	65	141
G3ABG	545	48	86	174	121	116	203	G2BLA	272	32	50	66	69	55	110
G3BHW	530	15	32	181	173	129	225	G3HQX	266	15	37	78	68	68	121
W6AM	518	30	58	288	86	57	288	G3DNR	253	10	21	87	65	70	117
G2YS	508	71	90	164	111	72	180	G2DHV	233	21	27	126	44	15	136
GM2DBX (Phone)	427	34	31	160	102	100	176	G3JVU	215	26	38	79	34	38	95
G6VC	409	34	53	151	102	69	175	G3KXT	157	8	6	41	13	89	115
W6AM (Phone)	369	13	32	264	39	21	264	W3HQO	153	3	6	35	82	27	94
G3JLB	367	43	50	95	89	90	163	G3DNF	130	6	30	41	35	18	60
G3HZL	365	34	69	113	85	64	137	G3IDG	117	11	15	29	27	35	51

(Failure to report for three months entails removal from this Table. New claims can be made at any time)

G3KPM, Holloway, London, was licensed in October 1955, after a long apprenticeship as an SWL — always the best way of breaking into Amateur Radio. Except for the Eddystone 750 receiver, the station is entirely home-built; the transmitter is in six pull-out racks in an aluminium cabinet, and total screening is achieved. The PA is an 813 running the full 150w. on the 10-80 metre bands, with a separate self-contained 10w. transmitter for Top Band. Modulation on the 813 PA is by a pair of G.E.C. KT88's in Class-AB2, and for 160 metres an 807 is used. Auxiliary equipment includes a TVI indicator, aerial filter unit, absorption wavemeter and grid dip oscillator and, in the interests of safety, an overload relay to cut power to the whole outfit. The QSL policy is 100% on all first-contacts. G3KPM also works mobile on 160, 80 and 40m.

one often hears on 28 mc. His droop was so noticeable, and his second signal so strong, that it was actually beating with his direct signal—the echo was mostly on a different frequency from the original signal, and there you are! With the BFO off, he sounded more like Chinese bagpipes than any single transmission we have ever heard.

Sad, Sad Story

ZS2AT (East London) asks us to congratulate GW3AHN on his phone WAZ, and also to spare some pity for a poor orphan! He was held up on Phone WAZ for years by Zone 17; finally he did work one, and impressed on the operator concerned, in his finest command of all languages, the necessity for a QSL for his phone certificate (after first having worked said station on CW). Seven months later the QSL arrived, and (you're right) it gave the CW report only. So now it's started all over again (send subscriptions to G6QB!)

RTTY

Every so often we receive several yards of "Copy-off-the-Floor" from VE7KX, who is desperately keen to get RTTY stations going in DX locations, starting off with the U.K. if possible. DX-wise, this mode is in its early days, but KR6AK maintains regular RTTY skeds with W6CG and WØBP (he even sent the latter a "Get-Well" card when BP's transmitter blew up and he missed the sked!). VQ4EZ is a potential enthusiast, having formerly been at the Creed factory in England.

Meanwhile, fifty surplus machines have been made available to Southern California amateurs at 85 dollars each, and another 150 are promised by January 1. No such offers are likely over here, but we do gather that one or two very second-hand teletype machines *are* available if one knows the ropes. The price of receiving and transmitting machines, not necessarily in working order, is about £25 each. Who knows — we might have to run an RTTY section yet . . .

And now for this month's activity reports, band by band.

Ten Metres

Still very sparsely populated by the real DX, especially in the mornings when it is open for interesting places. So says G2DC (Ringwood), whose best for the month were VP4LA and FB8CJ, others being VK, ZL, ZD6RM, ZS3D, VS6BJ, 9G1AA, OX3KW, VP6, 7, 8 and 9. CR5AR was a gotaway. During a recent 21/28 mc phone contest he found the hordes of W's overshadowed most of the other DX; in fact, G2DC worked over 400 of them and not one was called initially by him!

G3FPK (London, E.10) joins with G2DC in lamenting the lack of CW — his only new one was UA9CM. G2YS (Filey) put his score up well during the *CQ* Contest, and worked FB8CJ, VP7BT, UI8, UN1, UQ2, KP4, KZ5LC, TF3AB, VQ5EK, VK9XK, F3QV/FC and a few more.

G2BLA (Welwyn), with a temporary 122-ft. aerial at his new QTH, raised VQ4RF, 9G1AA, ZC4PN and 4AM, TI2OE and VE5 on phone; OQ5IG, CX2CO, SVØWP, ZE1JN and the like on CW. Contacts with VQ4 and ZC4 completed his WAC and WBE Phone, at last.

G3GQK (London, S.E.23) stuck to Ten only, using 35 watts to a Minibeam, and worked VP8DS, TG9AD, MP4BCI, KR6JF, 9G1AA, ZK2AB (0910), JA, ZL, VE7 and 8, CEØZG and masses of W's—all phone. Others heard were TI2PR, KZ5, OA4IGY and XE2DO. SJ3AG, operated by a YL or XYL, was working from some unidentified island at 1500 on December 10.

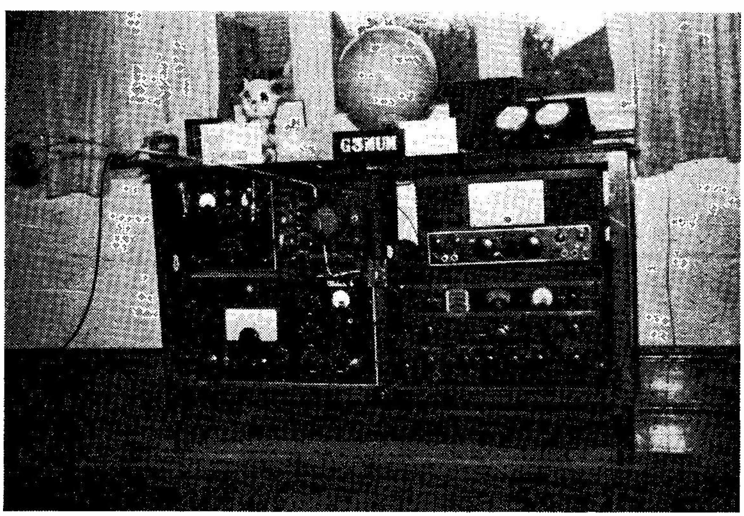
New for G3HZL (Isleworth) were VE3EGD/SU, KP4, VP3, VP6, ZL. and many Europeans. Others worked included UAØ, VQ3, VK6 and CR6—all CW. G3DNR (Broadstairs) raised TI, VK, VS6, VS9, VQ2, VQ4, 9G1, ZD6, ZE, ZL and ZS. GM2DBX (Methilhill) collected UQ2AN and 9G1AA for his century on Ten phone.

Concentration on the band brought in 17 new ones for G3IGW (Halifax), including KR6RA, VP3HAG, VS9AO, KZ5, YV and 9K2 on phone, with VK9XK, VP7BT, CE, UP2 and VS6 on CW. G3JVU (Gravesend) added VP5FR, ZD6RM, EA8BF, CX2BT, VQ4 and LU. G3DO (Sutton Coldfield) bagged CEØZG and VP2LS for all-time new ones, and also raised FS7RT and UAØLA—all phone.

GW3AHN (Cardiff) was busy during the 21/28 mc contest, and raised HP3RL, PYØNA, UA9's, VP3HAG, VP9EH, VS9AO, YS1M and YS1O, 9G1AA and 1BA, and 9K2AP. G5BZ (Croydon) sends a long list, among which are JA's, UI8AG, VS6BJ, VK9XK, CX2BT, VP4AA, VP7, OQ and OY.

World-wide coverage achieved by GW3AHN, Cardiff, who has made a WAZ ("Worked All Zones") on phone, using only 25 watts PA input. Here are the cards to prove it, an achievement which puts GW3AHN among the world's leading DX operators. There are 40 Zones in all, some very difficult indeed to work, and to make WAZ at all, whether on CW or phone and irrespective of power, is recognised as an outstanding DX distinction.

G3ABG (Cannock) worked CW with VE8, VK9XK, KP4. SVØWP, VP4LA, VP7BT and KZ5LC; phone connected with VE8, CN2AY, 9G1AA and 1BA, VS9AO, ZD6RM, 9K2AP, VP9EH and FS7RT. G3MJL (London, W.7) found things excellent and worked VK6CL (his first VK), 9G1's, VS9's, VE3EGD/SU, YS1O, ZD6RM, CX's, VP5BL and 8CV, VE7ZM and many lesser lights. G3LTH (near Exeter) also shows a good bag of DX phone on Ten CW, including ZD1, ZD2, ZD6, ZD7, TI and FB8.



On p.237 of our issue for July last, we mentioned G3MUM, Redcar, Yorks., who is wholly disabled except for some movement in his right foot. Here is his station, from which in his first six months on the air — G3MUM was licensed in May 1958 — he has had nearly 3,500 contacts. The transmitter is a 25w. Panda Cub and the main receiver is an AR88, with an S.640 and an R.1155 also available. The aerial is a 132 ft. end-on, coupled through a tuning unit. G3MUM, who operates his station with the toes of his right foot alone, acknowledges the help he gets not only from his locals, but also from his mother — the G.P.O. issued the call as his own tribute to her.

Fifteen Metres

This one is still G2DC's favourite CW band (and that goes for many more, including your commentator!) But, as he says, it's hard to believe that all the odd noises which we must assume to be commercial communication can mean anything to anyone, and the DX really has to be dug out on occasions. Two all-time new ones came along — I5CC and VP3HAG, plus VP4LA, who was new on the band. Others were W, VE (all districts), JA's, VP5, 6, 7 and 9, CO, CR6, CT2, CT3, CX and VS1, 6 and 9.

G2YS added KA2FF, CX2CO and UJ8AG; G2BLA worked SVØWP for a new one on CW, plus lots of Europeans on phone and CW; G3DNR collected ET2HM, JA, PY, SVØ and JA's.

New for G3HZL were EA9, OX,

FC, ET2, HE, CE, FB8ZZ, VK9, VP8, LA2JE/P and ZD7SA; also worked, JT1AA and OHØ. Among the gotaways were ZD1GM, FG, OR4VN, FB8XX and VQ5. G3JVU winkled out VQ5EK, KL7PI, F9QV/FC, SVØWAE (Rhodes) and VQ4FK. G6VC (Northfleet) worked 9K2AN, VS9AS, ET2HM and SVØWY.

G3DO has a nice list, including VP2AB, XZ2SY, UD6, UF6, HL9KT, UB5 and UC2. G5BZ emerged with VR2DG, UAØGF, JA's, SVØWY, JT1AA, OHØNC, KG1CK, KH6, KL7 and VK.

GW3AHN, the specialist and top scorer for this band, raised CO2US, JA, JT1AA, KG1CK, VP2AB, VP3, 4 and 5, YN1JR, YS1O and two 9G's—all phone. On CW he caught up with ET2HM, JT1AA, KH6's and SM5WN/LA/P.

G3ABG's log includes KL7PIV, F9QV/FC and UO5AA (CW); also PYØNA, VS9AQ, 9G1CH, CN2AY and VQ3DQ on phone. Among the best for G3LTH were PYØNA, HC1AG and HP1SB.

This cheerful chap is VS9O, located 400 miles into the desert in the Sultanate of Oman. He worked phone on Twenty, and was much sought after under the VS9 call.

Twenty Metres

G3FPK says the Far Eastern DX has been lacking in the early evenings. On many occasions all signals have been "watery." Worked were UAØKQB, UN1AH and ZD1GM; heard, UA1KAE/6 (1800), VP9EN, VP8BK and VU2BL.

G2YS worked OD5LX, OA4GT and OX3RH during the *CQ* Contest, and heard a type signing EAAD95, calling himself "Une station military de Spain"! G3LNR (Nottingham) heard ZD7SE (2125), also W2FQC/M, on SSB, parking his car in the garage, and as strong as other W's with a beam and a kilowatt.

G2DC found some early-morning DX at the beginning of the period, but conditions have definitely fallen off. Despite this, he snagged five all-time new ones —FO8AC, FB8ZZ, KC4USK, VK3ARX/LH and YA1AA. Others raised were FK8AS, KV4AA, KH6RR and 6COV, and ZD2DCP.

New for G3HZL were OHØ, JT1AA, LU (South Orkneys), LA4PF/P (Hope Island), CR7 and VR2. Nice ones that got away were ZK1AK, FK8AS, FB8XX, FS7RT (0200), KW6, XZ2TH and PK4LB. GM2DBX was thrilled to get his card from FU8AD (Twenty phone). G3JVU collected HP1BR, OX3RH, OQ5IG, KL7WAF, LX1RA, CX5CO and a ZS.

ET2PA was a new one for G6VC. GW3AHN worked KL7's, DL7AH/LX, OX3UD, UPOL6, and VP8BK. G3DO, though mostly on the other bands, worked FO8AB on phone.

G5BZ's list includes VE8's, KH6's (lots of them), UM8DX, LA4PF/P, two JA/MM's, KL7's, FO8AW, DL7AX/LX, VQ3MK and XW8AH. G3ABG worked CW with KL7, KP4, CX1BZ, OX3RH, UA9, UF6, UH8 and UP2.

Forty Metres

Nice things can happen on Forty nowadays—if you can stand the racket; those with selective ear-drums do best at it! G5BZ, for instance, worked W6KG, W6VSS/6, W6WWD and W7JLU, all during the "CQ" contest at 1500 GMT. G2DC has had skeds with VQ6AB, but not a whisper has come through; however, he did work EA9AP, UP2AT, UA9SA, CX, LU, PY and all W districts.

Two new ones for G3FPK were DL7AH/LX and PX3AC (the latter *rather* doubtful, we should say!). VP4RL was heard at midnight, being worked by W's. G2YS collected TI2PZ, VP7BT and YV5DE in the Contest. G2BLA raised PI1NTB (useful for WPX!), W, and Europeans.

G3HZL confesses that Forty is his favourite band, though the aerial isn't too good. But it brought in DL7AH/LX, VP7BT, UO6, UP2, UC2, VK and OY (all new), as well as UF6, UA9 and loads of W's, including 6's. G3JVU worked OHØNC, and G6VC added VP7BT to his score.

G3ABG collected DL7AH/LX, EA9AP, ZC4BN, W's, and UB5, UP2, UQ2 and UL7FA. G3MJL added LZ1AM on CW and worked plenty of Europeans on both CW and phone. In G3LTH's list, interesting ones were UL7HB and UN1AE.

Eighty Metres

Very few DX'ers have anything to do with Eighty these days, although we understand that certain other types of activity do go on up there! G2DC says, " Nothing of interest except the usual W and VE," and thinks we shall have to wait for a fall-off in sunspot activity before much happens.

G3FPK worked lots of DL's for the DLD-100 sheepskin, but others raised were DL7AH/LX, GD4VH, UR2KAE and an SM. G2YS managed UA2KAW and some W's. G2BLA was very pleased to get W1WLZ, also UA1KAG and many Europeans.

UA9GD and 9GI were new for G3HZL, who also worked W and VE. He only needs Africa for WAC on the band (we worked FA8BG at 1800 GMT not long ago). G3ABG scoured this band to some effect and raised UA3's, UB5WF, UC2KAB, EA1CP, SVØWP and DL7AH/LX.

Top Band Topics

First, the following notes from W1BB's bulletin. ZS2GE/2KZ, an OM/XYL team, are interested in the band, and are thinking in terms of an *aeroplane-towed* aerial 2000 feet long . . . W6KIP and ZL3RB maintain an unbroken sked, with W6KIP *always* getting through to New Zealand and ZL3RB *never* getting back! So they work cross-band, 1.8/14 mc, with W6KIP on 1998 kc . . . DL1FF and the other DL's will be on the band again until March 15 . . . HC4IM will be active with a long-wire three storeys high, on 1999 kc and also in the 1830-1835 kc area.

W1BB and others have noted that DX heard on the band around 0500 GMT is frequently missing when conditions have seemed good the previous evening. The W1's have been getting very good coastal station R/T signals from Tangier, Azores and Lisbon on 2182 kc as early as 2200 GMT (1700 their time), but it doesn't tie up with the conditions following, during the dark period.

G5MP (Hythe) recently worked ZB1AQ, who was peaking 579 and gave him 559. Earlier on (in August) G5MP operated on the band from Monaco with his own call, 3A2BM.

G3APA (Coventry), who has just claimed his WABC, worked DL1FF and DL1YA, who are restricted to 1825 - 1835 kc. G3LVW (Leeds) has received his card from UB5FJ, worked earlier in the year. We can add that UB5FJ is active again and very anxious to make Top-Band QSO's around 2300. A recent sked with him was unsuccessful, but perhaps a little too early in the year.

G3DVY (Hexham) has just claimed WABC and says he made no effort to achieve it, just taking the QSO's as they came. GW8PG (Denbigh) collects his second WABC, having qualified as G8PG some time ago. He is now a " full-time GW " and says he is active most week-ends from Cefn-Y-Bedd, Denbighshire, on CW; he QSL's all who ask for a card for WABC.

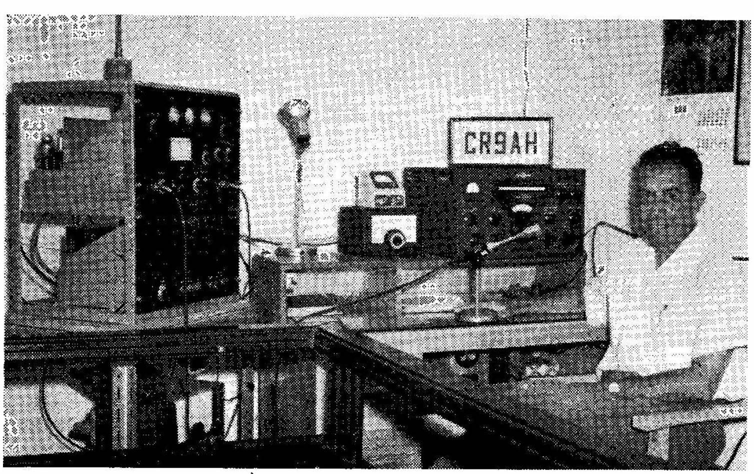
Late Flashes: G3CNM heard UA9CM and ZC4IP, both 339 on the LF edge; the UA9 was worked by OK1WR and heard well by DL1YA . . . G3CNM is working in the Trans-Atlantics with a ground-plane supported by a balloon . . . GI3HJA has just got going in Co. Tyrone; another one there is GI3NFM, to be on shortly.

G3ESY is starting up again to give county-chasers a chance to get Hereford. G3LNR heard PA1BRD, giving QTH as The Hague, working a G3.

Miscellany

W2CTN now handles QSL's for VK2AYY/2AIR/2FR (all Lord Howe), VR2DA and 2DK, FK8AT, JZØHA, CR9AH, XZ2TH, KW6CU, OX3RH, VK9BW and 9G1BQ . . . HV1CN's QSL's are delayed; apparently W1TYQ, who did most of the operating from there, isn't allowed to use cards printed in the USA—the QSL's must be approved by the Director of Radio in HV! The Vatican City authorities are very particular about these things.

G5MD forwards a letter from W7BAJ with the following odd pieces of news: The reason why Utah is still a rare State is that most of the operators there are the younger generation, who prefer phone to CW; having once sniffed the QRM in the DX segment of 14 mc, they decide DX is not worth while . . . Even the beginner must have " a kilowatt and a beam " to compete with the California boys. Utah, Wyoming and Nevada are all very thinly populated, and outside the cities (Salt Lake City, Cheyenne and Reno) it is quite difficult to get hold of good equipment. In Salt Lake City, W7BAJ says there are plenty of mobiles running around on 28 and 52 mc, but he practically has the 14 mc band to himself. In order to work DX, though, he had to invest in a Collins 75-A4,



CR9AH, Macao, China, is on SSB with a pair of 6146's in Class-AB1 as a linear PA. His receiver is a Collins 75A-4.

costing the equivalent of about £270.

G2FXQ (Woking) wonders whether it would be feasible to devise a DX contest in which DX stood for " distance " once more, instead of mere scarcity of population. He suggests that such an event could be arranged for U.K. amateurs only, results being based on the Great Circle Map divided into concentric circles. Then one point would be awarded for each contact with the central area, working up to a maximum of ten or twelve. (ZL's would be in pretty fierce demand!) G3FXQ asks whether readers would be interested in such a venture, so we have published his suggestion and echo his query—would they? If so, will they please write in and say so.

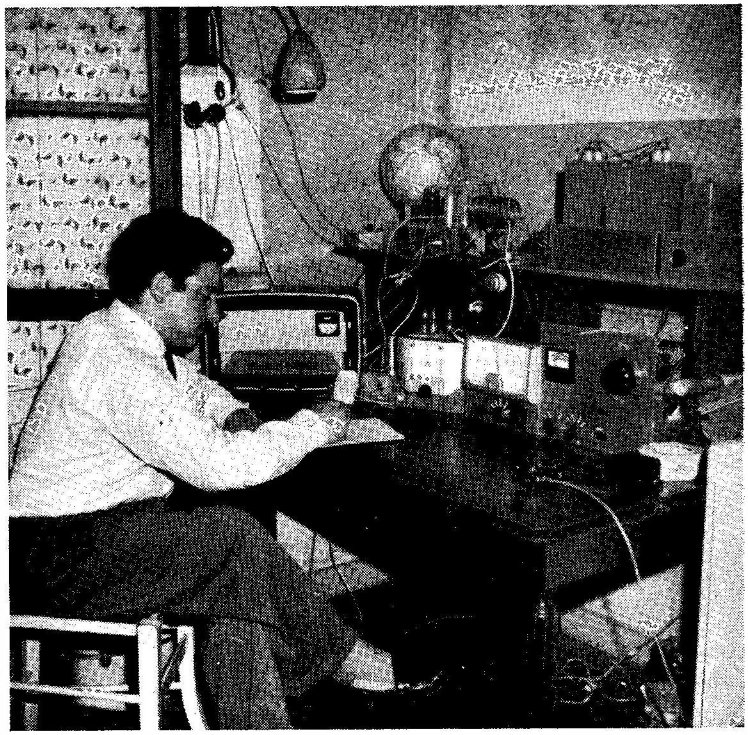
G3EFB (Boscombe) worked a queer one signing " EET2EY," 21 mc CW, and he vanished in the middle of giving his QTH, which started " Marq . . ." Can anyone elucidate?

ZS6AMH (Germiston) writes to say that ZD9AF is by no means phoney; the call was issued to Dave Watt, radio officer of the Met. station on Tristan da Cunha, and they keep a bi-weekly sked. ZS6AMH runs the QSL part of the deal, and encloses a card for our inspection. (One word of warning—although this ZD9AF is most definitely genuine, there may have been others that were not . . .)

A recent issue of the Hong Kong A.R.T.S. *News Letter* shows that there are some 35 licensed amateurs out there, of whom about seven are not active and another six are " queries." Most of the remainder are on both CW and AM; VS6BJ is also on SSB, and VS6CJ is on 50 mc.

ZB1NR (RAF Ta-Kali, Malta) reports that he will be sticking to 28, 21 and 14 mc, as he finds 7 and 3.5 mc almost impossible out there due to static and other noises.

G2DC says that Danny Weil had generator trouble while on Anguilla, and had to return to KV4AA; he should, according to present arrangements, have opened up on Dominica on December 17-18, staying for about two weeks, after which the plan is roughly two weeks each on St. Lucia, St. Vincent and Grenada. Sint Maarten and Guadeloupe are definitely " off," owing to licensing difficulties.



When G3AMM was on his way to Spain during the summer he met F2IG, Toulouse, who runs a Geloso VFO-PA 807 transmitter, with various aerials, the receiver being an amateur-band converter working into an ordinary BC set.

G3FPK tells us that KM6BL, " the best QSL'er from Midway," found that his costs were too high for an enlisted man's pay and is asking for SAE's from W's. The others he still QSL's by airmail, as yet. KM6BL would appreciate any skeds for times when he is likely to be workable here. QTH: L. F. McCollough, Detachment COMBARPAC, Navy 3080, FPO, San Francisco.

Seven Metres

Regarding recent reports of Russians being heard on the 7-metre band, G3MFH writes to say that this time last year he logged literally dozens of them working each other, both phone and CW, on 38-40 mc. The calls used were of the " VHF type "—RA1, RAØ, RB5 and so on. Stations called the Russian equivalent of " CQ VHF " and gave QTH's.

Things They Say

" Where are all these thousands of G's one sees in the latest *Call Books?* I hardly ever hear one " . . . (VQ3MK); " Various Contests are an enormous help in building up the Five-Band score " . . . (G2BLA); " VQ5EK says VQ5's will probably be QRT at the end of this month, as their licence fee is going to be £12! " . . . (G2YS); " I would love to see a worldwide 50-watt limit—rigidly enforced, of course " . . . (G2DC).

" Seem to have worked an incredible amount of DX during the month, and don't know whether you like me to record it all or just pick out the choice ones " . . . (G5BZ); " Why the heck don't some of you guys *listen* occasionally—then you wouldn't waste time calling me while I am transmitting " . . . (Very-annoyed rare DX station, who asks to remain anonymous).

Things They Mean

A few translations of popular sayings, just to remind you!

"Very best 73's to you . . . *73*; "RRR all OK solid FB" . . . *R*; "Ur ur sigs sigs RST 579 579 RST RST 579 579 579" . . . *RST 579*; "Break break break" . . . *Break*; "QRX ONE" . . . "*Have forgotten what I was going to say.*" Have you any more for the book? If so, please send them in next month.

WAE Contest

Don't forget the Fourth European (WAE) DX Contest, which will be in full swing at the week-end of publication. It starts at 2100 GMT on January 9, continuing until 2100 on January 11. Further particulars were published last month, but the rules are the same as ever: Five bands, Eighty to Ten, 2 points for contacts on Eighty, one on other bands. Six-figure code (RST and serial number, beginning at 001).

SWL Comment

Listeners' letters received just before writing this "Commentary" were too late to incorporate into the new section, "*SWL,*" the first offering of which appears on pp.578-580 in this issue. This section will always have to be compiled some few days in advance of the more topical Commentary, and we will give the deadlines well ahead. The next "*SWL*" will appear in our March issue, for which all correspondence from SWL's should be received by *January 31*.

Meanwhile, one or two interesting points from the SWL's this month. Peter Day (Sheffield) logged DL1FF, DL1YA and YU1FC on Top Band, and at the other end of the spectrum, on six metres, collected 104 different W and VE stations between November 12 and December 12! All W districts have been heard since October 19, including W7VRA in Arizona at S9. Peter Day's score on the 6-metre band is now six countries, six Zones and 22 States —with an RF26/Eddystone 358 and indoor dipole.

The latest—and choicest—piece of DX heard was KP4ACH, on December 13 at 1250 GMT. This six-metre work strikes us as a very fine achievement, and we only wonder why more SWL's don't get down there while the going is good. It won't last very long, and . . . who knows? . . . it might not happen again in a lifetime!

C. N. Rafarel (Birmingham) thinks Twenty has quite lost its reputation as a DX band, Fifteen and Ten being much more interesting at present. On fifteen he logged YJ1OM (New Hebrides), FS7RT, VK9AD and VR2BC; on Ten, CEØZG, UM8KAA, KW6CO, ZS7C and AP5HQ.

S. R. Smith (Crewe) reports hearing three Egyptians—SU1IM, 1KH and 1MS, all on Twenty CW; on Fifteen he mentions KG1CK, TG9HB, ZD1GM and ZD2GUP.

And that just about winds up this first Commentary of 1959. We only hope that the next eleven will be equally full of meat, and that our indefatigable 'chasers will lose none of their cunning.

Deadline for next issue is **first post on Friday, January 16.** Please make sure you don't miss the boat, and address everything to "DX Commentary," *Short Wave Magazine,* 55 Victoria Street, London, S.W.1. Until next month, Good Hunting, 73 and—BCNU.

THAT £400 RACAL RECEIVER

If your card went into the draw for the Racal receiver at the recent Amateur Radio Exhibition, you may be interested to know that it was won by an SWL, K. R. Rogers, of Hitchin, Herts., who is a C.I.D. man with the Hertfordshire Police. Total attendance at the 1958 Exhibition was just on 10,000, about 3,000 more than in 1957.

HANDBOOK FOR THE CR-100

We are informed that a comprehensive technical handbook on the CR-100 receiver is obtainable from the manufacturers at a cost of 25s. post free. Orders, with remittance, should be sent to: Publications Section, Central Division, Marconi's Wireless Telegraph Co., Ltd., Marconi House, Chelmsford, Essex.

RADIO TELESCOPE INSTALLATION AT R.R.E., MALVERN

It is reported that the Royal Research Establishment, Malvern is to have a dual-dish radio telescope, operating on the interferometer principle. The dishes will be 80 ft. in diameter, of spun aluminium, and the installation is being designed for very short wavelengths, down to 10 cm. or less, with special attention to the "hydrogen line" at 21 cm. This new equipment for the study of outer space is said to be the most versatile yet planned. They understand these problems at Malvern, for it was at the old T.R.E. (as it was known during the war) that the original radar research was done, much of it by Dr. Lovell (as he then was) who is now in charge at Jodrell Bank.

NEW G.E.C. VALVE TYPES

A large range of new G.E.C. valves, cathode ray tubes and semi-conductors will be on display at the 1959 Physical Society Exhibition.

Among the low-noise receiving valves on show A.2688 (CV 4081) is of special interest. It is the first miniature (B7G) low-noise triode to satisfy the Government CV-4000 specification for use in all high acceleration and shock conditions, and has a typical noise factor of 1.4 dB at 45 mc. E.2704 is a prototype E.H.T. rectifier using a ceramic-metal envelope and having similar electrical ratings to the A.2273 (CV2318).

In the microwave valve field a number of travelling wave tubes are on view. They include E.2807, a prototype power amplifier which has a power output of one watt and a gain of 20 dB at 2500-4100 mc. KLS2 is a new CW amplifier Klystron for communications transmitters. It has a centre frequency of 2650 mc, a tuning range of ± 60 mc, and power output of 1.5 kW.

A number of instrument and radar CRT's will also be displayed, along with gas switch tubes and corona stabilizers. LD517 is a new twin-beam high sensitivity tube with spiral post-deflection acceleration. It has a screen diameter of 5in. and deflection sensitivity of 10 V/cm.

Making Iron-Cored Chokes

PRACTICAL DESIGN DATA FOR THE CONSTRUCTOR

W. E. THOMPSON (G3MQT)

In this article, the design of iron-cored chokes—such as are used for audio and smoothing purposes—has been simplified to the extent that for a few basic sizes of core, constructional details can be worked out by charts and simple arithmetic to produce components to a given specification. Worked examples are shown, and the tolerances inherent in the simplification are quite acceptable in practice.—Editor.

BASICALLY, a smoothing choke consists of little more than a coil of wire with an iron core; a simple enough device, yet most of us buy them ready-made because it seems cheaper and easier than ploughing through the rather complicated-looking design procedure necessary to effect a bit of home brewing.

Strangely, few people seem to have investigated a possibility of simplifying design procedure to suit the needs of the average amateur, who looks for quick results giving a fair degree of accuracy. This article represents the writer's attempt to fill such a need. By concentrating on a few basic shapes for core laminations it has been found possible to produce charts and tables from which a range of chokes suitable for most requirements can be designed, covering a useful choice of inductance and current-carrying values.

Old mains transformers, or faulty speaker output transformers, provide a ready source of laminations for choke cores, and if they do not have a decent bobbin for the coil, it is an easy matter to fabricate one from sheet paxolin. In many instances, a choke can be made up for only the price of the wire, and shows some saving on the cost of purchasing a ready-made component. "Rolling one's own" is also something dear to the heart of all true amateurs, even if the finished article does not always look professionally made.

Some Basic Considerations

For the purpose of the design method described here, the waste-free shape of lamination is taken as the basic parameter, since it is in common use, particularly as it is well suited for choke cores. As most of us know, this shape of stamping derives its name from the method of production so that no material is wasted. The small sketch in Fig. 1 shows how two "E" and "I" laminations are obtained from a single piece of material. The sizes of the stampings are more or less standardized, and are known by the width of the centre limb of the "E". Thus, a 1 inch waste-free lamination has a centre limb 1 inch wide, and all other dimensions for the "E" and "I" are of necessity directly related to this basic dimension.

Table I gives the dimensions, signified in Fig. 1, for the six basic sizes considered in this article. The charts and tables which follow are related to these six sizes only, but laminations other than the waste-free type can be used if their dimensions are nearly the same. To use some shape which closely resembles the waste-free type would not affect a design to a large degree, since the charts are necessarily something of a compromise, and allow for some assumptions in basic parameters and calculations.

In preparing a design, the usual starting point is that a choke is required to have a certain value of inductance, in Henrys, when carrying a specified value of direct current, in milliamps. The problem is then to find what size of core to take, what gauge of wire to use for the coil, and how many turns to wind on it to meet the specification. Other factors which may need to be known are the DC resistance of the finished coil, the quantity of wire required for it, the voltage drop across it, and the width of the air-gap in the core. The tables and charts, and a few moves on a slide rule (or

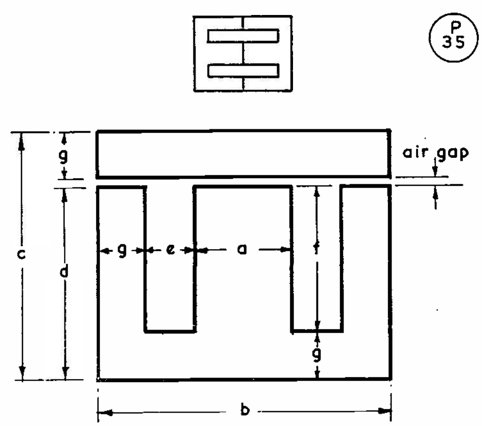
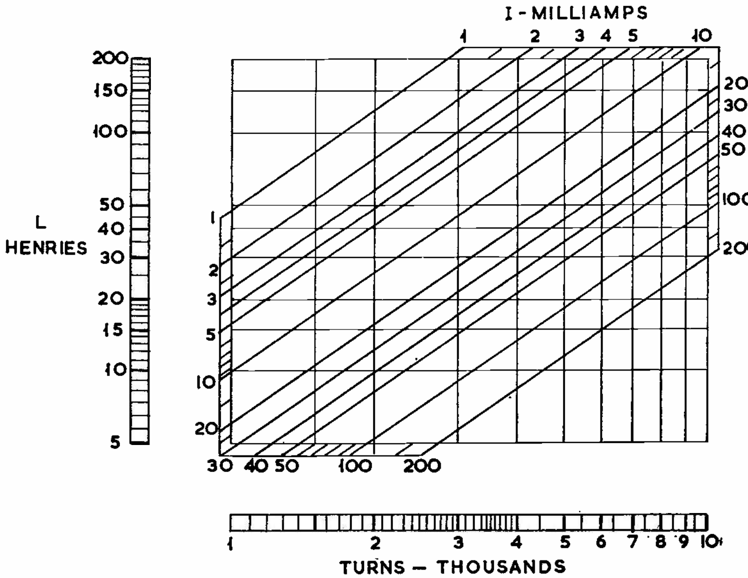


Fig. 1. What are known as "waste-free type" laminations, showing where the air-gap is left in the core. Dimensions 'a' to 'g' for the six sizes of stampings are given in Table I. The small sketch shows how two sets of laminations are obtained from one piece of material.



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I	TURNS		L
X 100	X 10	X 32	X 100
X 10	X 3·2	X 5·6	X 10
÷ 10	÷ 3·2	÷ 5·6	÷ 10
÷ 100	÷ 10	÷ 32	÷ 100

Chart 1. Determination of basic turns from known values of current and inductance. The turns-value has to be adjusted by the factor given by Chart 2. Examples of extending the ranges by means of the factors shown inset are discussed in the text.

some figuring on paper), will enable any or all of these factors to be found fairly quickly and easily. As will be shown later, the data can be used to reveal whether a particular design is possible, or to determine the optimum design that available material can produce.

For ease of reference in the charts and tables, the six basic sizes of laminations have been numbered A to F. In Table II the figures given refer to maximum winding space available on the bobbin, assuming that this is made of paxolin 1/16 inch thick. The dimensions e' and f' refer to maximum winding height and layer length respectively, while dimension A_w is the maximum winding area in the bobbin produced by e' and f'. Three dimensions for t are given, for three commonly-used stack heights. In each case the smallest figure for t is for cores with a square-section centre limb. The largest figure is for a stack twice as thick as the centre limb width, while the third figure is for a stack $1\frac{1}{2}$ times centre limb width. The three figures in each case for length of mean turn L_{mt} are for the three stack heights indicated; for other stacks the mean turn length needs to be calculated separately in accordance with the formula given in the footnote to the Table.

Using the Charts

Chart 1 relates inductance and direct current values with a parameter for basic turns. The inset on this chart gives factors which can be applied to extend the ranges of the chart when necessary.

From Chart 2 a correction factor is obtained, using known data for thickness of core (stack height, t) and shape of lamination (curves *A* to *F*). This factor is then applied to the basic turns value previously found in Chart 1, and so determines the actual number of turns required on the coil. Care should be used when reading the "divide" factors, since these increase from right to left, whereas the "multiply" factors increase conventionally from left to right.

Chart 3 enables the size of air-gap required in the core to be found. The dimension given by this chart is the actual width of the gap, as indicated in Fig. 1. When this chart was being compiled it was found that the six curves for the stampings *A* to *F* were so close to each other that little would be lost by showing only two. Therefore, only curves *A* and *F* are on the chart, referring to the largest and smallest stamping sizes. For most practical purposes, readings can be taken mid-way between the limits of these curves without serious error arising.

In order to set up the air-gap it is necessary that the core should be made up with all the "E's" together on one side of the coil, and all the "I's" together on the other side. Gaps of 2 mils. (0·002 inches) can be ignored, and the stack of stampings merely butted closely together. Wider gaps are best set by means of slips of insulating material to separate the butting faces of the "E" and "I" stacks.

Winding of coils should not present much difficulty, although winding by hand requires patience! If a fair tension is maintained on the wire it is easier to close-wind the wire in layers, but with very fine wires it is almost impossible to layer-wind. Random winding can be adopted in these cases, but care should be taken to keep the layering as even as possible. A turn or two of thin paper, such as from a cigarette packet, inserted at intervals will help to keep layering even, and will assist in holding up turns at the ends of layers.

Finished windings can be improved in appearance by wrapping a couple of turns of Empire cloth (varnish impregnated material) over the coil. This also serves to protect the top layer from accidental damage, and tends to retard the ingress of moisture.

A few examples in the use of the charts and tables follow, to demonstrate some of the ways they can be employed in varying circumstances.

Example 1. A 15 Hy. choke is required which can carry 50 mA DC. A 1 in. stack of 1 in. waste-free stampings is available. Prepare a full design.

Chart 1 shows that for 15 H and 50 mA the basic turns are 3000. Table I shows that a 1 in. waste-free stamping is size C; using curve C on Chart 2, it is found that a 1 in. stack produces a turns correction factor of × 1·2. The actual turns are therefore 3000 × 1·2 = 3600.

For 3600 turns and 50 mA the ampere-turns value is $\frac{3600 \times 50}{1000} = 180$. For this value, and core C stacked 1 in., Chart 3 shows that an air-gap of about 4 mils is required.

From Table II it is seen that a 1 in. stack of Core C has a maximum winding area A_w

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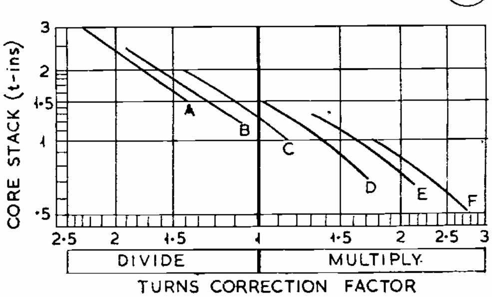


Chart 2. A correcting factor determined by the size of the core is given by this Chart. The factor is applied to the value for basic turns obtained from Chart 1. Curves A-to-F refer to the six sizes of laminations discussed in the text.

TABLE I

Stamping size	*a* in.	*b* in.	*c* in.	*d* in.	*e* in.	*f* in.	*g* in.
A	1.5	4.5	3.75	3.0	0.75	2.25	0.75
B	1.25	3.75	3.125	2.5	0.625	1.875	0.625
C	1.0	3.0	2.5	2.0	0.5	1.5	0.5
D	0.75	2.25	1.875	1.5	0.375	1.125	0.375
E	0.625	1.875	1.5625	1.25	0.3125	0.9375	0.3125
F	0.5	1.5	1.25	1.0	0.25	0.75	0.25

of 0·57 sq. in., and that the mean turn L_{mt} will be 5·8 in. long. Since 3600 turns are to be wound in an area of 0·57 sq. in., the largest size of wire will be one that winds $\frac{3600}{0{\cdot}57} = 6320$ turns per sq. in. By taking the square root, this figure is converted to turns per in. In this case, $\sqrt{6320}$ is nearly 80, and the wire table shows that 34g. DSC winds 81 turns per in. This wire can carry up to 134 mA, so is well able to handle the 50 mA for this design.

The total length of wire, from the mean turn L_{mt}, is $\frac{3600 \times 5{\cdot}8}{36} = 580$ yds. Using the values given in the wire table for yards per pound and ohms per yard the weight of wire is now calculated to about half a pound, and the resistance to 210 ohms. At 50 mA the voltage drop will therefore be 10·5 volts.

Example 2. A small supply of $\frac{5}{8}$ in. waste-free stampings is on hand, sufficient to make a stack of $\frac{7}{8}$ in. thick. Can these be used to make a choke of 5 Hy. to carry 85 mA?

Chart 1 shows that basic turns are 1750. From Chart 2, curve E, the turns are to be multiplied by 1·7, so actual turns are roughly 3000. Assuming that this is a possible design, Chart 3 gives the air-gap as 6 to 7 mils.

For this core, Table II shows a maximum winding area A_w of 0·18 sq. in., and the mean turn L_{mt} as 4·2 in. The wire size works out to 37g. enamelled as a maximum, which, it will be seen, has a current-carrying rating of only 72 mA. This design is therefore not a good one to proceed with, for not only would the inductance not be realized, but the coil would be likely to run too warm due to excess current.

Example 3. Using the core available in Example 2, what is the highest inductance that could be expected at 85 mA through the coil? Determine also the air-gap, DC resistance of coil, weight of wire, and voltage drop.

In this case a different procedure has to be adopted to find the inductance. From the wire table, 36g. will carry the required current, and for enamelled covering this size winds 110 turns per in. Turns per sq. in. are therefore $110^2 = 12{,}100$. The winding area being 0·18 sq. in., the maximum turns we can get on the coil will be $12{,}100 \times 0{\cdot}18 = 2180$. The turns correction is 1·7, so basic turns are $\dfrac{2180}{1{\cdot}7} = 1280$.

As this value cannot be related to the current curve for 85 mA on Chart 1, the correction factors in the inset must be applied. This shows that multiplying turns by 5·6 will give an inductance value which is multiplied by 10. To obtain the true inductance, this figure must clearly be divided by 10. In this case, multiplying the turns by 5·6 gives $1280 \times 5{\cdot}6 = 7170$ basic turns, and for 85 mA this gives an inductance value of 34 Hy. The true inductance is therefore one-tenth of this, namely, 3·4 Hy.

The mean turn is 4·2 in., so the length of wire will be $\dfrac{2180 \times 4{\cdot}2}{36} = 255$ yds. The weight of wire is thus about $2\frac{1}{2}$ ozs. and the resistance 135 ohms. Voltage drop will be 11·5 volts. Chart 3 gives an air-gap width of about 4 mils.

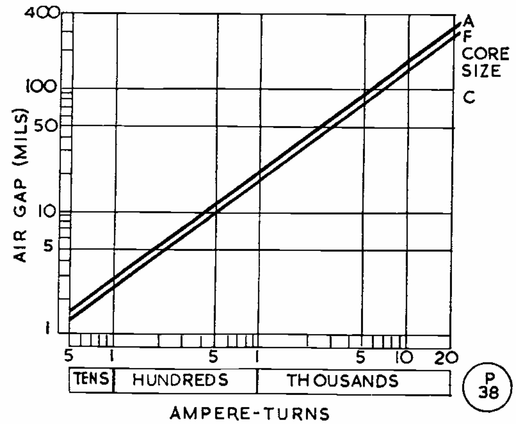


Chart 3, for determining the air-gap in the core. The value given by this Chart, in mills, or thousandths of an inch, is set in the core as shown at Fig. 1.

TABLE II

Stamping size	a in.	t in.	e' in.	$\pi e'$ in.	f' in.	A_w sq. in.	L_{mt} in.
A	1.5	1.5 2.25 3.0	0.67	2.1	2.12	1.42	8.6 10.1 11.6
B	1.25	1.25 1.875 2.5	0.54	1.69	1.75	0.94	7.2 8.4 9.7
C	1.0	1.0 1.5 2.0	0.42	1.32	1.37	0.57	5.8 6.8 7.8
D	0.75	0.75 1.125 1.5	0.29	0.91	1.0	0.29	4.4 5.2 5.9
E	0.625	0.625 0.875 1.25	0.23	0.72	0.81	0.18	3.7 4.2 5.0
F	0.5	0.5 0.75 1.0	0.17	0.53	0.62	0.1	3.0 3.5 4 0

Mean turn $L_{mt} = 2(a + t) + 8k + \pi e'$
where k = thickness of bobbin material (ins.)

Dimensions e' f' and A_w allow for thickness of bobbin material reducing available winding space in window of core.

Example 4. Two cores are available, one size B with enough stampings to stack to 2·1 in., the other being size A with a square centre limb. It is desired to make a 20 Hy. choke having a DC resistance as low as can be obtained, to carry 110 mA. Which of the two cores would produce the better design?

For the size B core, Chart 1 gives basic turns as 5500, and Chart 2 gives a correction factor of $\div$ 1·65, so the actual turns are 3330. Ampere-turns are 366, so air-gap is 9 mils, from Chart 3. In Table II, A_w is 0·94, so wire size should be one to wind $\dfrac{3330}{0{\cdot}94} = 3540$ turns per sq. in., or nearly 60 turns per in. The wire table shows that 29g. enam. winds 63 turns per in., and that it can carry 290 mA. As the mean turn value is not one of those shown in Table II, it will have to be calculated from the formula, thus:—

$$\begin{aligned} L_{mt} &= 2(a + t) + 8k + \pi e' \\ &= 2(1{\cdot}25 + 2{\cdot}1) + 0{\cdot}5 + 1{\cdot}69 \\ &= 6{\cdot}7 + 2{\cdot}19 \\ &= 8{\cdot}9 \text{ in.} \end{aligned}$$

Length of wire is therefore $\dfrac{3330 \times 8{\cdot}9}{36} =$ 823 yds., which is found to be about $1\frac{1}{2}$

pounds of wire. The resistance will be 136 ohms and the voltage drop 15v.

For the core size A, Chart 1 gives basic turns as 5500, and Chart 2 gives a correction factor of $\div$ 1·4, so the actual turns are 3930. Ampere-turns are 432, so air gap is 10 mils, from Chart 3. From Table 2, A is 1·42, so wire size will be one to wind

$$\frac{3930}{1{\cdot}42} = 2770 \text{ turns per sq. in., or}$$

nearly 53 turns per in. The wire table shows that 27g. enam. is suitable and that it can carry 420 mA. The mean turn, from Table II, is 8·6 in., so length of

$$\text{wire is } \frac{3930 \times 8{\cdot}6}{36} = 940 \text{ yds.,}$$

which is found to be nearly 2½ pounds of wire. The resistance is 107 ohms and the voltage drop is 12v.

It is clear that this second design in Example 4 meets the specification more closely than the first, although the larger quantity of wire would raise the cost of the choke. It should also be noted that these optimum designs require odd-number wire sizes; these gauges are not so readily procurable as even-number sizes, so if the latter are preferred the designs will have to be gone over again on this basis. The DC resistance will be higher, due to the slightly thinner wire.

WIRE TABLE

SWG	Diam. in.	Ohms per yd.	Yards per pound	Max. Curr.	Turns per inch						
					Enam.	SSC	DSC	SCC	DCC	E & SS	E & SC
16	.0640	.0075	26.0	6.4A	14	14	14	13	12.4	13.5	12.8
17	.0560	.0097	35.0	5.0	16	16	16	15	14	15.5	14.4
18	.0480	.0133	47.7	3.6	19	19	19	17	16	18	16.4
19	.0400	.0191	68.7	2.52	22	22	22	20	19	21	19
20	.0360	.0236	85.0	2.04	25	25	24	22	20	23	21
21	.0320	.0299	108	1.60	28	28	27	25	22	26	23
22	.0280	.0390	141	1.24	31	32	30	28	24	29	25
23	.0240	.0531	192	900mA	36	37	35	32	28	33	29
24	.0220	.0632	228	760	39	40	37	34	30	37	32
25	.0200	.0764	275	628	43	44	41	37	32	41	35
26	.0180	.0944	340	508	48	48	45	40	34	45	38
27	.0164	.1137	410	424	53	53	49	43	36	48	42
28	.0148	.1396	503	344	58	58	54	47	38	53	45
29	.0136	.1653	596	290	63	63	58	50	40	58	48
30	.0124	.1990	717	242	68	68	63	53	42	63	51
31	.0116	.2272	820	212	73	73	67	55	44	68	53
32	.0108	.2621	943	184	77	77	71	60	46	72	55
33	.0100	.3057	1110	158	85	84	75	63	48	77	58
34	.0092	.3612	1300	134	93	90	81	67	51	84	63
35	.0084	.4332	1556	112	101	96	87	76	55	89	70
36	.0076	.5292	1903	90	110	105	94	82	58	97	75
37	.0068	.6611	2380	72	122	115	102	87	62	106	—
38	.0060	.8491	3056	56	135	127	111	93	84	118	—
39	.0052	1.131	4066	42	159	143	123	103	69	133	—
40	.0048	1.327	4766	36	170	152	129	107	71	140	—
41	.0044	1.579	5700	30	186	163	143	—	—	150	—
42	.0040	1.911	6866	25	200	180	154	—	—	160	—
43	.0036	2 359	7500	20	220	194	165	—	—	176	—
44	.0032	2.985	10766	16mA	240	210	175	—	—	190	—

Notes: The yards per pound figures are for bare wire. Maximum current is based on a current density of 2000 Amps/sq. in. Turns per inch figures allow for spacing factor between turns for hand winding. Machine winding would produce slightly more turns per inch.

Example 5. A choke is required having an inductance of about 80 Hy. when carrying not more than 5 mA, using a 1 in. stack of size F stampings. Can such a choke be designed around this material?

The best way to deal with this design is to find the *smallest* size of wire that can be used to carry the current, and then use the charts to find what the inductance will work out to with the maximum number of turns the wire will produce on the available winding space.

From the wire table, 44g. enam. is suitable. This winds 240 turns per in., or 240^2 = 57600 turns per sq. in. Table II shows that the winding area A_w is 0·1 sq. in., so the turns on the coil would be 57600 × 0·1 = 5760. Chart 2 gives a correction factor of × 1·7, so the *basic* turns will be $\frac{5760}{1{\cdot}7} = 3390$.

For this value, and 5 mA current, Chart 1 gives an inductance value of 85 Hy.

The mean turn L_{mt}, from Table II, is 4·0 in., so length of wire is $\frac{5760 \times 4}{36} = 640$ yds.

Weight of wire is thus about 1 oz., DC resistance roughly 1900 ohms, and voltage drop 9·5v. Ampere-turns are so low (less than 30) that the air-gap would be less than 1 mil. An air-gap is therefore not necessary.

Example 6. A choke capacitance smoothing filter is to be applied to a battery charger delivering 1 amp. The inductance required is not critical, but needs to be a value approaching 0·5 Hy. A voltage drop exceeding 2v. cannot be tolerated. Explore the possibilities of designing a suitable choke.

It is clear at the outset that the DC resistance of the choke must not be more than 2 ohms. This demands that thick wire and the least possible turns be used, which in turn entails providing a large iron core. A pilot design can therefore be made with, say, 16g. enam. wire and a 3 in. stack of size A stampings. From this it can be decided whether various other designs need be considered.

From the wire table, 16g. enam. winds 14 turns per in., or 196 turns per sq. in. Table II shows that the winding area A_w is 1.42 sq. in., so the bobbin can accommodate 196 × 1·42 = 278 turns. The length of the mean turn L_{mt} is 11.6 in., so the total length of wire is $\frac{278 \times 11{\cdot}6}{36} = 89$ yds. The weight of wire is nearly $3\frac{1}{2}$ pounds, and the resistance comes out to 0·67 ohms, producing 0·67v. drop. Ampere-turns are 278, so the air-gap, from Chart 3, is 7 mils.

Chart 2 shows that basic turns for the core are divided by 2·3 to obtain actual turns; the actual turns here are 278, so basic turns will be 278 × 2·3 = 640. It will now be seen that neither the current (1 amp.) nor the basic turns value (640) appears on Chart 1, so correction factors in the inset must be applied to solve the inductance value. The procedure adopted in Example 3 will not help much, since to multiply basic turns by 5·6, giving 640 × 5·6 = 3580 turns, whilst bringing turns on to the scale of the chart, still does not bring the current curve to a readable position. Another method must be used so that the *inductance* value is brought on to a readable part of the chart. Dividing the current by 100 brings the 10 mA curve into use, and the inset on Chart 1 shows that dividing I by 100 reduces basic turns to one-tenth, namely, 64. If now this value of turns is multiplied by 32, giving 2050 basic turns, the 10 mA curve shows a value of 26 Hy. for inductance, but as turns are 32 times too many, this inductance is 100 times greater than the true value. The actual value is therefore 0·26 Hy. If the reasoning for this method is not clear, the reader can try drawing out the essential parts of Chart 1 for the value under consideration, and extending the scales, when it will be found that this value of inductance is arrived at geometrically.

To see how a different size of wire affects the design, the process described in the foregoing paragraphs can be gone through again for 17g. enam. wire, when it will be found that 360 turns can be wound on the bobbin, giving an inductance of 0·37 Hy, a resistance of 1·13 ohms, and an air-gap of 9 mils. for the same core. Just under $3\frac{1}{2}$ pounds of wire would be required. For 18g. enam. wire, however, a higher inductance of 0·6 Hy. is achieved with 510 turns, but at the expense of a much higher value of resistance, namely, 2·2 ohms, which exceeds the value specified.

The design using 17g. enamelled wire thus produces a component comparable with the specification. This example has purposely been included to demonstrate the flexibility of Chart 1, and to show how the correction factors given in the inset can be used to arrive at a solution.

REFERENCES

The following works were consulted for compiling data on which to base the design method put forward in this article:

Radio Designer's Handbook, 4th Edition, Chapter 5, Section 6

The General Radio "Experimenter," Vol. 31, No. 10. (*March 1957*).

Design of Iron Cored Inductances Carrying DC, N. H. Crowhurst. (*Electronic Engineering*, December, 1950).

Radio Inductance Manual, by N. H. Crowhurst.

IMPORTANT NEW ADDRESS

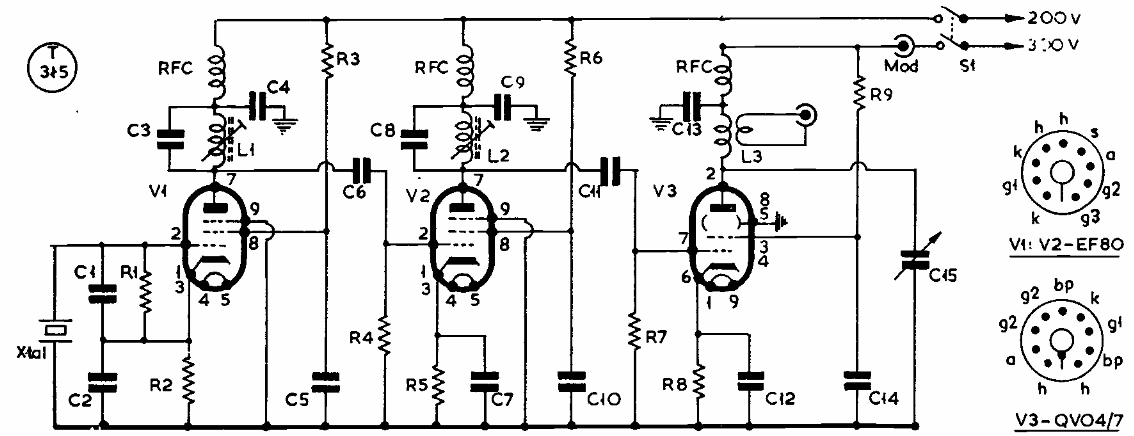
The address of the City & Guilds of London Institute is now 76, Portland Place, London, W.1 *(Tel.: LANgham 3050)*. The next Radio Amateurs' Examination is in May, for which entries—made through school, technical college or local Education Authority—should be in by February 28.

AMERICAN "ATLAS" SATELLITE

At the time of writing, the 4-ton "Atlas" missile launched as a satellite by the Americans from Cape Canaveral on December 18 is still in orbit—and still being used as an experimental repeater, or relay, station in space. The tracking frequency is 108.30 mc, the transmitter is on 132.45 mc and the receiving channel is 132.905 mc. Unfortunately, these transmissions are not within reliable radio range of the U.K., as the "Atlas" is in an equatorial orbit and does not rise much above our horizon. It is probable, however, that by anomalous propagation something could be heard from it at times.

The actual results obtained with this satellite as a space-relay station have been widely reported. From the strictly radio point of view, however, these results, while very interesting, are not "marvellous," in the sense that the apparatus has performed as intended and the frequencies as expected. Only as regards the power supply, perhaps, are there any particular design problems involved on the radio side.

More than 80% of licensed U.K. amateurs are regular readers of SHORT WAVE MAGAZINE



Circuit arrangement of the 10-metre transmitter discussed in the text. It gives an output of about 5 watts, and is suitable for local phone working; under good conditions on the 28 mc band, some DX has been raised. The general design can be applied to a low-power transmitter for the other HF bands.

QRP Transmitter for Ten

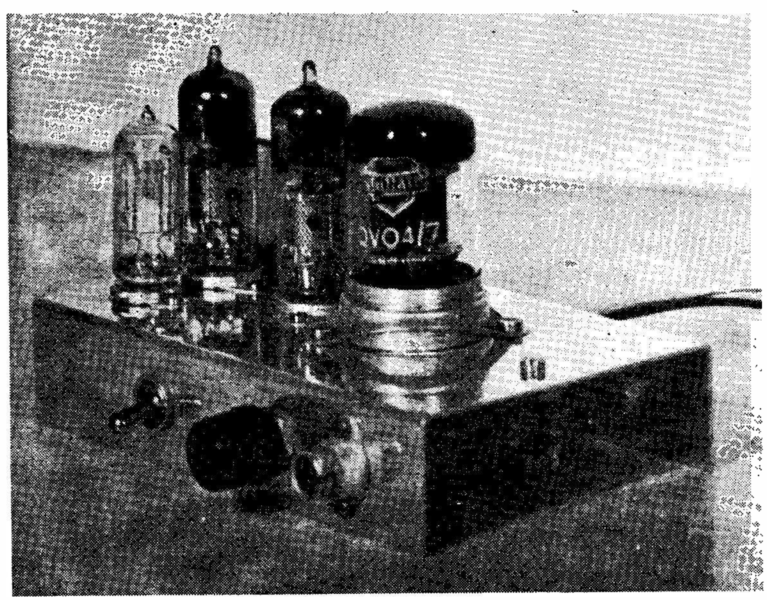
DESIGN FOR LOCAL PHONE

D. PRATT (G3KEP) AND D. NOBLE (G3MAW)

IT is surprising what little power is required for working on the DX bands assuming that a reasonable aerial is available. A low-power transmitter was constructed and is described in the article. The unit was initially designed for use on the 10-metre band; but with suitable changes to the coils and the selection of an appropriate crystal, it may be used on any of the high-frequency bands.

The transmitter comprises a Pierce crystal oscillator on 9·38 mc, the third harmonic output of which is taken at 28 mc and amplified by a tuned buffer amplifier which drives the QV04-7 PA. Any miniature high gain RF pentodes can be employed for the oscillator and buffer stages. EF80's were used in the prototype, but others such as EF91, or 6AK5 would be suitable. The PA could also run a 5763 or any other modern type, although the circuit is designed for the valve specified.

Oscillator and buffer stages can be set up by inserting a meter in the grid circuit of the following stage, and peaking the the coils L1 and L2 for maximum drive current. The PA tuning is best carried out by means of a field-strength meter. This may consist simply of a crystal diode connected across a 500 μA meter with a short piece of wire fastened to one of the connections for RF pick-up. If the meter is not sensitive enough, the other terminal may be



The 10-metre transmitter described in the article — a simple layout very suitable for local telephony working.

Table of Values

The simple QRP 10-metre transmitter

C1, C6, C11	47 $\mu\mu$F silvered-mica	R8	100 ohms
C2	180 $\mu\mu$F silvered-mica	R9	10,000 ohms
C3, C8	12 $\mu\mu$F silvered-mica	RFC	1.25 mH RF choke
C4, C5, C7, C9, C10, C12, C13, C14	.001 μF disc-ceramic	Xtal	9333 to 10,000 kc crystal
C15	50 $\mu\mu$F miniature variable	L1, L2	12¾ turns, 26g. enam. close wound on 5/16in. former, with iron-dust core
R1, R4, R7	47,000 ohms	L3	7 turns, 16g. enam. copper, self-supporting, 7/16in. inside diameter, with 1-turn link at 'cold' end.
R2	2,200 ohms	V1, V2	Mullard EF80
R3, R6	4,700 ohms	V3	Mullard QV04/7
R5	180 ohms		

earthed—the little finger of your left hand should suffice!

Modulation and Power

The transmitter is run from the modulator and power supply of the writers' Top Band rig. But any power unit capable of supplying about 300 volts at 60 mA will suffice.

Originally, the transmitter was used for low-power experiments on ten metres, to test the capabilities of QRP for local working on this band. However, during good 10-metre openings it has been found possible to raise American stations using this simple rig and an indoor dipole.

FRED'S DX-PEDITION

ANOTHER RARITY NOT WORKED

By G3COI

THE very word DX-pedition has a ring of romance about it! Since the day when he had read an account in the *Magazine* of a G3-plus-3 who had operated from some tiny country in Europe and had won himself DXCC in twenty-four hours, Fred had yearned to do something similar. But it was difficult, for two main reasons: First, because he had only two weeks' holiday in the year; and secondly, who wants to give a /A station in Blank-on-Sea, England, DXCC in twenty-four hours? (The Fred's always went to Blank-on-Sea, by order of the XYL, and any suggestion of deviation by Fred himself was promptly squashed.)

However, the occasion arose when Fred was called upon by his firm to travel to a little village in Westmorland—hence our story, for, as it is well known, Westmorland is a *rare county*. Needless to say, Fred was overjoyed to have the opportunity to become even a minor DX sensation, and he set about his preparations with gusto.

All the DX gossip columns were advised, both at home and abroad. During every QSO, he would tell the other fellow all about it and ask him to pass the news on. Occasionally he would go on Eighty, switch to transmit and carry on an imaginary QSO, in which details of the project would be described at great length.

The result of all this was, of course, that in no time at all the entire DX world was agog and poised, waiting for the first tinkling CQ that would be nonchalantly thumbed out by our hero on his ancient bug. At least, that was Fred's impression, and as the day for his departure drew nearer he became more and more agitated. He would wake up in the middle of the night shouting "Go down five kc and wait your turn!!" and "Those who send a five-shilling postal order with their QSL will get priority!!"

Came the day, and Fred packed all the items essential to a DXpedition into his car. First in was the converted 1154—this had a T6 note on Top Band, so that on Ten it sounded like a keyed bath waste-pipe. It was followed by the power unit—a glorious metal boxed affair that weighed nearly two hundred-weight. When this unit was just connected to the mains in its stand-by position, it hummed like a battery of electric shavers—but to hear its HT supply switched into use was just something . . . There was a rending crack as the relay went over, and the rectifiers glowed like flashbulbs as the thing worked itself up nasally into a steady whine. The whole effect was frightening to any stranger, but Fred had grown accustomed to the din and used to tune his PA by listening for minimum whine.

He had now filled the car's boot and started to put gear on the back seat. The next object was his receiver. This was, or had been, an 1155 which had undergone *considerable* modification. All the D/F parts had been removed, but, unfortunately, while doing this Fred took out several other vital components and never successfully replaced them, with the result that the performance fell to the level of a crystal set with one tuned circuit. This meant that a preselector had to be used on all except very local stations—so that went into the car as well. The receiver power pack was an absolutely unmodified standard rack-mounted job used originally in the 1131—an RAF transmitter running a fair amount of power. Its rated output was in the region of 1500 volts at 300 mills, but Fred had dropped most of this by the simple insertion of a series resistor. It was easy to turn ex-Government gear to amateur use, Fred always maintained.

Finally, he packed a suitcase with three hundred yards of Don-8 wire (that's the stuff you see advertised as being useful about the house and garden), a loud-speaker with a damp and mouldy cone, his rusty bug key, the dog-eared log, two crystal inserts—one of which was defunct as a crystal mike but which worked poorly as a condenser type—and sprinkled the lot with glass insulators, spare knobs, and a dressing of useful bits of flex.

Fred checked everything over, kissed his XYL and departed. He had been on the road only two hours when he was suddenly transfixed with horror and narrowly missed a large Keep Left sign — he had forgotten to bring his large economy roll of insulation tape! You may say that this was a trivial thing to get upset about, but to Fred his insulation tape was the matrix which bound him to his radio—the Svengali to his Trilby, or whatever. He used it for everything, apart from the obvious one of covering up bad joins in wire. It held his whole station together and had even crept remorselessly down from his shack into the rest of the house, where black and sticky tape was beginning to show up in the most odd places. For instance, do *you* ever use it to mend cracked cups?

Anyhow, he could not be without a roll, so he stopped at the earliest opportunity and bought one; then, serene once more, he continued on the expedition. He had soon finished his business call and made quickly for the small hotel where he was to spend the night. The manager was glad to have a customer of any sort, as it was during his off-season and trade was poor. He did not say a word when Fred staggered across the lounge and upstairs to his room with loads of what appeared to be (and, in fact, was) junk.

It only took about three hours to get all the stuff in an operationable state, and that included the erection of a magnificent long wire aerial that terminated almost in Lancashire; but Fred, although exhausted, was well satisfied and sharpened his pencil ready for the fray. He tuned her up on the nose, sat slightly hunched in the unfamiliar chair, and placed his grimy thumb on the paddle of the key. This was to be the CQ that would rock the bands to their very roots—it would mean a special DX supplement in the *Magazine*, at the very least.

But those historic letters were never sent, because at that poignant moment there was a power failure which lasted until the following morning, by which time our man had to start the journey home. If you ever hear of anybody who is going Westmorland way, let Fred knew because he wants that county. (I want it myself, for that matter.)

PLIGHT OF A BALLOON

On the morning of Friday, December 12, the BBC announced that a manned balloon had been launched from Teneriffe, Canary Is., on an east-west free flight drift across the Atlantic. At this time of writing, December 31, there is no certain news of its whereabouts; there has been little reliable radio contact, and only one sighting, a few days after take-off.

The operator in the balloon, T. Eiloart, of Cambridge, had been rushed through the R.A.E. and a Morse test, and allotted the special call-sign G7AA, for operation on the 7, 14, 21 and 28 mc amateur bands, using crystal-controlled battery-operated equipment for sending coded messages on frequencies which were to be kept secret. The radio plan called for the co-operation of certain G's, "specially selected" — how or by whom is uncertain — whose function it was to maintain watch on the G7AA schedule. These operations were to be co-ordinated by G3MGB, Upminster, Essex.

At intervals during Friday, December 12, EA8BB (Santa Cruz, Teneriffe) came up on 21190 kc phone, with G3AAE operating, and acting as control for the watch-keeping U.K. stations—G2FUX, G3JZK, G6UT and G8KS. From the context of the traffic, it was clear that the local situation at take-off had been chaotic, and that the absence of any signal from G7AA hours after take-off was giving rise to considerable anxiety, not to say near-panic. By about 5.00 p.m. on the 12th, G3AAE was advising that, as it was so important to get a contact, the frequencies and the nature of the operation should be published, and that all amateurs should be asked to listen for G7AA. (Apparently, this could be done only by permission of the interested newspaper!) However, at 11.00 p.m. that evening G3JZK and G8KS copied a message, from G7AA in the balloon, which allayed immediate anxiety. On Saturday, 13th, EA8BB (G3AAE again operating) discussed with the U.K. net a partial message thought to have originated from G7AA that morning.

During his discussions with the U.K. on December 12 (while operating from EA8BB), G3AAE explained that with EA8BB he had thoroughly tested the G7AA radio equipment, which he could verify was working perfectly up to the time of take-off. It seems that at take-off the balloon car was heavily bumped and then dropped into the sea; as the batteries were outboard of the car, or gondola (which is designed as a sort of sailing raft) it is possible that they were damaged. It also appears that in order to get lift at the moment of take-off, essential items of radio equipment may have been jettisoned. But because of the darkness and confusion, even those on the spot cannot be certain of this.

We were given a good deal of advance information on the radio plan for G7AA, which could have appeared in the December issue of SHORT WAVE MAGAZINE. However, at the request, on November 28, of those concerned with radio arrangements for the expedition, publication was withheld.

BBC HANDBOOK 1959

On the technical side, the *BBC Handbook* for 1959 is full of information. There are quick-reference tables giving necessary details of all BBC transmitting stations, long and medium-wave, VHF and television. There is also a map showing where all these stations are, and where the numerous studio centres are located. Two graphs show the increase in population coverage of the television and VHF services linked to the number of transmitting stations in use year by year. A frequently-asked question is answered by a list of the opening dates of television and VHF stations.

Among the articles on technical matters are "How to Get the Best Reception," "Wavelength Allocation" and an outline of the work of the various engineering departments of the BBC. Recent engineering developments are discussed in the "Review of the Year" section. *BBC Handbook 1959*, 280pp., well illustrated, fully indexed, price 5s., from the BBC.

VHF BANDS

A. J. DEVON

Poor Conditions and Low Activity—

Some Notes and News—

More VHFCC Elections—

AS you might expect, not a great deal to report this month—as usual at this time of year, correspondence has been on the thin side, which also just about describes VHF conditions since our last appearance.

Those who follow the glass will have found it extraordinarily variable, particularly during the week December 7-14, when there were large daily changes, with a marked downward trend to around 28·50, then a fairly steady low value held all through the following week; an upward movement commenced on the 22nd, and by the 24th the curve had got back to the 30·00 mark.

During most of the period, activity has been low and conditions generally poor; nevertheless, the regular schedule-keepers have been able to keep in touch. The PE1PL report remarks that, with them, their more distant contacts—such as G2NY, G3IRS and HB9RG—were *less* subject to varying conditions than the stations at their nearer distances, *e.g.* DL3VJ, G3JWQ and G6FO. And for those who may have wondered at the absence of PE1PL's signals immediately after the Christmas period, they were closed down from December 25 to January 5. The regular schedules with G2HCG, G2NY, G3IRS, G3JWQ and G6FO have now been resumed, and those who are interested can find activity on two metres every week-day during 0900-0930 and 1230-1330 GMT. PE1PL is on 144·000 mc, and is a very useful band-edge marker signal.

Though tropospheric propagation has been at winter level, there are reports of some short Aurora openings — on the evening of December 13, G3MED (Nr. Northwich, Ches.) found GM2FHH (Aberdeen) coming through at 2025, and has also been hearing some of the London stations at workable strength when engaged with their locals.

The calls h/w lists were too few and too short to warrant appearance this month, but one or two are worth mentioning: SWL Winters (Melton Mowbray) has a fine total of W/VE stations heard on six metres, from as far west as the W7 area, with W5's preponderating; this was all heard during four week-ends up to December 7. (Incidentally, he has a genuine Russian QSL for the reception of their first satellite, and can supply a translation of the card.) G3MND (Reigate, Sy.), who has just started on two metres, shows a good list of G's heard in the six weeks to December 16; of his totals, 69 are G3/3's and 52 hold two-letter *(i.e.* pre-war) call-signs.

G3MED puts in claims for all tables, and now has a good total of 16C worked for the Seventy-cem; he is also the most recently-licensed operator to qualify for Countries Worked, with 10. G3MED remarks that as his "old TV-type coax" got hot when he was running 130w. input, he has changed it for something better! The beam is a 6-over-6 at 45 ft., and he is certainly a fine signal in the London area when conditions are anything like reasonable.

G6QN (Colliers Wood, S.W.19) writes to re-claim his VHFCC No. 109 (issued as long ago as July,

TWO METRES
COUNTIES WORKED SINCE SEPTEMBER 1, 1958
Starting Figure, 14
From Home QTH Only

Worked	Station
49	G5MA
39	G3HBW
38	G3JWQ
37	G3MED
27	G3GSO, G3KQF, G3LTF
25	G3DVK
22	G3MAX
21	G3LTF/A
20	G2CIW, G3KPT, GW3MFY

This Annual Counties Worked Table opened on September 1st, 1958, and will run till August 31st, 1959. All operators who work 14 or more Counties on Two Metres are eligible for entry in the Table. The first claim should be a list of counties with the stations worked for them. The list can be added to as additional counties accrue.

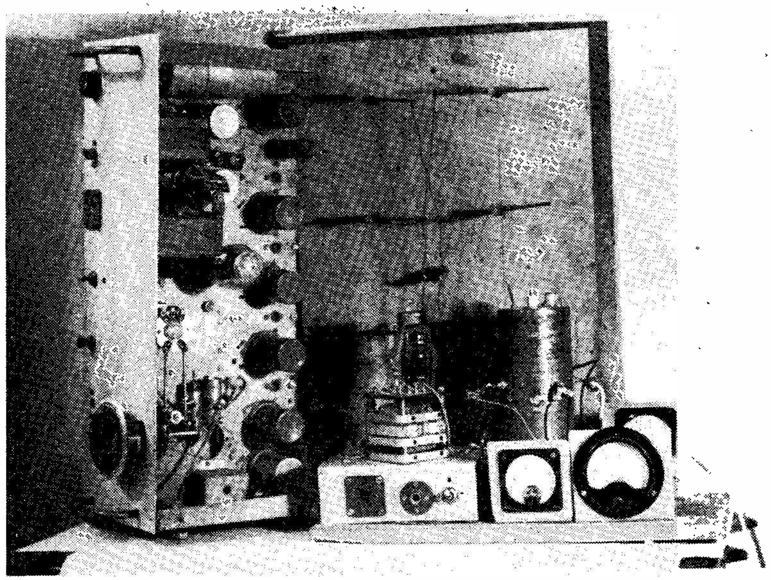
SEVENTY CENTIMETRES
ALL-TIME COUNTIES WORKED
Starting Figure, 4

Worked	Station
32	G2XV
27	G3HBW, G3KEQ, G5YV
26	G3JWQ, GW2ADZ
23	G3BKQ, G6NB
22	G6NF
20	G3HAZ
18	G2CIW, G3IOO
16	G3MED
15	G4RO
14	G2DDD, G2HDZ
12	*G5BD*
10	G2OI, G3IRW
9	G3LHA, G5DS
7	G2HDY, G3JHM, G3LTF
6	G3FAN, G3JMA, G3KHA, G3WW
5	G3FUL, G3IRA, G3IUD, G5ML
4	G3JGY, G3KPT

On working four Counties or more on the 70-Centimetre band, a list showing stations and counties should be sent in for this Table, and thereafter new counties worked notified as they accrue

TWO-METRE FIRSTS

G/DL	G3DIV/A-DL4XS/3KE	5/6/50
G/EI	G8SB-EI8G	23/4/51
G/F	G6DH-F8OL	10/11/48
G/GC	G8IL-GC2CNC	24/5/51
G/GD	G3GMX-GD3DA/P	29/7/51
G/GI	G3DA-GI2HML	29/6/49
G/GM	G3BW-GM3OL	13/2/49
G/GW	G5MQ-GW5UO	22/10/48
G/HB	G6OU-HB1IV	12/9/53
G/LA	G6NB-LA8RB	29/6/53
G/LX	G5MR-LX1AS	23/7/55
G/OK	G5YV-OK1VR/P	27/10/58
G/ON	G6DH-ON4FG	25/9/48
G/OZ	G3WW-OZ2FR	1/6/51
G/PA	G6DH-PAØPN	14/9/48
G/SM	G5YV-SM7BE	1/6/51
G/SP	G5YV-SP6CT/P	28/10/58
GC/DL	GC3EBK-DL3VJ/P	22/3/53
GC/EI	GC2CNC-EI2W	8/10/51
GC/F	GC2CNC-F9OK	17/11/53
GC/GI	GC3EBK-GI3GXP	14/9/56
GC/GW	GC2FZC-GW8SU	16/6/54
GC/ON	GC3EBK-ON4BZ	4/3/53
GC/OZ	GC3EBK-OZ2FR	2/3/53
GC/PA	GC3EBK-PAØHA	16/7/55
GD/EI	GD3DA/P-EI2W	30/7/51
GD/GM	GD3DA/P-GM3DA/P	29/7/51
GD/GW	GD3DA/P-GW5MQ	28/7/51
GI/DL	GI3GXP-DL1SE	5/1/56
GI/EI	GI3GQB-EI2W	13/6/51
GI/GD	GI2FHN-GD3DA/P	29/7/51
GI/GM	GI2FHN-GM3OL	1/7/49
GI/GW	GI2FHN-GW3ELM	8/7/49
GI/OK	GI3GXP-OK1VR/P	27/10/58
GI/ON	GI3GXP-ON4BZ	5/1/56
GM/DL	GM2FHH-DJ1XX	29/5/55
GM/EI	GM3BDA-EI2W	12/6/51
GM/HB	GM3HLH-HB1RG	4/8/57
GM/ON	GM3EGW-ON4BZ	21/11/53
GM/OZ	GM2FHH-OZ2IZ	18/6/57
GM/PA	GM3EGW-PE1PL	22/4/53
GM/SM	GM2FHH-SM6ANR	22/7/55
GW/DL	GW5MQ-DL4XS	22/9/51
GW/EI	GW2ADZ-EI8G	19/4/51
GW/F	GW2ADZ-F3LQ	14/5/50
GW/HB	GW2ADZ-HB1IV	14/9/53
GW/ON	GW2ADZ-ON4YV	13/5/50
GW/PA	GW2ADZ-PAØHA	13/5/50
GW/SM	GW2ADZ-SM6QP	1/7/53
CN2/CN8	CN2AO-CN8MB	26/6/55
DL/OZ	DL6SW-OZ2FR	4/3/51
DL/SM	DL2DV-SM7BE	10/3/51
EI/DL	EI2W-DL3VJ/P	29/8/52
EI/F	EI2W-F8MX	9/8/56
EI/ON	EI2W-ON4BZ	21/9/51
EI/PA	EI2W-PAØFC	10/10/53
ON/LA	ON4BZ-LA1KB	4/7/53
ON/LX	ON4TR-LX1MS	? ?
ON/OZ	ON4BZ-OZ2FR	3/6/51
ON/SM	ON4BZ-SM7BE	2/3/53
ON/SP	ON4BZ-SP6CT/P	28/10/58
ON/9S4	ON4UD-9S4BS	19/8/56



G3FUL (Luton), in co-operation with G3BVU and G3JZW, has been getting some very encouraging results on 23 centimetres (1250 mc band) using SEO gear, as pictured here. The transmitter is at lower right and uses a 703A "door-knob" in a TPTG circuit, made up of a brass can with controllable feed-back and copper-tube lines; the input is 18w. and is tone-modulated (MCW) by an 807. The aerial is a stack of ten end-fed elements, with mesh reflector and adjustable matching; when correctly adjusted, a neon will strike on each element in the stack. The receiver is after an original design by G3CGQ, and was described in the August 1955 issue of "Short Wave Magazine." Ranges of up to 50 miles have been obtained with this gear, and six counties worked under /P conditions from selected sites.

1952) as the original was lost in a disastrous fire that destroyed all the G6QN records. G3DLU (Sheffield) has been devoting himself to bench-work, and now has yet another version of the CC G2IQ converter, which is working well on a temporary indoor aerial. G5MA says that he has worked G2ADZ (Woolacombe, N. Devon) twice during the period, and that the schedule with GD3UB remains pretty reliable. A rarity also worked was GW8MQ, for Carmarthenshire.

Four-Metre Band

G3LWP, Arundel, is on 70·2 mc with 7w. to a beam, and G8RO, Tangmere, is on 70·3 mc with 20w. and a beam; they are in local contact and hope to find some more activity on the 70 mc band.

London VHF Dinner

We are asked to announce that the annual dinner of the London UHF Group will be held at the Bedford Corner Hotel, Tottenham Court Road, London, W.1, on January 31, at 7.00 p.m. Tickets are 12s. 6d., from G4KD, 35 Gibbs Green, Edgware, Middlesex.

VHFCC Elections

The following have qualified for membership of the VHF Century Club: Fritz Herbst, DL3YBA, Burgdorf, VHFCC Certificate No. 231; E. S. B. Sydenham, G3LOK, Cowes, I.o.W., No. 232; Sehiltz Marcel, LX1SI, Luxembourg, No. 233; and L. F. Crosby, G3FGT, Shirley, Birmingham, No. 234.

Dead-line ——

Before closing this month's short story, your A.J.D. would like to thank those who sent him season's greetings, which were very much appreciated. We hope that it will indeed be a Happy and a Prosperous New Year for all who follow this piece, with plenty of EDX/GDX to the usual VHF pattern. Last date for the next issue is **January 21,** addressed: A. J. Devon, "VHF Bands," *Short Wave Magazine,* 55 Victoria Street, London, S.W.1. Every good wish, and with you again on February 6, all being well.

Resonating a Wire

INTERESTING MULTI-BAND AERIAL TUNER SYSTEM

B. WARDMAN (G5GQ)

This article is based on practical experience using no more than "a piece of wire" with a suitable tuner unit to bring it to resonance on any required band. An important by-product of the system is that it also gives considerable lift on the receiving side. The discussion will be of particular interest to those who, living in flats or having only small gardens, are not able to put out any sort of full-size amateur band radiating system.—Editor.

WITH so much attention being devoted to beam aerial arrays, very little is now being published about simple, one-wire jobs. Maybe they appear so simple that few consider much information is needed. Still, it should be realised that, so far as the communication bands are concerned, *i.e.*, from 1.8 to 30 mc, the use of the beam is, and must continue to be, a minority activity *if proper use of our band allocations is made.* Quite a large proportion of amateurs could erect some form of beam for 28 mc operation, where the small physical size permits an indoor form of construction. On 21 mc, the proportion is substantially reduced, whilst on 14 mc only a small minority can contemplate the use of beams. When 7, 3.5 and 1.8 mc are considered, the enormous areas required for effective beams—to say nothing of the engineering problems involved—rules them out for all practical purposes.

One result of this—and it is a bad one for the future of Amateur Radio in this country—is poor band occupancy. Some are completely overcrowded, others half-empty. One finds the man with a beam for two or three of the HF bands sticking just to them all the time, unable to go on to any other. At the other extreme, there is the newcomer (or even old-timer) on Top Band, with an aerial he has just managed to get working on that band, doubtful about trying any other band because of his fear of aerial complications and his poor chances against the much-publicised beams.

But let everyone realise this honest fact: Provided ten feet of wire can be run up inside or outside, operation on all bands from 1.8 to 28 mc can be enjoyed and plenty of DX obtained, from OK on Top Band, to anywhere in the world on 14, 21 or 28 mc.

The thing to remember is that almost any odd length of wire can give good results, *provided it is treated properly.*

Effective RF is expensive stuff, whether to receive or to generate. The generating, or transmitting end, is pretty obvious; it is one thing to generate power inside the transmitter, quite another to radiate it so that it is picked up thousands of miles away. Assuming there were no restrictions either as regards money or license, one could simply push up the power to hundreds of kilowatts until a signal eventually leaked through to its destination. It is far cheaper to use less power and more efficient radiating arrangements. On the receiving side, there are no such restrictions, but other factors come into play; there is an effective limit for receiver size above which internal noise level becomes the limiting item, and the user is faced with providing a better signal to his receiver either by increased trans-

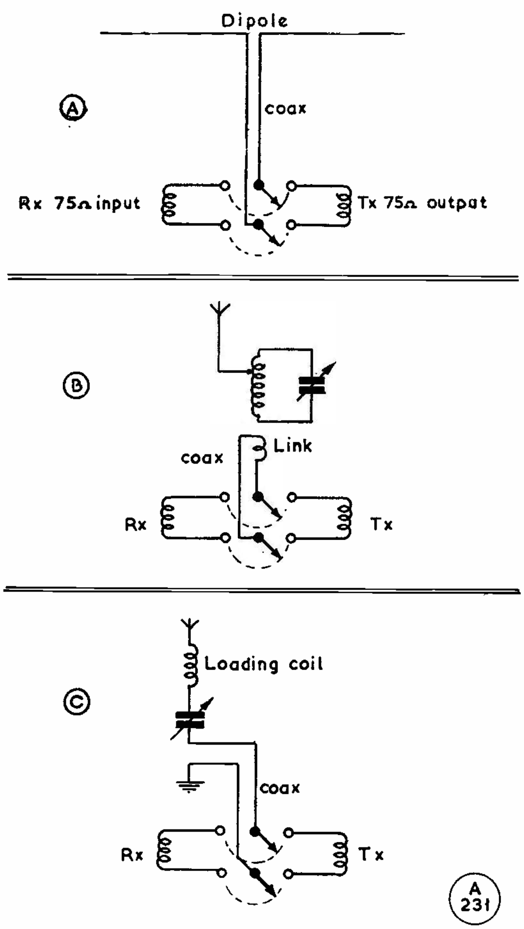


Fig. 1. The simplest arrangements, involving low-impedance feed and a DPDT change-over switch.

mitter power or by making his existing aerial arrangements more effective.

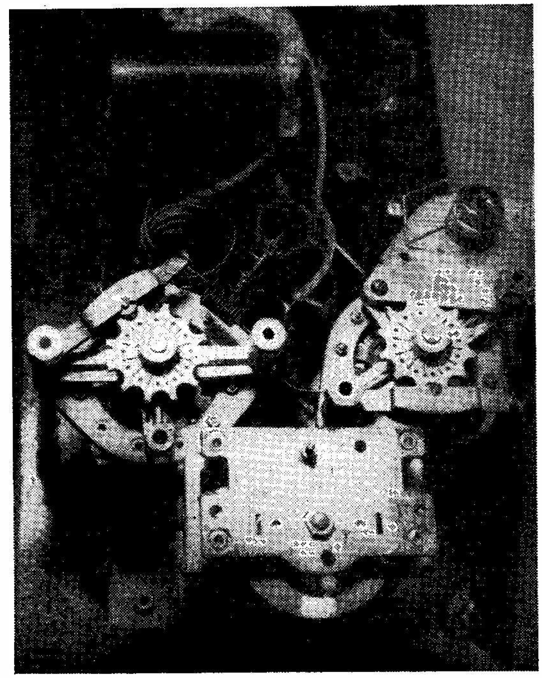
Just after the war, the American G.E.C. produced a pamphlet on a neat little device called the "R9'er." It was a one-stage, wide band preamplifier, especially suitable for 28 and 21 mc, which was claimed to give gains up to about six S-points. One factor stressed by them was that this unit incorporated *aerial matching* which, as they pointed out, was overlooked by most amateurs but which could provide an astounding improvement on its own. Repeatedly the writer has demonstrated this, by switching the same sample piece of wire coupled direct to a receiver to an alternative connection *via* a simple coupling unit, with an immediate gain of at least four S-points—and a signal which jumps from S3 to S7 or S8 really is being boosted! In effect, it represents an enormous increase in transmitter power.

Practical Application

Translating theory into the practical side, the amateur (whether for transmission or reception) faces three general forms of aerial possibility. First, he may have to cope with aerials located away from the transmitter room, and which are fed by low-impedance cables ; one can regard these as self-matching types in that the matching takes place at the aerial itself (and this may be a one-band centre-fed dipole or combination making a beam) and all he has to do after that is connect the feeder to the transmitter or receiver low-impedance side (Fig. 1a). Next, he will have semi-tuned types of end-fed aerials for, say, 7 mc (Fig. 1b) requiring a parallel tuning match for voltage feed and for length adjustment. Thirdly, he will have to match quarter-wave, or even smaller lengths, loaded up for 3.5 and 1.8 mc. In other words, he should be able to cope with any properly cut aerial, or any odd piece of wire strung up, and be able to get the utmost from it without any real bother.

Now the first possibility (Fig. 1a) needs no complicated switching arrangements. It must be assumed that, in accordance with modern practice, both receiver and transmitter are designed right from the start for use with coax low-impedance feeders ; therefore, either the two or three feeder systems from the aerials can be plugged in separately as required, or else a simple switching arrangement devised to select the required feeder.

When it comes to using end-fed aerials, however, and having to switch them over to quarter-wave current-feed, switching does become a little complicated. Taking it the simplest way, look at Fig. 2. In this, the sort



General impression of the tuner unit as constructed by G5GQ, and described in his article. Components of the "surplus" TU5B variety are very suitable for the construction, which can be in any convenient form mechanically. The tuner should be built into a screening box for maximum TVI-proofing.

of case envisaged is the station using a 33ft. end-fed aerial (as Fig. 1b) for 14 mc, *i.e.* voltage feed. It is the only bit of wire available, and he would like to use it as a quarter-wave, current fed, loaded aerial for 3.5 mc. It has to be *loaded* because 33ft. is $\frac{1}{8}$-wave on 3.5 mc. That is two uses for this one piece of wire, and that means two positions on each switch.

On first looking at Fig. 2, the switchery may look complex, but really it is not. For simplicity, four separate switches have been drawn, and according to requirements, some of these might be grouped together, *i.e.* using switch wafers instead of separate switches. All we really have here are:

S1—To switch our 33ft. wire from voltage to current feed, *i.e.* from 14 to 3.5 mc condition—A to B.
S2—To switch one side of the tuning condenser (which is not earthed so must be insulated from the panel), from A to B, L3.5 being the loading coil.
S3—To switch the other side of the tuning condenser, from A to B.
S4—To switch the coax cable feed, also from A to B.

When the switches are in position A, the aerial is tapped on to the 14 mc tuning coil, L14, the two sides of the tuning condenser are connected to L14 by S2 and S3 and the coax line to the send-receive relay connected to the 14 mc link coil, L14C.

Changing to switch position B connects the 33ft. length to the 3.5 mc loading coil, L3.5, through the tuning condenser (now in series) to the "hot" side of the coax, and *via* that to earth.

Extending the idea to cover more bands simply means increasing the switch positions; for example, to cover all six bands from 1.8 to 28 mc would mean six positions instead of two. These should be apportioned to "A" and "B" modes according to the user's individual requirements. For example, supposing some 50 feet of wire can be got up as a minimum, with 66 ft. preferred. Then voltage feed is possible from 7 to 28 mc and the scheme would involve four "A" positions (for 7, 14, 21 and 28) and two "B" positions, for 3.5 and 1.8 mc. Alternatively, if he can only get 30 to 33 feet up, then the answer is to use three "A" and three "B" positions.

Turning to detail, the size of the tuning condenser, C, has to be considered. Physically, it may have to handle 150 watts (if you use full power), with quite a lot of RF volts, so it must be adequately spaced. The conventional method of specifying the space between the plates is always confusing; it is used so rarely that most of us don't remember whether ⅛ inch spacing means the distance between the fixed and moving, or what. So here is a very good guide: Set the condenser to minimum, *i.e.* with the moving plates right out, not meshed with the fixed ones in any way; then put a ruler along the moving plates. If there are not more than six moving plates in one inch, the condenser will take your 150 watt voltage peaks from 3.5 mc upwards.

Next, to the electrical size of the condenser. On 28 mc, a 60-75 $\mu\mu$F parallel tuning condenser is just about the maximum for reasonably easy tuning. On 1.8 mc, something like 150 $\mu\mu$F is necessary to cover the band. The easiest way is to have a 75-75 $\mu\mu$F split stator, using one half only for the higher frequencies, and bringing in the other half for the lower. Fig. 3 shows how to connect an additional wafer S5 to do this. Mechanically, the condenser must be insulated from ground; this can be done by bolting an insulating sub-panel about 2 inches behind the main panel, with the condenser mounted on it. The extension shaft *must* also be well insulated; allow at least an inch of good insulating rod before the knob, with plenty of "hole" in the front panel.

Switch Selection

Switches are another vital item: with 150 watts of RF they must be good and substantial. At G5GQ, the aerial selector switch, S1, is a heavy one from a TU5B unit. For the other switching, the heavy RF type ("surplus") are used, with two assemblies each carrying two wafers (S2-S3 and S4-S5). This gives sufficient flexibility for almost any purpose.

Coils for the "A" connection—Fig. 2 and variations—will be more or less the same for all users, and will be approximately:

28 mc band—About 4 turns, 14g. enamelled, 1¼-inch diameter, spaced about ⅛-inch between turns, soldered directly to the switch.
21 mc band—About 9 turns as above.
14 mc band—About 17 turns, wound on a one-inch diameter polythene former.
7 mc band—About 30 turns, on a one-inch former.

In each case the link coil can be one turn. There is plenty of tuning capacity to make up for latitude in the coils. To check them, couple up to the transmitter using reduced power (otherwise there may be a burn out), without any aerial connected. As the condenser is swung, resonance will be indicated by the PA anode current trying to hit the meter stop and practically every watt of power the rig is capable of producing will appear across the aerial tuning coil.

Coupling

Now for coupling the aerial. On ten metres, for example, any length of wire between 14 and 18 feet can be used, and the unit will take up the slack. It is easiest to line up using a simple radiation device, as described by the author in the July 1958 issue of *Short Wave Magazine*. Starting at the "hot" end of the coil, try tapping on at various positions, at about 1½

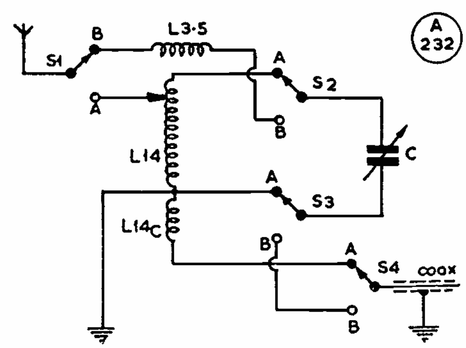


Fig. 2. Practical layout for a two-band coupler, with switches S1-S4 to change from Condition (B) to Condition (C) in Fig. 1. L-3.5 is proportioned to load up the aerial to a quarter-wave on 3.5 mc. The size of coil L-3.5 will be governed by the length and capacity of the aerial wire.

inch distances apart, *i.e.* at each half turn for a couple of turns down. A spot will be found where maximum output is indicated. Putting on multiples of that aerial length, *e.g.* 33ft. or 66ft., will all work with the same coil. Assuming one has the requisite length (for 7 mc, anything between 65 and 75 feet) suitable tapping points will be found, although for 7 and 14 mc the tapping can be tried at one turn intervals on these larger coils.

There is one exception, and this must be remembered. A 66ft. approximate length can be used on 7, 14 and 28 mc. A 33ft. length can be used on 14 or 28 mc, but it just will not work on its own for 21 mc because it is too far off resonance for the unit to take up. Do not let that worry you; internally, or externally, insert a small coil in series with either 33ft. or 16ft. (about 9 turns on a one-inch diameter former) and that will give resonance.

On the "B" connection (loaded quarter wave) no firm data can be given for the coils, because so much depends on the length of "aerial" wire and the effective length of the earth connection, which will naturally vary from station to station. The most logical approach is to set up initially for the normal length of wire to be used on the highest frequency band for which quarter-wave operation is planned. For example, if the normal length of wire is likely to be about 30 feet, then some 35 turns of 16g. enamelled, close wound on a 2-inch diameter former, will just about resonate on 3.5 mc. With the "B" connection, setting up can only be accomplished with the aerial connected, because it is part of the tuned circuit. However, assuming that you have set it up with 33ft. and a coil as described for 3.5 mc, it is quite easy to add an external loading coil of about 40 turns same diameter to bring it up to 1.8 mc. Tune up again using the radiation meter. For "B" operation, any length of wire can be made to resonate, from 10 feet upwards, and it will work quite well.

Using the system as described for reception on the HF bands, an average gain of between 4 and 5 S-points is obtained at G5GQ on a very good specimen of AR88D, whilst on 3.5 and 1.8 mc the difference is between 3 and 4 S-points, compared with an untreated end-on "piece of wire" on the receiver.

Constructional Suggestions

As most of us like trying out various aerial ideas, it is helpful to design the unit so that any modification can be made quickly. The one used by the writer is built into an old TU5B case.

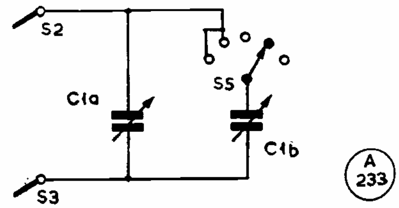


Fig. 3. Extending the circuitry of Fig. 2 to cover more band C1A, C1B are two halves of a split-stator condenser, to increase capacity for Top Band operation — see text.

The coax send/receive relay is bolted on the back of the box. The cables from the 30v. relay supply, and from the transmitter and AR88D, plug into it, adaptors having been made for that purpose, so that the entire unit may be disconnected immediately for any experiments. The input coax to the relay is brought into the case through a hole, and terminated, at the end of 12 inches of spare cable, with a plug. This goes into a socket on the switch assembly. On the top of the case is a feed-through insulator for the aerial, and again this has about 9 inches slack inside, terminating in a single jumbo plug which fits into a socket soldered to the aerial switch S1. Therefore, to make any alteration to the tuning unit, such as varying a tapping point, all one has to do is loosen off the front panel bolts (upon which the entire unit is built) disconnect the two plugs, and the panel and entire assembly comes clean away.

Apart from its obvious use right at, or on, the transmitter, the unit has other advantages. There is an undoubted filtering effect on harmonics which might otherwise affect TV. And, of course, for those who have to keep their gear tucked away in some cupboard under the stairs, or otherwise remote from a window, a tuner of this sort really is a boon, for the transmitter can be connected to it by an inconspicuous cable under carpets or round the skirting boards, whilst right at the window this unit will see to it that every ounce of power is used.

MOBILE RALLY ARRANGEMENTS

All clubs and local groups organising a Mobile Rally for the coming season are asked to let us have details as soon as possible, so that full advance information can be published in SHORT WAVE MAGAZINE. This may also serve to avoid any unnecessary clash in dates, such as happened more than once last year. It is also recommended that to make a Mobile Rally really successful, something more than a general invitation to mobiles, with talk-in facilities, is needed; the programme as a whole should be of direct interest to those who operate /M, with one or two competitive events included.

Band Marker Oscillator

FOR RECEIVER CALIBRATION

R. Q. MARRIS (G2BZQ)

A SIMPLE but accurate band-marker oscillator was required for use with receivers covering the 7-28 mc amateur bands; it had to be portable, and capable of being switched on quickly, on any band, to give an immediate check — no waiting for heaters to come up.

The unit described here meets these requirements and produces adequate output, either fundamentally or by harmonics, on any band. Crystals for useful frequencies are extensively advertised in *Short Wave Magazine* for as little as 7s. 6d., and it was decided to use these as the basis for the unit, not only on account of their low cost but because, being mainly ex-Service types, their calibration can be relied upon. Crystals were therefore obtained for 7000, 7150 and 7500 kc, which produced marker frequencies, and harmonics, as shown in the Table below.

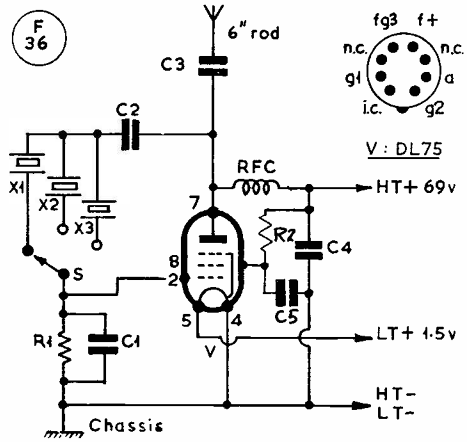
For the oscillator itself, a Pierce circuit is used because it has the important advantage of requiring no tuning; it is simply a matter of switching the crystals to obtain the wanted output frequency. The valve selected was a Mullard DL75 sub-miniature battery output pentode, but other RF pentode types would be equally suitable. (The valve-base connections shown in the diagram are for the DL75.) This valve gives a good harmonic output, and can be used with a standard portable-radio type of battery, of 67/1·5v., which lasts indefinitely, as the LT consumption is only 25 mA, and the total plate current a bare 2 mA.

From the circuit as shown, it will be seen

BAND MARKER OSCILLATOR

Band	*Xtal 1*	*Xtal 2*	*Xtal 3*
7.0- 7.15 mc	7,000 kc	7,150 kc	7,500 kc*
14.0-14.35 mc	14,000 kc	14,300 kc	15,000 kc*
21.0-21.45 mc	21,000 kc	21,450 kc	22,500 kc*
28.0-30.0 mc	28,000 kc	28,600 kc	30,000 kc

(**Not used*)



Crystal Oscillator using a DL75 battery valve.

Table of Values

Circuit of the Marker Oscillator

C1 =	47 $\mu\mu$F	R2 =	25,000 ohms
C2 =	.003 μF	RFC =	2.5 mH RF choke
C3 =	100 $\mu\mu$F	Xtals =	*See text*
C4, C5 =	.005 μF	S =	3-position switch
R1 =	47,000 ohms, ¼w.	V =	Mullard DL75, or similar

that the three crystals are selected by a three-position switch; this must have an isolated spindle. If further crystals are required for more frequencies, it is only a matter of providing a switch with the appropriate number of positions.

It will be noted that a 6in. "radiator" is used on the oscillator; a piece of stiff wire is soldered to a wander-plug, and the radiator is plugged into the output socket of the unit when in operation. In using the device, a point to watch is the degree of coupling into the receiver—this can be adjusted either by the length of the radiator, or the placing of the unit with respect to the receiver, or its aerial lead.

Construction is in a small metal case, with the battery plugged in as required. Alternatively, the battery could be built in, which would call for an on-off switch on the unit. When in use, the receiver BFO should be switched on and the gains turned down so that a sharply-tuning signal is produced.

THE F.O.C. ANNUAL DINNER

The annual dinner of the First Class Operators' Club was held in London on November 29, with a total attendance of 53 members and guests. The chair was taken by G5LC. The winners of the Club's own marathon contest were announced—G3FXB and G8KP equal first, with G4CP third. The honorary secretary of the F.O.C. is L. Belger, G3JLB, 103 Whitehill Road, Gravesend, Kent.

The Other Man's Station — GW3CF

THE owner and operator of GW3CF — F. G. Humphreys-Jones, Silverlyn, 15 Gronant Road, Prestatyn, Flints. — was licensed just over 20 years ago, and describes his present station as "a modest set-up, covering 3.5 to 28 mc with relatively low power." Apart from the equipment shown here, GW3CF also operates /M on Top Band—and it is of interest to add that a photograph of the pre-war GW3CF appeared on p.20 of the August 1939 issue of SHORT WAVE MAGAZINE.

As seen above, the equipment is contained in and on a writing table, having top dimensions of 2 feet by 4 feet. Either side of the knee-hole is a cupboard, and the three drawers along the top are 24 ins. from front to rear; so they are adequate to accommodate log-books, call-book, cigarettes and other odds and ends.

The station is housed in the corner of a little-used living-room. The gear, reading left to right, consists of: Beam direction indicator and rotator switch; all-band CW monitor, *not* frequency-conscious within the band to which it is switched, and deriving HT from rectified RF to supply its audio oscillator, with LT from the receiver. Out of sight, behind these units on the left, is the Vox-Box; the station receiver is an Eddystone 750, beneath which is the main control switch, giving "manual transmit or receive," "press-to-talk," or "voice-controlled operation" *via* the Vox-Box, *i.e.,* four positions. An Acos desk microphone is used; the bug key is of Australian origin—the name plate says "The Simplex Auto," *Made in Melbourne*—and the speaker is an 8-inch one in the central cabinet.

The band-switched 38w. Phone, 50w. CW transmitter is extensively screened and filtered against TVI. The line-up is: (6AM6 VFO), (6AM6 untuned buffer), (5763 wide-band amplifier) followed by three 6BW6's which are wide-band coupled multiplier stages; the second 6BW6 doubles to 14 mc or triples to 21 mc; the VFO and the two following stages operate on 3.5 mc. The PA is a clamped 807 with pi-output, using a 6V6 as clamper. The power supply is internal for *all* heaters and HT with the exception of the HT to the 807. Modulated HT for the PA is piped up in coax from the modulator located in the knee-hole; this runs a pair of 6L6G's in Class-AB1. The VFO circuit is a high-L Colpitts and is temperature compensated.

A standing-wave ratio indicator sits under the raised front of the transmitter. It is of the Monimatch type, always in circuit. The actual bridge is screwed to the right-hand side of the knee-hole.

Send-receive change-over is accomplished by six relays, two of them being sequentially switched, and others slugged where necessary. This results in the complete absence of electrical clicks in the receiver, even when using voice-control, and is found to contribute a great deal to the pleasure of operating; the relays are also resiliently mounted to avoid mechanical noises.

Aerials in use at GW3CF are a Cubical Quad for 28 mc, 20 feet high (rotated by a cowl-gill motor at 25v. AC, geared down to about 2 : 1) and "a wire," running from the window up into the roof-space; this is end-fed and can be provoked into loading up on all bands, using a separate coupler on the window sill; it manages to have at least one point of maximum current fairly high up.

Other equipment for the station consists of an Avo Model 7, a BC-221, a tape recorder and a wide-coverage GDO.

Operating interests are phone and CW, mainly on 14, 21 and 28 mc. A daily phone schedule is kept on 28 mc with W8MWE near Cleveland, Ohio; the score on this stood at 122 by the third week in November—and he only runs 30 watts to a 3-element beam.

The actual DX record at GW3CF is good for the power used, 50 countries having been confirmed. The take-off is open to the west, the location being very near to the coast, and on rising ground.

JODRELL BANK TRIUMPH — VOICE-ECHO FROM THE MOON

The great success of the American "Atlas" satellite as an experimental space-relay station, in operation since December 18, should not be allowed to obscure the Jodrell Bank achievement of November 29, when a voice-echo was received from the moon. The result of this particular test, which was a triumphant success, was broadcast (as a recording) by Professor Lovell on the evening of Sunday, November 30, in the course of his fourth Reith Lecture on the BBC Home Service.

In a letter to the Editor of SHORT WAVE MAGAZINE Professor Lovell says " . . . the frequency . . . for the moon-reflection recording was 400 mc . . . the telescope was of course used both as a receiver and transmitter . . . the power output of the transmitter was 75 watts and the receiver bandwidth a few kc . . ."

The path-distance was close on 480,000 miles and about 2½ seconds elapsed between transmission and reception. The echoed voice was quite clear and undistorted, superimposed on a heavy "sharsh" background. In his Lecture that evening, Professor Lovell explained that one part of the moon's surface has been found to be a particularly good reflecting area. Certainly, it was an astonishing result having regard to the very low transmitter power used (in this context), though it has to be remembered that the gain of the Telescope, as a Tx/Rx aerial at 400 mc, is very considerable.

At any rate, the "first voice from outer space" was not, as the Americans have claimed, that of President Eisenhower on December 18 last, but the "Hullo" from Professor Lovell, by moon-reflection recorded on November 29, 1958.

FREE FOR THE ASKING

A new publication called *Valves and Semi-Conductors for the Radio Amateur* has just been produced by Mullard Limited. It lists, in the form of a handy folder, abridged data on receiving and transmitting valves, germanium diodes and transistors from the Mullard range which are suitable and recommended for all amateur applications. The main heads are: Receiving Valves, Transmitting Valves, Data on Semi-Conductors, Valve Equivalents, and a Transmitting Valve Chart showing frequency and power output ratings of all Mullard types up to the QY4-250, capable of giving a kilowatt of RF at its maximum full-rating frequency of 75 mc. Some 20 different transmitting types are shown in this Chart, of which the QQV06-40A, rated at 90w. RF output up to 200 mc, is one of the most popular in current amateur use. For your copy of *Valves and Semi-Conductors for the Radio Amateur* write: Press Department, Mullard Limited, Mullard House, Torrington Place, London, W.C.1, mentioning that you saw it in SHORT WAVE MAGAZINE.

SCOPE OF RUSSIAN JAMMING

In the course of the United Nations debate on cultural relations on December 3 last, it was stated that Russia now operates a total of not less than 2,500 *jammer* stations alone, estimated to cost her some £35 million a year! All this vast edifice of broadcasters does nothing at all but radiate meaningless noise, with the sole object of keeping Russia screened and totally cut off from the outside world. The Russian jamming technique is both indiscriminate and unintelligent — even the speeches of Russian leaders travelling abroad are obliterated, simply because they come from "the other" side of the Iron Curtain. It is a sad comment on the theme of "cultural relations" that this Russian jammer network is actually the largest broadcast system in the world, far surpassing even the Voice of America.

AMATEUR LICENCE INFORMATION

Full details on how to obtain a radio amateur transmitting licence are available on application to: Radio Services Dept. (Radio Branch), Post Office Headquarters, London, E.C.1. Ask also for the G.P.O. pamphlet, *How to Become a Radio Amateur.* All who are thinking of taking the next Radio Amateur's Examination, in May, should get these leaflets.

" . . . . Yes, it's all one-knob control here . . . . "

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.

DL2ER, J. C. Clinch *(G3MJK, ex-VS2ER/G5PM),* Headquarters 1 (BR) Corps, B.F.P.O.39.

G2TD, F. R. W. Strafford, M.I.E.E., M.I.R.E., Woodcot, Mead Court, Waltham Abbey, Essex *(re-issue).*

G3MNJ, J. C. Yates, 5 Middlehurst Road, Grappenhall, Warrington, Lancs.

G3MQX, P. Lane, 45 Ridge Road, Kempston, Bedford, Beds.

G3MTX, A. C. Pointon, 2 Holmesdale Road, Bexhill-on-Sea, Sussex.

G3MVC, N. Craig, Wood Lea, Egremont, Cumberland. *(Tel.: Beckermet 276.)*

G3MVI, D. A. Heather, 14 Wood Road, Shepperton, Middlesex.

G3MVM, P. B. K. Pierson, 28 Gordon Hill, Enfield, Middlesex.

G3MVT, J. L. Tiptaft, 42 Hutton Road, Birmingham, 20.

G3MWP, N. S. Beckett, 67 Sebastian Avenue, Shenfield, Essex. *(Tel.: Brentwood 4897.)*

G3MXV, H. V. Pierson, 4 Highfield Terrace, Didsbury, Manchester, 20. *(Tel.: Didsbury 5675.)*

G3MYC, C. J. Cheatle, 961 Chester Road, Erdington, Birmingham, 24.

G3MYO, A. M. Jeenes, c/o Officers' Mess, R.A.F. Station, Boulmer, nr. Alnwick, Northumberland.

G3MYX, F. C. Richardson, 7 West View, Canterbury Road, Folkestone, Kent.

G3MZF, F. B. Furminger, 9 Martello Road, Folkestone, Kent.

G3MZW, J. A. R. Smith, New Street, Deddington, Oxon.

G3NAV, E. R. Cook, 4/134 Lozells Street, Lozells, Birmingham, 19.

G3NBK, A. M. Thatcher, T.D., M.A., The Bungalow, Worksop College, Worksop, Notts.

G3NCV, M. F. Airey, 91 Alexandra Road, Blackburn, Lancs.

G3NDE, G. C. Driver, 57 Central Avenue, Farnworth, Bolton, Lancs. *(Tel.: Farnworth 1440.)*

G3NDG, B. I. Fleming, The Cottage, Gill Lane, Yeadon, nr. Leeds, Yorkshire.

G3NDH, K. H. Howard, 36 High Street, Whitchurch, Aylesbury, Bucks.

G3NDI, C. R. Fry, 69 Bills Lane, Shirley, Solihull, Warks.

G3NDK, R. K. Webb, c/o Officers' Mess, R.A.F. Station, Hullavington, Chippenham, Wilts.

G3NDO, P. Sorab, 29 Linwood Road, Handsworth, Birmingham, 21.

GI3DNP, E. McCauley, 35 Linsfort Drive, Londonderry.

G3NDW, F. J. Moore, 3 Redlands Close, Solihull, Warks.

G3NEA, L. J. Saunders, The Summer House, Eden Vale, Westbury, Wilts.

GM3NEC, C. S. Miller, 19 Craighill Drive, Clarkston, Renfrewshire.

G3NEE, R. J. R. Pedder, 27 Hillside Grove, Southgate, London, N.14.

G3NEG, E. Wilkinson, 12 Woodlands Close, King Edward Drive, Grays, Essex. *(Tel.: Grays Thurrock 3718.)*

G3NEH, J. L. Isles, 142 Duke Road, Chiswick, London, W.4.

G3NEM, J. Love, 5 Hawthorn Road, Roby, nr. Liverpool, Lancs.

G3NEP, P. Bradley, Southlands, Central Drive, Wingerworth Park, Chesterfield, Derbyshire.

CHANGE OF ADDRESS

G2BLA, M. A. Pyle, 16 Dudley Hill Close, Welwyn, Herts.

G2FQW, K. Jones, B.Com., A.T.I.I., Flat 3, 50 Shelley Road, Worthing, Sussex.

G3AUX, Dr. K. L. Owen *(ex-GW3AUX),* Bryn-y-Coed, Cranham, Glos. *(Tel.: Witcombe 2258.)*

G3AVE, F. C. P. Flanner, 91 Blackrock Road, Wyreley Birch, Birmingham, 23.

G3AWS, A. W. Summers *(ex-VS6AW),* Apt. 101, The White House, Albany Street, London, N.W.1.

G3EFB, Dr. A. H. Walker, 1 Wharncliffe Road, Boscombe, Hants.

G3GJW, T. I. Lundegard, 11 Avondale Road, Mottingham, London, S.E.9.

G3GRX, E. L. Simpson, 31 Dukes Road, Shaws Park, Hexham, Northumberland.

G3HUB, M. E. Harrison, No. 10 Officers' Caravan Site, R.A.F. Station, Boscombe Down, Amesbury, Wilts.

G3JSN, J. C. Beal, 3 The Courtway, Carpenders Park, nr. Watford, Herts.

G3JZK, G. T. Sassoon, 8 Huntingdon Road, Cambridge, Cambs.

G3KGZ, W. J. Wallace, c/o Sgts' Mess, R.A.F. Station, Feltwell, Thetford, Norfolk.

GI3KYP, A. D. Patterson, 45 Gilnahirk Park, Cherry Valley, Belfast.

G3LJW, L. D. V. Taylor *(ex-GW3LJW),* 3 Wrentham Avenue, Kensal Rise, London, N.W.10.

G3LTT, H. A. Gray, 267 New Parks Boulevard, Braunstone Frith, Leicester.

G3MCS, W. R. Hawthorne, 151 Hildaville Drive, Westcliff-on-Sea, Essex.

G3MIN, B. C. A. Kenneford *(ex-VQ5CB),* 2 Mill Lane, Shoreham-by-Sea, Sussex. *(Tel.: Shoreham-by-Sea 3428.)*

GW3MMU, P. M. Fulton, 36 Sunnybank Road, Blackwood, Mon.

G6AW, W. E. F. Jennings, 57 Harefield Avenue, Cheam, Surrey.

GW8PG, Station near Wrexham, Denbighshire. *QSL to:*—A. D. Taylor, 37 Pickerill Road, Greasby, Upton, Wirral, Cheshire.

G8UO, H. Beadle, 12 Cartmel Road, Keighley, Yorkshire.

CORRECTION

G2BWN, J. F. H. Weller, 5-J Grove End House, St. John's Wood Road, London, N.W.8.

THE THIRTEENTH MCC

The Magazine Top-Band Club Contest
November 15-16 : 22-23, 1958

RECORD entry, record scores . . . as we hoped and expected, this, the Thirteenth "MCC," turned out to be the best of the series. With no fewer than fifty Clubs taking part, the scoring was fast and furious; and for the first time in the history of this Contest, most operators found themselves working against the clock.

Crystal Palace—relative newcomers to MCC—scooped the pool this time with a very creditable win and, of course, a record score of 546. Hard on their heels with 539 points were **Coventry** and **Stourbridge,** placed equal second after many recounts by the scrutineers. These two Clubs were respectively second and first last year, with only eight points between them; this year another eight points for either of them would have meant first place!

Harlow, who were fourth last year, made the same position this time with their score of 517. (Aldershot, who were third in last year's event, had not produced their log several days after the closing date, and so are unplaced this year.) Fifth, and the only remaining Club to top the 500 mark, are **Bailleul,** who have been consistently good with their second place in 1956 and seventh place last year.

The others all appear in Table I, from which it will be noted that scoring became pretty close below the 460 mark, but that 50 points separated Bailleul (512) from their nearest down the list, Sheffield (462).

Lost Points

Many Clubs will be wondering why their quoted score falls somewhat short of their claimed figure! There were four main reasons for deductions: Contacts made before 1600 or after 1900 GMT (there were plenty of these, duly noted by the Listening Ears); Club contacts that were *not* Club contacts; inaccurate logging of call-signs, QTH or RST; discrepancies between times, RST and QTH at the two ends of the QSO.

About twenty clubs managed to keep their claimed score intact, and they may rightly congratulate themselves on good operating and accurate logging (also on having watches that did not stop at 1859 hrs.!) The others may well ponder on sundry matters, particularly on whether it is really good practice to *start* a new contact at 1904 and to log it as 1859.

We would once again remind all concerned that this Contest is always monitored, one of the tasks of the invigilators being to check on out-of-hours contacts; these are all noted, and duly deducted from the claimed scores! There was, therefore, no need for one certain Club station to tell another that a QSO the latter was engaged in at 1905 was "unfair." That contact was entered on the black lists of two

1st:	**Crystal Palace & District Radio Club, G8GP**	**(546)**
2nd:	**Coventry Amateur Radio Society, G2ASF/A**	**(539)**
	Stourbridge & District Amateur Radio Society, G3BMY ...	**(539)**

Last year, Stourbridge Radio Society won MCC by a margin of eight points over Coventry Amateur Radio Society. In this year's event, the thirteenth of the Magazine Club Contest series, Stourbridge (G3BMY) and Coventry (G2ASF) tie for second place with 539 points — no matter how we try, we cannot get the thickness of a piece of paper between them! This is the station of G3BMY, with G3HVX operating; they had a half-wave end-fed aerial and, as last year the main tuning control of CR-100 receiver was ganged to the VFO of the transmitter

of the invigilators!

Scoring

As was expected, the larger number of Clubs taking part made non-Club contacts less important than ever before, and their numbers fell off accordingly. (Last year the winner worked 45 " non-Clubs " — this year only 33.) And at this point it is interesting to note that if non-Club contacts had been abolished altogether, and the Contest decided on Club contacts alone, the first twelve places would have been unchanged, except that Stourbridge would have been third instead of equal second.

Stations in large towns made more single-pointers than the others, naturally, but they could not afford to waste too much time doing so. The target, ideally, was to work between 45 and 48 Clubs in each three-hour session; and sixteen stations per hour, with time for searching, would have been a fairly brisk pace. Some of the northern Clubs were not too easily found down in the south — and *vice versa*—particularly during the first two hours. In any case, the fact remains that single-pointers have fallen from 96 in 1954 to 33 in 1958.

Comments

The level of operating earns general praise this year, apart from the usual criticism of the habit of bunching together and causing unnecessary QRM. The density between 1820 and 1860 kc was at least ten times that of the 1880-1900 kc area.

" Comic abbreviations " come in for a lot of criticism, and the natural search for brevity led to efforts like the " Sad Club " up Stevenage way; to two " CARS " and " SAS " ; and to many very puzzling titles, some of which were not adhered to for the whole Contest. This will have to be rationalised next year, so that there is no doubt about a Club's identity.

There seems to be a general feeling that the whole thing should be held one hour or two hours later to give the northern stations more of a chance.

***TABLE I*: POSITIONS AND SCORES**

	CLUB	CALL	Club Points	Non-Club Points	TOTAL POINTS
1.	Crystal Palace	G8GP	513	33	546
2	Coventry	G2ASF/A	510	29	539
	Stourbridge	G3BMY	507	32	539
4.	Harlow	G3ERN	498	19	517
5.	Bailleul	G3IHH	486	26	512
6.	Sheffield	G4JW	441	21	462
7.	Salisbury	G3FKF/A	435	16	451
8.	Northern Polytechnic	G3LPY	420	30	450
9.	Hastings	G6HH/A	420	24	444
10.	Dowty	G3LAM	417	15	432
11.	Cheltenham	G3GPW	402	15	417
12.	Clifton	G3GHN	396	18	414
13.	Grafton	G3AFT/A	360	36	396
14.	Stoke-on-Trent	G3GBU	378	16	394
15.	Stevenage	G3JLA	381	11	392
16.	Nottingham	G3EKW	384	6	390
17.	Gravesend	G3GRS	366	20	386
18.	Medway	G2FJA	354	21	375
19.	Harrow	G3EFX/A	360	10	370
20.	Sutton and Cheam	G3MES	351	17	368
21.	Thanet	G3DOE	351	10	361
22.	Chester	G3FNV	345	9	354
23.	Mitcham	G3LCH	336	17	353
24.	Leeds University	G3LUU	345	6	351
25.	Liverpool	G3AHD/A	324	15	339
26.	Scunthorpe	G8FW/A	321	4	325
27.	Rugby	G3BXF	315	9	324
28.	Leicester	G3LRS	306	16	322
29.	Overstone	G3KQH	306	14	320
30.	Bury	G3BRS	294	15	309
31.	Grimsby	G3IYT/A	291	11	302
32.	Torbay	G3LHJ	288	12	300
	Barnsley	G2AFV	297	3	300
34.	Acton, Brentford & Chiswick	G3IIU	279	16	295
35.	Barnet	G3FFA	276	15	291
36.	Ravensbourne	G3HEV/A	282	8	290
37.	South Shields	G3DDI	285	3	288
38.	RAF Watton	G3MSZ	243	7	250
39.	North Kent	G3ENT	231	10	241
40.	Wellingborough	G3KSX/A	222	14	236
41.	Preston	G3LBU	195	6	201
42.	East Kent	G3LTY	180	17	197
43.	Derby	G3ERD/A	177	13	190
44.	West Lancs	G4BM/A	138	3	141
45.	Ringwood	G3KCJ	129	4	133

Several of *them* remarked that the band was only opening up during the last hour. The sessions were originally fixed with an eye to the TVI problem, but as TV no longer starts at 1900 hrs. (it's on all the time!) we shall probably fix next year's MCC for 1700-2000 GMT.

Now for some individual "shorts": "Heard stations calling ten minutes before time and several minutes after. Band seemed to be opening up just at the end . . . *(Preston)*; "The only MCC station operating from a residential caravan?" . . . *(Ringwood)*; "Top Band is 200 kc wide, not 20" . . . *(North Kent)*; "Are there no Clubs in GW, GM, GI, GC or GC?" . . . *(Barnsley)*; "One or two attempts to cut in on an unfinished QSO were put down to over-enthusiasm rather than deliberate jamming" . . . *(Overstone)*; "Band conditions were the best ever experienced during the Contest" . . . *(Stoke)*; "Use of initials is now getting out of hand—make 'em use full name" . . . *(Grafton)*; "Each year some Clubs will use their ingenuity to reduce their name even more" *(Clifton)*.

Many Clubs, including **Salisbury** and **Hastings,** found that they made 80 per cent. of their contacts by calling CQ (but if *all* Clubs relied on CQ's there would be no contacts at all!)

The G2ASF set-up for MCC putting C.A.R.S. in second place with Stourbridge. Above, the monitoring position, with SWL's Davenport, Phipps, Morden and Stewart, and G3CZS and G3FOH (near right) on the Eddystone 840A receiver. Below, old-timer G2LU at the paddle of the same bug-key that was in use last year! G3HDB is writing up the log, while G2FTK looks on. Coventry Amateur Radio Society have been strong contestants in the Magazine Club Contest for many years now, winning the event in 1946 and 1951.

Operating Factors

Contestants who were really out to win relied on the services of two or three crack operators; many others, who treated the thing as a QSO party rather than as a grim struggle, put all their operators on to give them some experience. In this connection, here is an interesting comment from **Northern Polytechnic**:—"The same two operators as last MCC, with a year's experience and bug keys—hence over double last year's score . . . next year, El-Bugs?" (N.P. were 31st last year and 8th this year, which more or less speaks for itself!)

Harlow say "If the entrants continue to increase in future events, the operators will be kept really busy." **Salisbury** worked with one operator throughout, but with plenty of help in collating and logging. **Cheltenham,** with two operators, used their NFD gear running from car batteries. **Clifton** fielded a team of seven licensed operators and three SWL's. **Stevenage** had five operators available, **Nottingham** two, and **Sutton & Cheam** six.

Medway, who finished with a very fair score, comment thus: "The majority of the operating this year was done by the juniors, G3LXO (aged 18), G3NDY (16) and G3MGL (14)." Thinking of N.P.'s comments, earlier, we shall expect a terrific score from Medway next year . . . **Harrow** found it was "good training for the new Contest operators"; **Scunthorpe** used four operators, with a fifth member working the tea machine: **Acton, Brentford &**

Chiswick put six operators on, three of them quite new to contest work.

Barnet, with six operators, actually suggest that the time should be cut to two hours per session! **North Kent** found certain stations in too much of a hurry—more haste, less speed . . . **Thanet** had trouble with GNF, North Foreland Radio; **South Shields** with Cullercoats; and **Liverpool** with all sorts of coastal QRM.

Suggestions

Among the suggestions made by contestants are two that the organisers will think over very carefully before next year's event. The first is that the whole thing should be one or two hours later; an alternative idea put up by more than one Club is that there should, in future, be only two sessions—possibly of four hours each.

Concerning abbreviations, it is obvious that this has got out of hand. It is hardly practicable to insist on full titles, and one idea which seems sound is that each Club should be allotted a "Code Number" of its own, to be tacked on to the RST report for each QSO. All the Clubs competing this year, together with all Clubs on our regular reporting list, could be allotted a number in our *November* issue, and any others wanting to enter at the last minute could write in and ask for a number up to a week before the first day of the Contest. This, we imagine, should be a workable scheme.

Statistics

Comparing this year's table of positions with the 1957 version, we find the following improvements: **Crystal Palace** (17th to 1st), the most spectacular; **Northern Polytechnic** (31st to 8th); **Hastings** (9th at their very first attempt); **Stevenage** (32nd to 15th); and many smaller movements.

Judges' Remarks

Logs were well kept, on the whole, and the rules were adhered to with small exceptions. One Club, however, completely misread them and worked all their locals for one-point contacts at each of the four sessions! Quite a large number of points had to be lopped off their score, needless to say.

A minor annoyance for the judges was the use of one column for both "QTH" and "QRA," one merely being displaced to the right by half an inch or so in the same column. These Clubs could have been disqualified for failing to read para. 6 of the Rules, as published on p.441 of our October issue, but the judges (fortunately for them) were not in a mood for splitting hairs.

In the typewritten category, the best logs received came from Hastings, Grimsby, Coventry and Rugby, in that order; among the hand-written logs, special mention for Stevenage, Mitcham, Acton, Chester, Clifton, Bailleul and Dowty. With the exception of five or six that were frankly horrible, most of the others were either very good, good or just adequate. Those mentioned above were really outstanding and made checking a pleasure instead of a nightmare!

Thanks also to G3KRC (Barnet) and G3CWW (Mill Hill) for valuable check logs. They each worked nearly forty Clubs, during the second week-end.

TABLE II

ROLL OF HONOUR : 1946-1958

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
1956	Stourbridge	Bailleul	Harlow	36
1957	Stourbridge	Coventry	Aldershot	39
1958	Crystal Palace	Coventry / Stourbridge	—	45

Late Entries

It is a matter for much regret that the logs from the following Club stations were received too late for checking, and could not therefore be taken into Table I: Aldershot, G3KMO, claimed score 484; Norwich, G3JGI/A, 331; Surrey (Croydon), G3EUE, 204; Wirral, G3CSG, 436. And G8FC, R.A.F. Locking, understood to be participating, had not put in a log at all by the time this had to go to press.

Clubs were given nine full days to produce their logs, and 45 were received on time. To allow this, the judges could only give themselves five days (which included a week-end, as well as the normal routine work) to go through all the business of checking and producing this story, with the photographs. It will, therefore, be appreciated that it was quite impossible to take in late entries, or defer the work of checking to accommodate possible latecomers. We are very sorry, but there it is—and just as disappointing for us when we know that a total of 50 Clubs could have been shown in Table I.

Finally, thanks, as ever, to all those who participated and made such a success of this year's "MCC." Many will have gained valuable experience and learnt some lessons which they will be eager to make use of in next year's event. For the 1959 Contest we foresee an even larger entry and still keener competition.

All Club secretaries are asked to note that the deadline for the next Activity Reports is **Friday, January 16.** Address them to "Club Secretary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. And to round off this report, a Happy New Year to all Club secretaries, officers and members, whom we hope will continue to flourish in 1959.

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SALE: AR88D, first-class condition, handbook, £50; R1155, p/pack, 6V6 output stage, handbook, £5 ; Bendix RA10/DA, with control box, £2 ; SCR-522 Tx/Rx, 30/-; RF-24, RF-25, 5/-; Xtal calibrator, 1000, 100, 10 kc, brand-new, £1 ; BC-455, 6-9.1 mc, brand-new, control box, 15/-; RU-19 Rx, 200 kc-14 mc, less coils, 8/-.—K. E. Laskari, 79a Woodstock Avenue, N.W.11. *(Tel.: SPE. 7536*, after 7 p.m.).

COMPLETE STATION for sale: CR-100 rebuilt by Webb's; Minimitter converter, Panda Cub and aerial matching unit; £80.—Chris Lovell, 17 Albion Mews, London, W.2.

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WANTED: Damaged or faulty R107, £3, plus carriage; UM3 or similar output transformer. —G3MIS, Three Chimneys, Staplesbarn Lane, Henfield, Sussex.

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SMALL ADVERTISEMENTS, READERS—*continued*

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AR88D for sale, perfect condition, best offer, please?—G3GDQ, 21 Love Lane, Tottenham, London, N.17.

BC-348, £8. 18 Set, 25/-. Absorption wavemeter, 7/6. WANTED: 15- and 10-metre Tx, bug key.—Denman, 5 Testcombe Road, Gosport, Hants.

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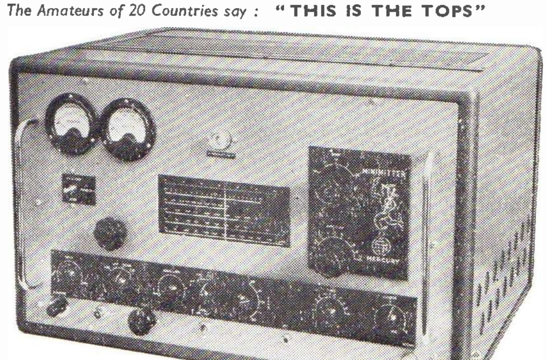

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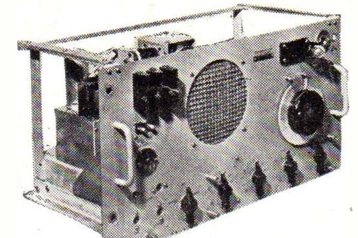

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