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EXCLUSIVELY FOR THE RADIO EXPERIMENTER & TRANSMITTING AMATEUR

VOL. VII No. 5 JULY 1949

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SHORT WAVE MAGAZINE

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THE *SHORT WAVE LISTENER* ASSOCIATED WITH THIS MAGAZINE IS SPECIALLY FOR THE RECEIVING ENTHUSIAST

EDITORIAL

Rejoinder

Those who may spare time to glance over this space will have seen our comment last month on the subject of the BBC's operations in the 7 mc band.

That Editorial has inspired official replies from both the BBC and the GPO. The gist of these is given below.

From the BBC :

> "The question was raised in the House of Commons recently, and the Assistant PMG pointed out that no amateur wavelengths had been transferred for the purposes of supplementing broadcasts in the Russian language.
>
> "The wavelengths on which the BBC carries out its transmissions are allotted to this Corporation by the GPO, and we are, therefore, not in a position to comment on the manner in which they are allotted."

From the GPO :

> "Of the frequencies mentioned in your Editorial in the *Short Wave Magazine* for June, 7120 kc has been used for Russian transmissions since March 24, 1946, and for other purposes since 1942. Neither of the other frequencies you mentioned is being used by the BBC for the Russian service.
>
> "The Postmaster-General is, of course, well aware of the difficulties arising out of the operation of transmitters in bands other than those allocated to them . . . he is doing what he can to minimise these difficulties which . . . are not peculiar to use of the amateur bands by broadcasting stations. Conditions in the field of international radio are still very far from normal . . . it is doubtful whether any real improvement will be possible until . . . the Atlantic City Conference is fully implemented.
>
> ". . . the Postmaster-General will continue to keep the matter under review and as soon as conditions enable him to take some action with a view to improving the position, he will do so."

From all this, it is clear that the BBC is not responsible for its frequencies; that the GPO can at present do nothing to improve the position; and that amateurs are not alone in having their bands occupied by other agencies.

Austin Forsyth
6BFO

Single Sideband Working

Some Practical Considerations

By **H. C. WOODHEAD (G2NX)**

Any method or system new in the technical sense is always of great interest to the progressives in the Amateur Radio field. The principles of Single Sideband operation are certainly not new in commercial telephony working, but SSBSC has not as yet aroused much interest in amateur circles. Here is a useful article for those who would like to explore the possibilities.—Ed.

THERE is no need to stress here the advantages of Single Sideband Suppressed Carrier working over the more normal DSB methods as used in Amateur Radio. These have been covered adequately by G3VG (*Short Wave Magazine*, July, August, 1948) and it is not proposed to recapitulate them here, though it may presently appear that it is possible to eliminate some of the disadvantages which are normally held to weigh in the balance against SSB systems.

It would, perhaps, be as well at the outset to make clear the distinction between Single Sideband Suppressed Carrier and Double Sideband Suppressed Carrier. The present article will be concerned entirely with the former.

In the case of DSBSC, as distinct from SSBSC, the carrier must be reinserted at the receiving end *at the correct frequency and phase* or the resulting speech will be so distorted as to be unrecognisable.

For this reason alone, therefore, it is extremely unlikely that the system suggested by G3VG, as a simplified system of SSBSC but being in fact DSBSC, would be adopted as suitable for amateur operation.

In Fig. 1 are shown diagrammatically the four different conditions to which it will be necessary to refer in the course of this discussion. At (*a*) is the Double Sideband system normally employed by the amateur. In this example the carrier is shown situated at 50 kc and the sidebands extent from 47 kc to 53 kc, occupying a space in the high frequency spectrum of 6 kc but having an audio transmission band of 3 kc. In (*b*) the case is much the same, except that no carrier is transmitted and this must be reinserted at the receiving end correct both in frequency and phase.

In (*c*) both the carrier and upper sideband have been removed and for reception the carrier must be reinserted, but there is some latitude regarding the frequency and an error

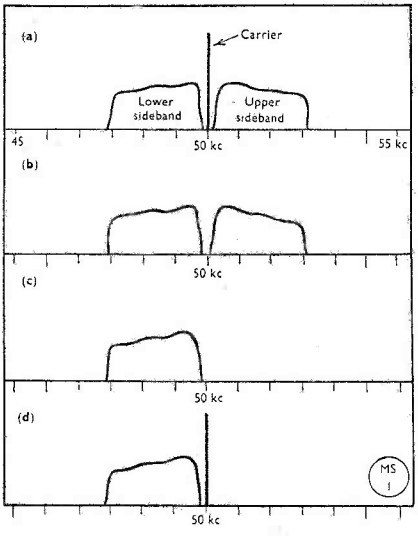

Fig. 1. Showing four different types of telephony transmission. (*a*) Double sideband, with carrier ; (*b*) Double sideband, carrier suppressed (DSBSC) ; (*c*) Single sideband, carrier suppressed (SSBSC) ; (*d*) Single sideband, with carrier.

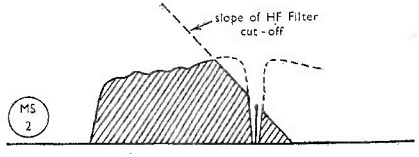

Fig. 2. Showing how the form of an asymmetric sideband signal may be determined by the shape of the HF filter response.

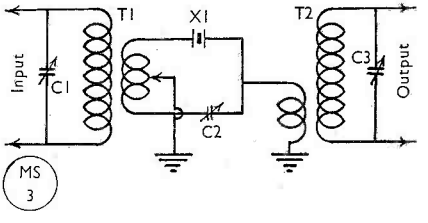

Fig. 3. Crystal filter as used in a communications receiver. T1, input transformer tuned to pass-frequency ; T2, output transformer tuned to pass-frequency ; C1, tuning capacity for T1 ; C2, Balance or phasing condenser ; C3, tuning capacity for T2.

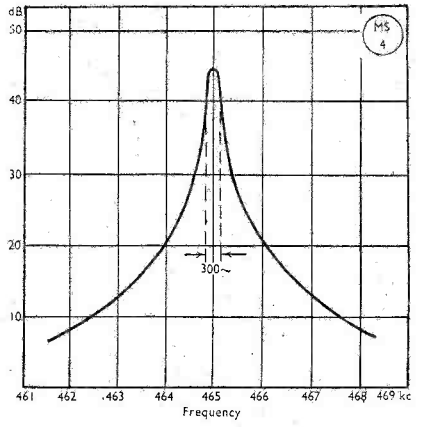

Fig. 4. Typical response curve for circuit shown in Fig. 3.

of perhaps 100 cycles may not render the speech unintelligible, though, of course, the speech frequencies will all be translated up or down by the amount of the error and the quality will suffer accordingly. For example, a transmitted audio frequency of 1,500 cycles would be received as 1,600 or 1,400, depending on which side of the correct frequency the reinserted carrier erred by 100 cycles. In (*d*) is shown a single sideband complete with normal carrier. This can be taken on a normal receiver and is barely distinguishable from (*a*).

In actual practice combinations of these four conditions are often encountered, which

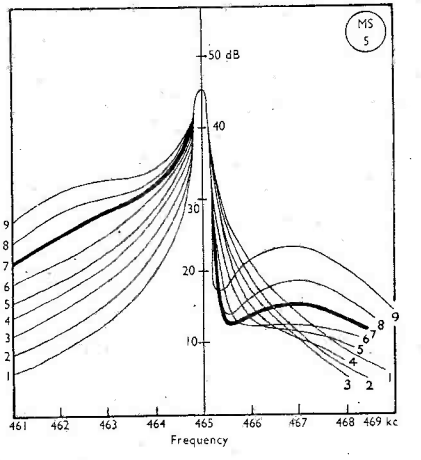

Fig. 5. Curves 1-9 obtained by decreasing the value of C2 in Fig. 3 from the balance condition.

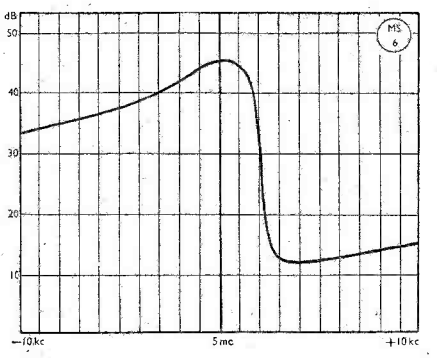

Fig. 6. Equivalent curve 7 in Fig. 5 for a 5 mc crystal, drawn to an expanded frequency scale. Note that the upper cut-off is some 20 dB for 400 cycles.

are so close to one of them as to be barely distinguishable from it. Such a case, for example, is the Single Sideband Pilot Carrier, which is between (*c*) and (*d*) but more nearly resembles (*c*). On the other hand, Asymmetric Sideband, shown diagrammatically in Fig. 2, is a combination of (*a*) and (*d*), and must be considered as a separate case.

Now the methods of producing the condition shown in Fig. 1 (*c*) so far adopted have been:

(1) By removing the unwanted carrier by balancing and the unwanted sideband by filtering;

(2) By removing the unwanted carrier by balancing and the unwanted sideband by phasing.

Method (1), as far as the author is aware, has not yet been adopted for amateur use because of the difficulty encountered in constructing a suitably narrow filter to remove the unwanted sideband.

Method (2) appears to be meeting with some success in the United States, though the author has never yet worked a W using this system, nor has any other amateur of his acquaintance. It does not appear to have met with much support on this side of the Atlantic due, presumably, to its complexity. It depends for its operation on a network capable of producing a 90-deg. phase change equally in all frequencies in the audio range of, say, 100 to 3,000 cycles. Such a network is quite possible of construction, though it is difficult to maintain the output in exact quadrature over the entire audio band.

The Crystal Gate

It is proposed to explore further the possibilities of Method (1) for amateur use by consideration of a crystal filter of the type used in the average communications receiver for so-called "single-signal" reception.

The arrangement for such a filter is shown in Fig. 3, where both the input and output circuits are tuned to the resonance frequency of the crystal and the condenser C2 is adjusted to have the same value as the inherent capacity of the crystal in its holder. Thus, for any frequency except the narrow pass-band of the crystal, the circuit is balanced and no output results. In the pass-band the reactance of the crystal branch of the circuit is very much reduced and so the bridge is unbalanced. The response of such a filter is shown in Fig. 4, from which it will be seen that the band width which may be expected from a 465-kc filter may be of the order of 300 cycles. This figure can be varied to some extent by adjustment of the impedances of the input and output circuits, but it is obviously too small to be of any use as a sideband filter. If, however, such a filter is constructed with a crystal of ten times the frequency, the pass-band would be about ten times as great. So a 5-mc filter would give a pass-band of the order of 3 kc, which is something like the required figure, but the sides of the curve are still not sufficiently steep to cut off one sideband and leave the other intact.

There is, included in the average communications receiver, a "phasing" control which is none other than the condenser C2 of Fig. 3 ; this has the effect of modifying the response as shown in Fig. 5 or of tilting it the other way, according to whether C2 is increased or decreased on the central balance position. One of these curves (No. 7) for a 5 mc crystal, has been plotted to a larger frequency scale in Fig. 6 and it will be seen that a circuit so adjusted offers a discrimination of some 20 dB for 400 cycles on its steep side and the band width on top is at least 3 kc.

Such a filter can be used to produce an asymmetric sideband, as shown in Fig. 2, from which the carrier can be balanced out. The further inclusion of an audio filter to remove all frequencies below, say, 200 cycles would leave only a single sideband as shown in Fig. 7.

Selection of Suitable Crystals

The components of the circuit of Fig. 3 are a matter for some experiment but to obtain a sharp cut-off the input and output circuits of the crystal bridge should have an impedance of only a few thousand ohms. It is for this reason that T1 is a step-down transformer with its primary tuned and T2 is a step-up with its secondary tuned. The ratio will, of course, depend on the other circuits with which the filter is required to work. It is not possible to give precise constructional details as these will depend on the frequencies of the crystals which may be available.

In the case of one experimental filter for use with a crystal of 5·655555 mc, the values were as follows :

T1—*Pri.* = 30 turns 28 SWG DSC, ⅜ in. dia. former
** *Sec.* = 15 turns 28 SWG DSC, ⅜ in. dia. former**
T2—*Pri.* = 8 turns 28 SWG DSC, ⅜ in. dia. former
** *Sec.* = 30 turns 28 SWG DSC, ⅜ in. dia. former**
C1 = 100 $\mu\mu$F variable condenser
C2 = 30 $\mu\mu$F variable condenser
C3 = 100 $\mu\mu$F variable condenser

In order to improve the discrimination against the unwanted sideband still further, it is preferable to have two of these filters in cascade. They may be arranged as two parts of the same filter or they may be inserted separately in two successive valve anode circuits. In any case their effect will be additive. By this means the discrimination may be increased to 40 dB and the transmission may be regarded as truly SSB, though the addition of the second crystal may introduce fresh difficulties.

Unless the two crystals are identical in frequency the two response curves will not

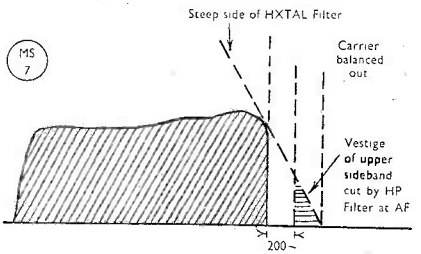

Fig. 7. Single sideband suppressed carrier operation produced by a combination of balanced modulator, crystal filter and high-pass audio filter.

coincide and the maximum discrimination will not be obtained. But identical crystals are not easily come by and in the case of three in the possession of the author, all calibrated as 5·655555 mc, there are differences of some 400 cycles. The ideal would be two identical crystals for the filters and one about 1,500 cycles away for use as the carrier oscillator though it will probably be found possible to trim the oscillator crystal by this amount to bring it to the correct position for the carrier.

There is another alternative in the band-pass circuit of Fig. 8 which uses two crystals with slightly different frequencies to obtain a band-pass with steep sides as shown in Fig. 9 and while 5 mc is quite a suitable frequency for the narrow single-crystal circuit, it is probable that for the wide-band circuit of Fig. 8 a lower frequency of the order of one or two megacycles would be required. The choice of type of crystal filter and the frequency employed will depend on the availability of suitable

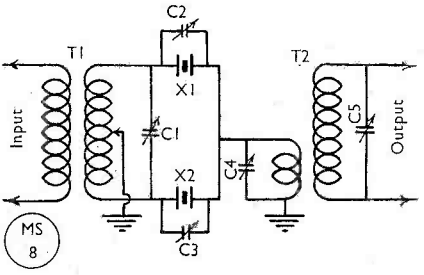

Fig. 8. Band-pass crystal filter using two similar crystals with frequencies differing by a few hundred cycles. T1, input transformer tuned to pass-frequency ; T2, output transformer tuned to pass-frequency ; C1, tuning capacity for T1 ; C2, C3, phasing condensers, about 30 $\mu\mu$F ; C4, C5, tuning capacities for T2.

crystals and the best method is probably to choose some frequency around 5 mc (known to have been commonly used in ex-Service equipment but of no use for amateur bands and therefore available for a few shillings), and to obtain as many of them as possible in the hope of picking three that suit the requirements.

To sum up, then, the receiver type crystal gate offers considerable possibilities for use as a filter for SSB working provided a frequency about 5 mc is chosen and the phasing condenser is adjusted to give the steepest side of the response curve to coincide with the carrier. Alternatively, a band-pass crystal filter may be used at a lower frequency. Either of these filters is operated in conjunction with a balanced modulator for removal of the carrier and a high-pass audio filter to remove the lower frequencies which remain in both sidebands.

It is hoped in a subsequent article to describe the construction of an SSBSC Drive Unit for use on 80, 20 and 10 metres based on the principles outlined above.

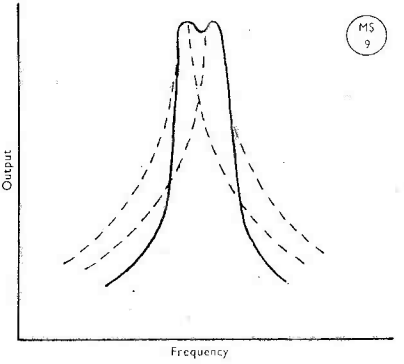

Fig. 9. Response obtained when using two crystals of slightly differing frequencies in the circuit of Fig. 8. Curves for the individual crystals are shown dotted.

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If your call appears below, it is because we are holding QSL card(s) for you and have not got an address for mailing. Please send a large stamped, self-addressed envelope, with name and callsign, to BCM/QSL, London, W.C.1., which is a full and sufficient address for our QSL Bureau from any part of the world. And if you would like your call to be listed in "New QTH's", please mention that at the same time. It ensures eventual appearance in the *Radio Amateur Call Book*.

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ZC6 QSL COLLECTION

We are informed by 4X4BX, as QSL manager of the Israeli Amateur Radio Club, that he holds about 300 cards for ex-ZC6 operators whose incoming QSL's have now fetched up in Tel-Aviv ; as these ex-ZC6's (many of whom were under cover) have spread out all over the world, 4X4BX asks that the *eighty* operators concerned should send their ZC6 call, present QTH and an IRC to the QSL Manager, P.O. Box 4099, Tel-Aviv, Israel, when the cards will be forwarded.

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NBFM Adaptor Unit

Applicable to Existing Equipment

Designed and Described by **G4LU**

Those who normally operate with NBFM on Ten are always enthusiastic advocates of its use. Here is an adaptor unit which can be incorporated into existing RF equipment; it can therefore be built and tried experimentally without seriously disturbing the main transmitter.—Ed.

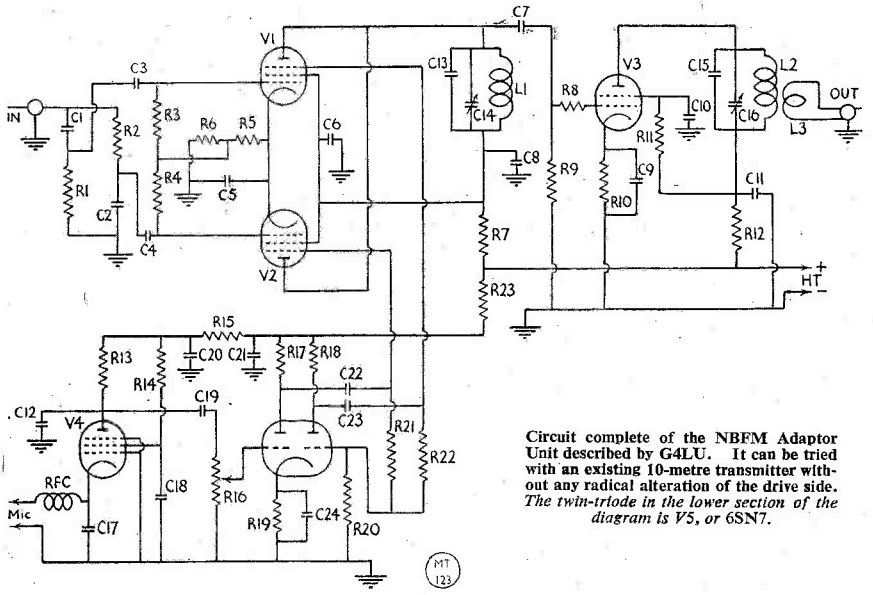
THE merits and demerits of NBFM have been adequately dealt with in previous articles which have described complete NBFM exciters, but whereas these articles have included a VFO or crystal drive the present one describes a unit which can be inserted between an existing VFO and the driven portion of the transmitter. With this arrangement the stability of the mean carrier frequency remains unaffected and is determined solely by the stability of the VFO itself or the crystal drive in use.

The writer's NBFM unit was designed to work with a VFO at 3·5 mc, which had an output impedance of 75 ohms, and which was normally coupled by means of coaxial cable to a following broad band exciter. The NBFM adaptor can remain in circuit permanently even when the transmitter is used with AM on the lower frequency bands, it only being necessary to break the microphone circuit.

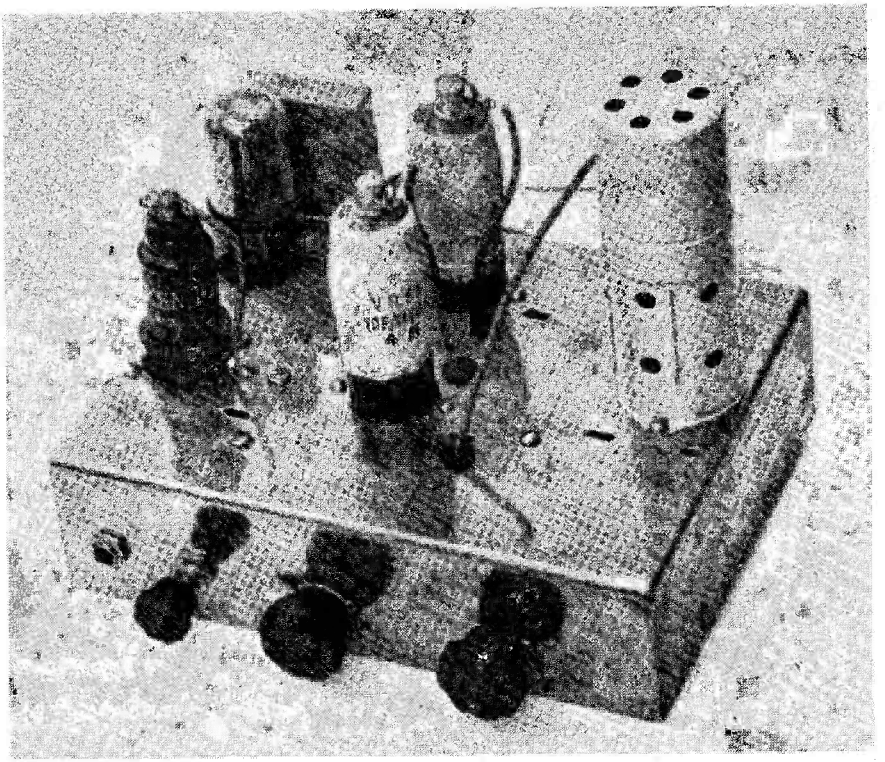
The phase modulation system is employed, together with simple audio-frequency correction in the microphone amplifier stage, to give the equivalent of frequency modulation. No originality is claimed for the circuit except in so far as was required by the particular valve types used, which in this case happened to be types available from ex-Service equipments. The phase modulator uses a pair of SP61's (VR65-CV1065) and the output amplifier an EL32 (VT52-CV1052). The audio line is 6J7 (VT74-CV1074) microphone amplifier and 6SN7-GT (CV181-CV1986) phase inverter.

The Phase Modulator

The 3·5 mc input is fed to the two SP61 grids *via* a phase-splitting network comprising C1, C2, R1, R2, the function of which is to produce a phase difference of approximately 90 deg. between the two grid voltages. The output of each valve is then separately amplitude modulated by means of audio voltages applied to the suppressor grids of the SP61's. The two audio voltages are, of course, supplied 180 deg. out of phase by the 6SN7 phase inverter. The outputs of the two modulator valves are combined in the common



Circuit complete of the NBFM Adaptor Unit described by G4LU. It can be tried with an existing 10-metre transmitter without any radical alteration of the drive side. *The twin-triode in the lower section of the diagram is V5, or* 6SN7.



General view of G4LU's NBFM Adaptor, described in this article.

anode tuned circuit resulting in a phase modulated signal.

Table of Values

Circuit complete of G4LU's NBFM Adaptor

C1, C2, C3, C4, C7 = 200 $\mu\mu$F mica
C5, C6, C8, C9, C10, C11,
C17, C22, C23 = 0·01 μF mica
C12 = 500 $\mu\mu$F mica
C13, C15 = 50 $\mu\mu$F mica
C14, C16 = 100 $\mu\mu$F variable
C18, C19, C20 = 0·1 μF paper
C21 = 0·5 μF paper
C24 = 25 μF, 25v wkng.
(***All condensers, except C24, 350v wkng.***)
R1 R2, R5 = 200 ohms, ½ watt
R3, R4, R9 = 100,000 ohms, ½ watt
R6 = 3,300 ohms, ½ watt
R7 = 2,200 ohms, ½ watt
R8, R11 = 100 ohms, ¼ watt
R10, R12, R19 = 2,000 ohms, 1 watt
R13, R16, R20 = 0·5 megohm
R17, R18 = 47,000 ohms, ½ watt
R21, R22 = 0·25 megohm, ½ watt
V1, V2 = SP61
V3 = EL32
V4 = 6J7
V5 = 6SN7GT
L1, L2 = 29 turns, 22 SWG enamelled, 1 in. diam.
L3 = 4 turns over-wound on L2
RFC = 2·5 mH

There is a slight degree of amplitude modulation present in the output of the modulator stage, but this is removed by the action of the output amplifier and the subsequent doubler stages which are normally run under Class-C conditions and perform the limiting function very efficiently. Since the SP61 has a sharp cut-off control grid characteristic and an extended cut-off suppressor grid characteristic, different static values of grid bias must be used on the two electrodes. This point is taken care of by returning the control grid circuit to a point above earth potential on the cathode resistor chain. Approximately two volts bias is supplied by the cathode resistor to the control grid circuits and about 30 volts bias to the suppressor grids. Grid leak bias is also provided by R3, R4, to enable the valves to work under Class-C conditions when the RF drive is applied.

Approximately 8 to 10 volts RMS RF voltage is required by each SP61 valve and can be supplied by a VFO or crystal drive capable of delivering 1½ to 2 watts into a 75-ohm load. In the event of the station VFO working on 1·6 mc and not 3·5 mc it

will be necessary to double the values of C1 and C2 in order to retain the desired phase difference between the two SP61 control grid voltages. It will also be necessary to change the anode tuned circuits to cover the lower frequency.

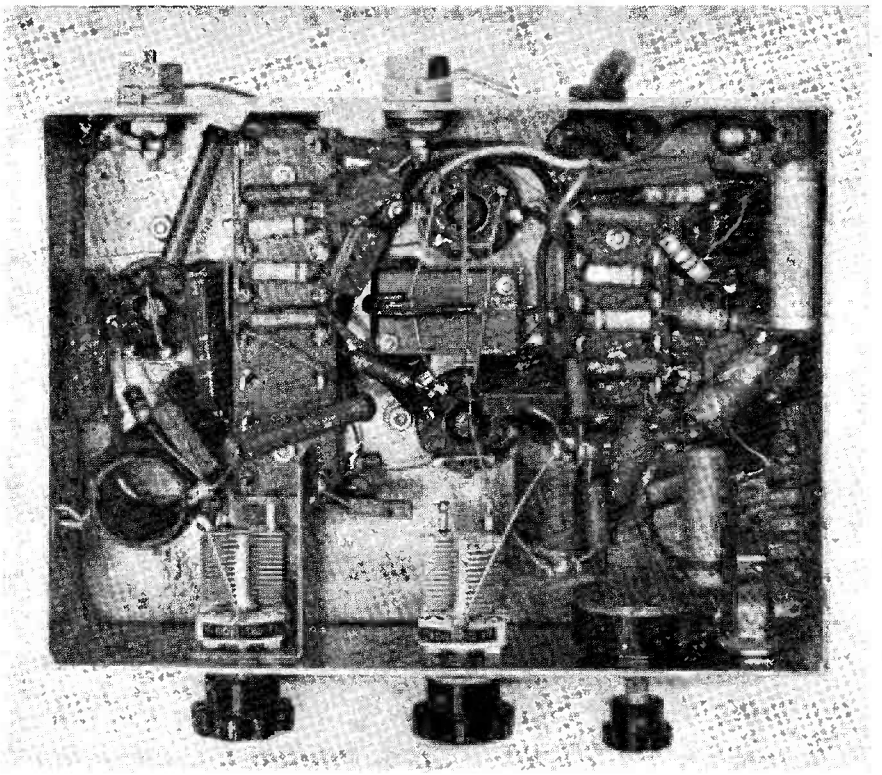
The output amplifier is quite straightforward and no difficulty should be experienced with this stage provided a grid stopper resistance of about 50 to 100 ohms is put in close to the grid terminal of the valve.

The Audio Stages

The input amplifier is designed for use with a carbon microphone, but no energising battery is required since the microphone is in the cathode circuit of the valve, the control grid of which is earthed. This circuit is capable of good quality reproduction, especially when used with some of the American Service types of microphone inserts. Obvious changes will be necessary if it is desired to use a crystal or other type of microphone.

An RF filter is included in the microphone input circuit to prevent unintentional FM from rectified RF when the transmitter is used on AM. C12, which is effectively in parallel with the input amplifier load resistance, provides the falling audio frequency characteristic necessary to transform the phase modulation to frequency modulation. The phase inverter uses a conventional circuit which provides two approximately equal voltages, but of opposite polarity, to the modulator valves.

The Adaptor can be comfortably accommodated on a chassis 8 in. by 6 in. by 2 in., but if it is desired to incorporate a power supply a somewhat larger assembly will be necessary. The power supply requirements are moderate, being about 45 mA at 250 volts for HT and 2 amps at 6·3 volts for the heaters. The unit as described and illustrated has been used for a number of QSO's on ten metres and to date only one adverse report, due to overswing, has been given.



Underneath the NBFM unit, showing construction and arrangement of parts. Note the shield at the side of the amplifier tuning condenser, left.

Quad for Ten

A Practical Design

By **B. C. COOPER (G3TC)**

As a highly directive system which is easy to build for the ten-metre band, the Cubical Quad has naturally attracted a good deal of well-merited attention. This is an interesting article on the design and erection of such a system.—Ed.

SOME months ago the writer was astonished to hear, whilst in contact with a W station, that he was using a " Cubical Quad " aerial. This was the writer's introduction to a system with a name reminiscent of the geometry class.

Interest was stimulated by a note in "VHF Bands" in the November, 1948, issue of the *Short Wave Magazine*, that a two-metre Quad 25 ft. high had given a performance equal to a four-element beam at 50 ft. If this performance could be duplicated on Ten here was an aerial with possibilities.

The necessarily rather sketchy information in the article referred to was gradually supplemented with further details garnered during the course of many contacts with operators in the States, until finally the basis for an experimental design emerged.

Design

The sketch shows the main features of the structure. The beam consists of two squares, a radiator and reflector, each square containing four quarter-wave sides 8 ft. 3 in. long, lying in the same plane and spaced one quarter-wave from each other. 16 SWG aluminium wire was used for lightness, but this is very susceptible to the weather, and corrodes quickly. Copper wire, although somewhat heavier, is a better proposition. The supports for the wire were 7-ft. lengths of bamboo cane, obtainable from any market gardener, and cut to size. A bakelite tube 8 ft. 5 in. long and 1½ in. in diameter was utilised for the boom. Half-inch holes were drilled an inch from each end, and ½ in. to the rear and at right angles to the original holes a further set was drilled. The bamboo canes were then slotted through and bound together with wire at the centre to provide good support for the elements. Small pieces of perspex at each tip of the canes served to insulate the wire from the frame. The canes from tip to tip when bound together measured 12 ft.

In the original version, the radiator was fed with 70-ohm coax. cable. At a quarter-wave spacing the proximity of the reflector to the radiator has little effect on the impedance at the feed point of the latter. The reflector was made 5 per cent. longer than the radiator, the additional length taking the form of a stub at the bottom of the reflector. A shorting bar was moved along the stub until maximum forward gain was indicated on a field strength meter.

Mounting

The Quad was mounted on a 16-ft. light wooden mast, subsequently reduced to 12 ft. to facilitate adjustment. The whole array was so light that it could easily be raised into position with one hand.

Results

Comparative checks against a dipole 27 ft. high and aimed in the same direction as the Quad showed a spectacular gain on reception. On changing over to transmission the results on reception were more than confirmed. A series of tests were undertaken with stations in the States, and the average improvement by the use of the Quad could be conservatively rated at two S points. On one QSO a W7 remarked that the Quad was putting the only G signal through to the West Coast on the top end of the ten-metre band. In the course of a few days many reports were received that the system was radiating the strongest signal into W on the HF end of the band. The input for these tests was 75 watts to a pair of 807's.

Frequency Sensitivity

The original version was found to tune very sharply on the resonant frequency, and at any wide departure from this frequency the system would not load. To overcome this defect, and in order to obtain wide-band coverage the original radiator was replaced with 300-ohm cable and fed with the same material on the folded dipole principle. This method was eminently successful—the performance of the original radiator on the peak frequency was preserved with the added advantage that the tuning of the whole system was reasonably flat over the entire ten-metre band.

Stub Tuning

While the Quad was down for this modification opportunity was taken to remove the shorting bar from the tuning stub on the reflector, replacing it by a 50-$\mu\mu$F variable condenser. Field strength measurements showed a marked increase in forward gain at the optimum setting of the condenser.

Unfortunately, at the writer's location, with an aerial only 16 ft. high, radiation is restricted to the north-west ; this caused a misinterpre-

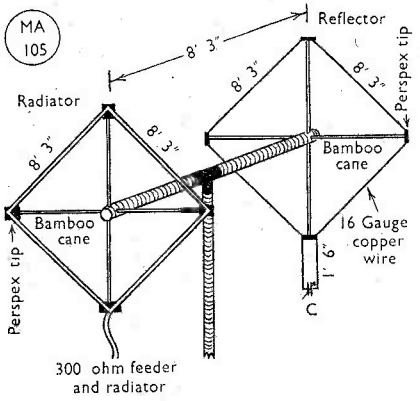


Fig. 1. Dimension and mounting details for the Ten-Metre Cubical Quad described by G3TC.

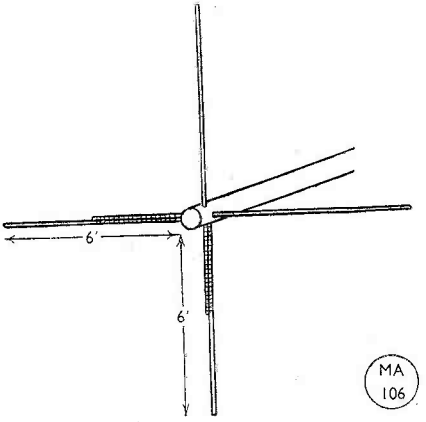


Fig. 2. The method of fixing the bamboo canes, supporting the elements, to the ends of the spacer boom.

tation of band conditions, which suggested that Ten had closed down for the summer so far as North American contacts were concerned. As it cannot be claimed to improve the appearance of a garden, the Quad was prematurely dismantled !

It can be said, however, that during the period the Quad was in operation it easily outperformed every other type tried here on 10 metres, and the writer firmly believes in its practical value as an effective radiating system.

A Quad constructed on the lines suggested here has several attractive features :

(1) Cheapness.
(2) Simplicity of construction.
(3) Ease of erection.
(4) Outstanding performance.

If intending constructors propose erecting the array high in the sky they would be well advised to strengthen the bamboo frames with an additional length of cane to cross-brace the centre. It may be possible to employ some alternative material for the frames, but it will be difficult to find a substitute of equal weight having the same strength.

Adapting High-Cycle Transformers

Surplus Unit Application Note

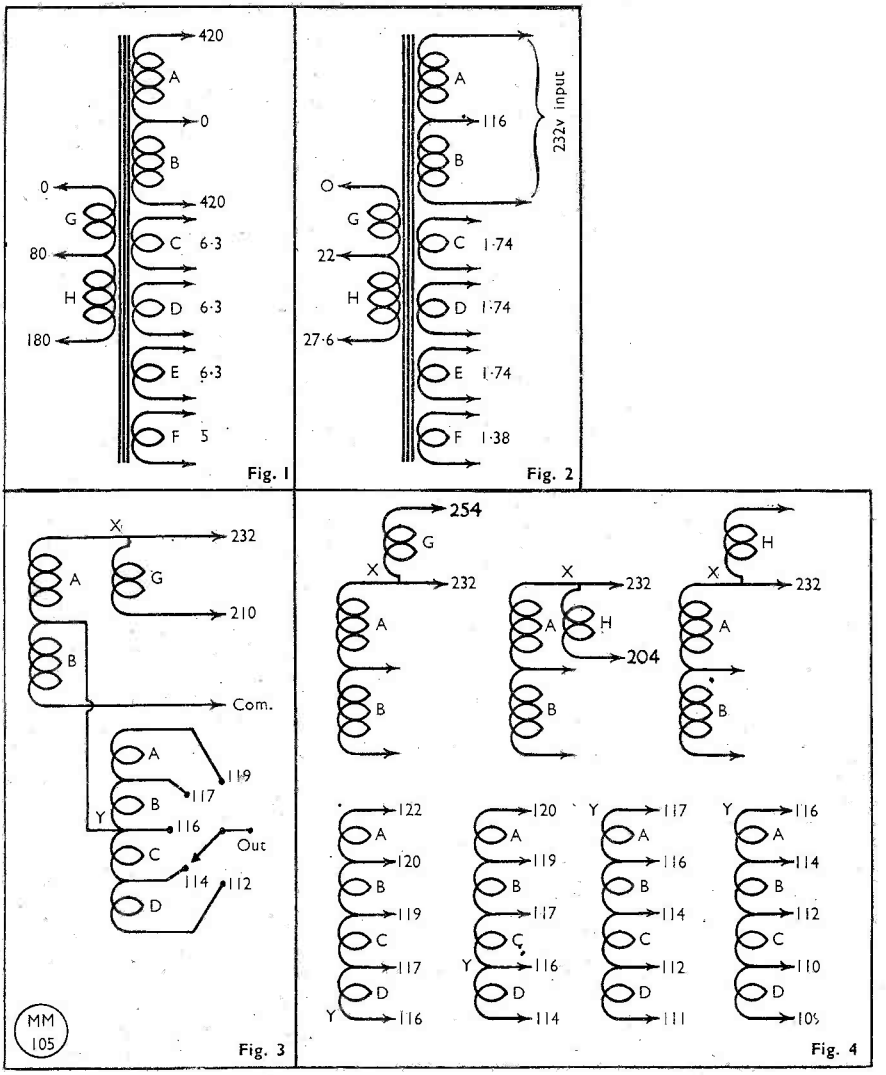
POWER transformers from ex-Government surplus equipment designed for high mains frequencies are often discarded. Use has been made of two types by the writer, which are discussed below.

The first was obtained from a surplus power unit which supplied both EHT and HT voltage to some radar equipment. The transformer is marked TDS25M but the more usual "section of ref." is not visible.

The mains supply (210 volts 50 cycles at the writer's QTH) is connected to the outer points of the winding marked 550-0-550. The voltage from the normal 80-volt primary winding is 14 volts and each of the four heater windings gives approximately 1 volt. These windings and the original 80 volts primary are connected in phase so that output voltages of 14, 15, 16, 17 and 18 are obtained. This output is rectified by the usual type of surplus selenium rectifier rated at 1 amp and costing 5s. and is used either to charge a 12-volt accumulator or to operate ex-Government surplus relays of up to 1,000 ohms.

The second type was obtained from an Admiralty modulator unit type W6331. The transformer is Admiralty pattern W5465. The normal ratings and connections are shown in Fig. 1. The voltage obtained from each winding on application of 232 volts to the normal HT winding is shown in Fig. 2. By connecting the various windings in the correct phases the auto transformer arrange-

ment of Fig. 3 is arrived at and is used to operate a BC342 receiver from the 210 volts 50 cycles supply. A range of alternative connections (Fig. 4) of the primary winding sections G and H, and the heater sections C, D, E, F about the points X and Y respectively, can be made to obtain an output most suited to the local prevailing mains voltage. An aerial coupling switch from a BC375 tuning unit is modified by fitting stops (and an additional location slot for an "off" position, if required) for the output voltage adjustment.



Sketches showing details of the Admiralty transformer type W.5465, with alternative connections to give different voltage outputs. The power units discussed in the accompanying notes are amongst those designed for high mains frequencies, and as such cannot be used to give the rated outputs on a normal 50-cycle supply. By connecting the windings as suggested in the text and shown above, they can however be adapted for a number of useful purposes.

Cleaning Up the Speech

Discussing Amplifier-Modulator Design

By **J. A. PLOWMAN (G3AST)**

As the author rightly remarks, much of the telephony to be heard on the bands to-day is not nearly as good as it could be. Here he describes a speech amplifier-modulator, in two units, which will be of great interest to all those striving for high-fidelity phone.—Ed.

COULD you disconnect your speech amplifier from your modulator and listen to a symphony concert without demur? The author can, and very often does. Ask yourself this question, and if your answer is in the negative, then it is time you were busy in the speech section of your rack!

A great deal has been said and written about the high efficiency of modulators, but it seems that unnecessary stress has been laid upon this fact.

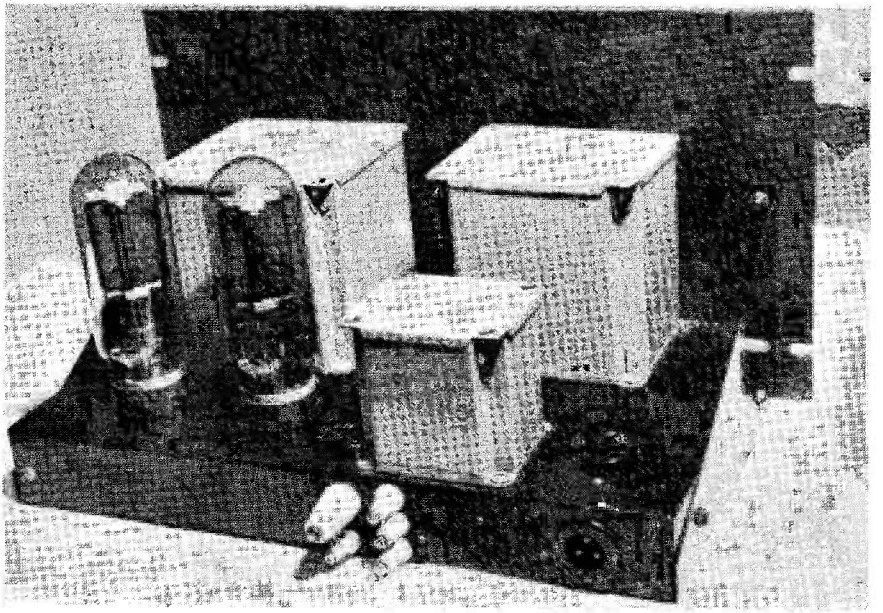
While we all appreciate that some amateurs are not very fortunate as regards facilities, it is felt that insufficient data have been published on modulator design.

The author's own requirements were found to be thus:

(1) A power capability of 50 watts audio; 75 watts to be available with little alteration.
(2) Wide frequency range with level response.
(3) Low harmonic distortion.
(4) Elimination of circuits critical or difficult to adjust.

If the modulator was to be constructed to these rather exacting standards, the choice of microphone needed some thought. Of those available on the market the velocity type was dismissed as being rather too expensive, leaving a choice of condenser, crystal or moving coil. As matching problems present themselves with a moving coil microphone, and the condenser type needs such a tiresome polarising voltage, a crystal microphone was chosen. The type in use is a D104. Some amateurs have little time for this model, but it is interesting to note that the results from these tend to vary more than somewhat. The author was very fortunate in this respect.

Considering the speech system as a whole it was hoped that no transformers would need to be used except for the modulator itself, but calculations showed that the speech amplifier



The modulator unit designed by G3AST, using 845's. The heavy components are mounted towards the front panel.

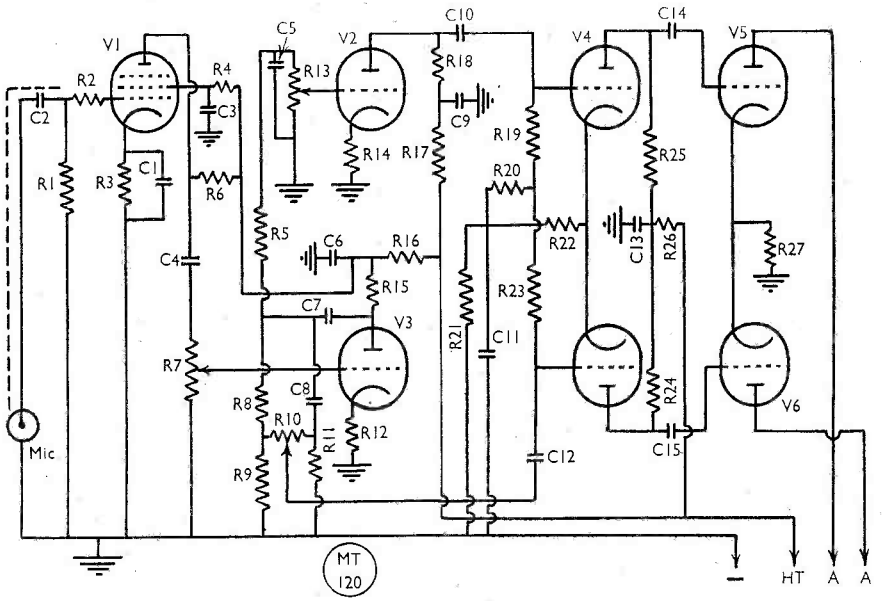


Fig. 1. Circuit of the equipment designed by G3AST to give high fidelity with full modulation. Details are discussed in the text, and G3AST shows that average amateur quality can be much improved. *Note: In this diagram, the grid returns for V5, V6, should be completed with* 100,000 *ohm resistors, taken from each grid to earth.*

output valves could not realise the required grid-to-grid swing for the modulators without a coupling transformer.

Choice of Modulator Valves

Tetrode modulator valves were dismissed owing to (*a*) excessive harmonic distortion, and (*b*) critical anode load. High amplification Class-B triodes were also written off as (*c*) they have to be run at constant maximum level for distortion to be a minimum, and (*d*) the widely differing current demands on the power supply are most severe.

The remaining and really logical choice for "hi-fi" (as the Americans would say for high fidelity) is therefore low *mu* triodes, preferably running Class-A. These have the advantages of introducing practically no distortion (except at abnormally low anode loads); impose a constant drain on the HT supply; are not in the least critical in respect of anode load (above a reasonable figure); Class-A triodes are not prone to parasitics on peaks; are very easy to adjust (there are no adjustments !); and they will work first time.

In fact, there are very few valves suitable for this service, as a long search through the catalogues showed.

The obvious choice is the RCA 845; there is a British equivalent, the STC 4242A, replacing the STC 4211E. These valves have 10-volt heaters, graphite anodes—and lend a very professional appearance to the rack ! The output from a pair of 845's in Class-A is very nearly 50 watts with negligible harmonic distortion. In Class-AB1 the output is 105 watts at 1,250 volts HT—still with negligible distortion.

Table of Values

Fig. 1. Circuit of G3AST's "Hi-Fi" Amplifier

C1 = 50 μF, 25v
C2, C4, C7, C10 = 0·05 μF, 350v tubular
C3 = 0·25 μF, 350v tubular
C5, C12 = 0·02 μF, 350v tubular
C6, C9, C13 = 8 μF, 350v elect.
C8 = 0·002 μF, 350v tubular
C11 = 2 μF, 500v paper
C14, C15 = 0·1 μF, 450v tubular
R1, R4 = 2 megohm, ½ watt
R2 = 47,000 ohms, ½ watt
R3, R12, R14 = 1,000 ohms, ½ watt
R5 = 270,000 ohms, ½ watt
R6, R20 = 100,000 ohms, ½ watt
R7, R13, R19, R23 = 1 megohm, ½ watt
R8 = 250,000 ohms, ½ watt
R9, R15, R16, R17, R18 = 50,000 ohms, ½ watt
R10 = 500,000 ohms, ½ watt
R11 = 20,000 ohms, ½ watt
R21, R26 = 10,000 ohms, ½ watt
R22 = 500 ohms, ½ watt
R24, R25 = 30,000 ohms, ½ watt
R27 = 390 ohms, 3 watts, 5 per cent. tolerance.

Response

The modulation transformer is a Woden type UM3; however, at the high anode-anode loads as encountered in a pair of 845's, the bass response drops off owing to low primary inductance; this has been corrected earlier in the amplifier itself by a separate bass boosting valve.

At the other end of the frequency spectrum, top loss resulted due to the "small" mica RF by-pass condenser from the centre of the PA tank to ground; this was corrected with a suitable network in the speech amplifier.

The Speech Amplifier

The speech amplifier is hardly original—little bits having been taken from this handbook or that. The high-gain stage is a 6SJ7 pentode, though a 6J7 may be used with slight modification; but a 1620 is to be preferred. Coax lead is used from the grid to jack line, and indeed right up to the microphone. The shielded lead supplied with the microphone checked at 50 $\mu\mu$F per yard on a bridge, which is a lot of capacity in a 5-megohm circuit. The two following triodes V2, V3 are looking after different parts of the frequency spectrum. V2 is responsible only for the range 400 cycles and below, being controlled by the bass attenuator R13. V3 handles 400 cycles and above, while the treble may be brought up with the treble attenuator R10. Resistor R7 controls the level and is independent of response settings. The outputs of V2 and V3 are fed into the grids of V4 in the correct phase relationship; this valve, a 6N7, is in the popular cathode-coupled paraphase phase splitter circuit and needs no explanation. The output of V4 feeds a pair of 1622's; 6L6's can be used, but are slightly inferior to the former.

The coupling transformer is 1 : 4·5 step-up to feed the 845 grids. The secondaries are bled with two swamping resistors; these reflect the correct anode-anode load for the 1622's and should not be omitted on any account. The coupling transformer should be ordered with split secondaries for separate biasing. The diodes V3, across the input transformer secondary, are a protective device to limit positive-going excursions of the grid. As soon as the grid becomes positive to the cathode in either valve, the respective anode conducts and the audio is by-passed to ground. The valve used is a 12H6, this being run from the 845 10-volt filament transformer without any trouble. If Class-A operation only is anticipated, the modulation transformer can be a Woden UM2, but once again the lack of primary inductance at high anode load may become a factor to be taken into consideration.

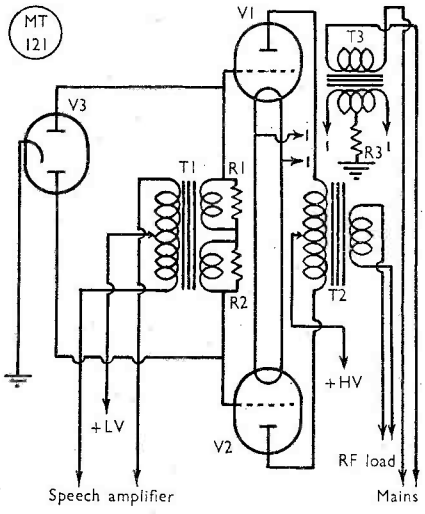


Fig. 2. The modulator proper, using a pair of 845's with a 12H6 limiter, as suggested by G3AST. ***Note:*** *The junction R1, R2, must be earthed in this diagram.*

Table of Values

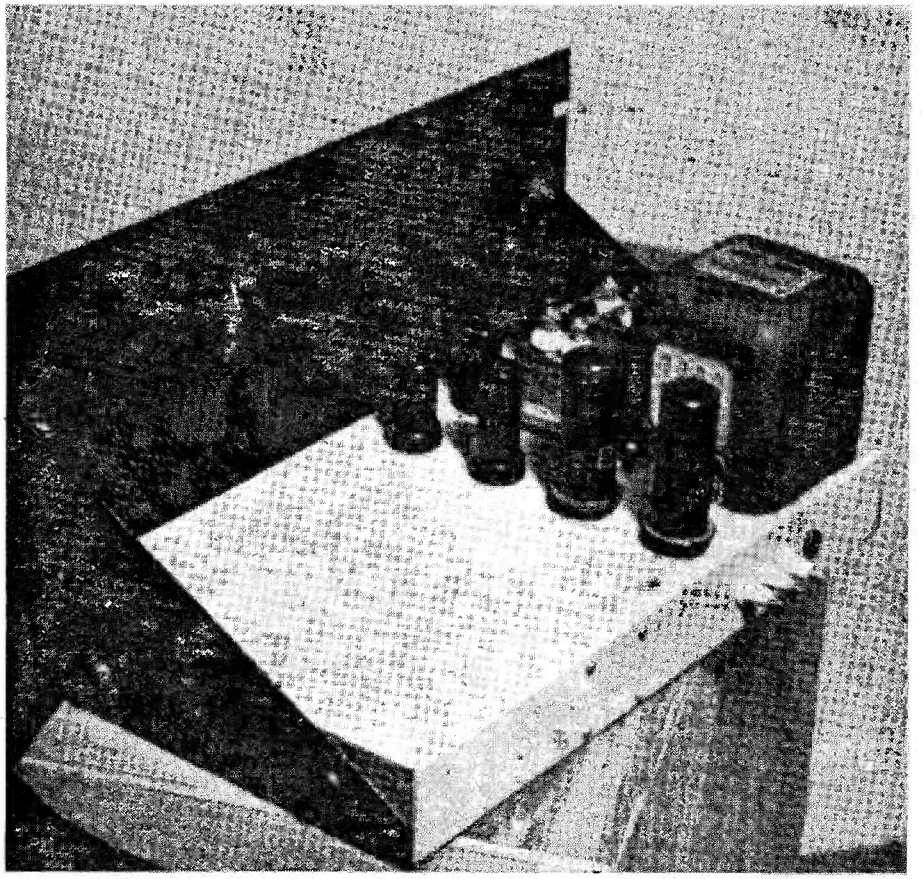
Fig. 2. The P/P 845 Modulator Unit

R1, R2 = 100,000 ohms, ½ watt
R3 = 2,000 ohms (*see text*)
T1 = 1 : 4·5 step-up, split secondary for separate biasing (Woden special)
T2 = UM3 (Woden)
T3 = 10v 10-amp (Woden)
V1, V2 = RCA 845
V3 = 12H6

Construction

The system was constructed in two sections the speech amplifier and the modulator. No doubt both the units could have been squeezed into one chassis, but this was considered undesirable. Both units are on standard chassis with 10-in. panels. It will be noticed that on the speech amplifier all the valves are metal, and that no power supply components are brought anywhere near the deck; to do so will only lead to headaches and is considered bad practice anyway for high gain amplifiers.

By virtue of the fact speech amplifiers are often in strong RF fields, the wiring was made extremely short and direct. Resistor boards lead to rambling wiring and are "out." A metal undertray was made for the amplifier to shield the wiring from stray RF, but this has since proved unnecessary and has been omitted, allowing the resistors to run cooler. Incidentally, all resistors, except the 1622 cathode bias, are IRC miniatures, the latter being Erie 3-watt.



The speech amplifier used by G3AST for fidelity tests, in conjunction with a 10-inch speaker and an acoustic labyrinth; The circuit of this amplifier is at Fig. 1.

The modulator shelf is a much more formidable proposition. Here, a steel chassis with welded corners is a "must." Two layouts came to mind for this deck ; first, a symmetrical disposition across the centre line of the chassis, secondly, the layout suggested by the photograph. After weighing some of the individual components, and realising that, to be fair to the front panel, the transformers would need to be very near the front, reducing leverage, the layout shown was adopted. This put the 845's well in the rear, which turned out to be a good thing, as tremendous heat is dissipated by these valves when running.

All wiring on the modulator deck is done with 7-mm auto ignition cable, except the 12H6 circuit.

The output valve sockets are first mounted on a plate of 8 SWG dural and then bolted to the chassis by steel brackets. This protects the operator from the terminals which are very large and exposed. The cathode bias resistor consists of two 0·2-amp "mains dropper" resistances used for AC/DC sets. Adjust the bias with care, and never allow the plates to show any colour.

Operation and Results

The speech amplifier should be checked first by testing on a speaker. For these tests the author uses a 10-in. speaker in conjunction with an acoustic labyrinth. This gives very good results and allows appreciation of very low frequencies.

The final job is adjustment of the modulator valves. After the wiring in this stage has been

carefully checked and the secondary of the modulation transformers shorted out, HT up to a maximum of 1,480 volts may be applied to the plates, and the consumption checked. If necessary the common cathode bias resistor should be adjusted (with HT off) until the plate current is 104 mA for the two valves. The speech amplifier may now be connected, the anode load for the modulator matched to the PA in the conventional manner, and the modulator is ready to use. The response on the air may be adjusted to suit individual taste by listening on a phone monitor.

This modulator has evoked interest and comment over the air for many months since it has been in use. It is free of all the vices common to amateur modulators, it does not possess that boomy "ham" quality too prevalent these days, and provides a standard of fidelity of which any amateur may be proud.

For the QRP man, the modulator (output) stage may be omitted, the 1622 valves connected as tetrodes, and battery biased Class-AB1 to provide 34 watts of audio with less than 10 per cent. total harmonic distortion.

For those with high-power licences, the 845's can be battery biased to class AB1 and will give enough audio to modulate a DC carrier input of 250 watts.

Two-Element Beam for Twenty

Full Constructional Data

By **P. PENNELL (G2PL)**

Our contributor describes a simple beam-and-mast assembly which is quite a practicable proposition for 14 mc, even if space is restricted for the erection of the mast. A beam system has so many advantages that it is well worth the effort of construction.—Ed.

MANY people who have only a limited space for aerial erection must have wondered how they might obtain improved results on the 14 mc band. Without doubt, an all-metal two-element beam is the solution for confined spaces, but how can one get it airborne? The following description is intended to show an easy and cheap solution.

A few articles on "folded beams" have appeared in Amateur Radio literature, but they are never as satisfactory as the full span types, and are usually far more complicated mechanically.

Fig. 1 shows a plan view of the two-element system. The central boom is made of duralumin channel 3 in. wide with 1½ in. sides. Several beams have been built using 3 in. tube with the elements pushed through holes at the ends. Experiments in high gales have shown that the ⅜ in. wall channel, which is slightly heavier, is far more satisfactory than tubing; the elements have less tendency to pull the duralumin boom. Furthermore, the holes can be drilled through the channel for fixing directly on to the mast. With tubing, either a separate clamping bracket must be used, or an inner reinforcement tube must be pushed down to the point where the fixing holes are drilled through—and often with this method the beam does not finally appear level on the mast.

When drilling the boom for fixing, it is necessary to ascertain where the centre of gravity lies, otherwise the beam will tend to lean over on one side when erected. This may easily be done by balancing the beam on the thin edge of a piece of wood, and changing the position of the boom until a perfect balance is obtained.

The T-match has been selected for feeding the aerial with 300-ohm ribbon. This form of impedance matching may be criticised electrically because of the difficulty of obtaining a perfect match over the whole band, but mechanically it is ideal, especially as it reinforces the radiator; because the feeder line will normally be short, the loss in the efficiency of the system is very small. The dimensions shown in Fig. 2 are a reasonable compromise and do not produce a bad standing-wave ratio on the feeder line.

Construction

A few words on the constructional details of the beam may be helpful. Where joints or screws occur, care has been taken to avoid the use of dissimilar metals, or if that has been unavoidable, the joints and connections have been painted over in order to exclude the air. (It is interesting to look over a beam aerial which has been exposed to the weather with no protective paint and which has dissimilar metals in contact with each other.) Two coatings of aluminium paint should be applied to the whole of the metal work before erection. Some may think that too much fuss is made of this point, but experience counts, and the writer was astounded to see a description, in

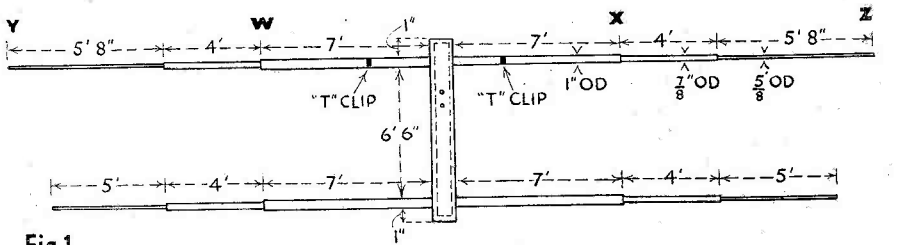


Fig 1

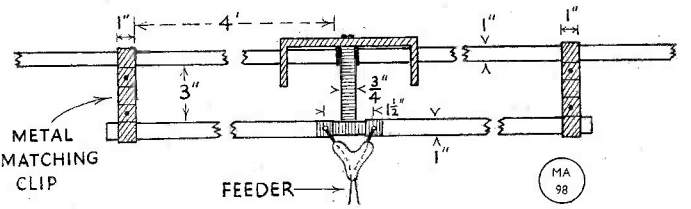


Fig 2

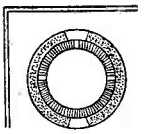


Fig 3

Fig. 1. Plan view of G2PL's two-element beam for 14 mc, showing dimensions of sections. Fig. 2. Front view of the T-match for the driven element of the 14 mc beam. The small drawing is Fig. 3, the section through two tubes of differing diameter, showing packing at the joint, which is finally clipped for rigidity.

an American magazine recently, of an excellent beam which would undoubtedly crumble from erosion after a year of use !

The elements are constructed from 1 in. o.d. duralumin tube at the centre ; as shown, a reduction in diameter occurs at W and X, and Y and Z (Fig. 1). The size of the remaining tube is not critical ; telescopic is ideal, but if this is not available, then the tube may be packed up rigidly as shown in Fig. 3 ; odd scraps of duralumin tube 2 or 3 in. long are cut in half, lengthwise, for this purpose. Jubilee clips should be used to ensure that the tube is held firmly at the joints, and the screw of the clip should be well greased, in case the system has to be dismantled at some future date. Finally, it is advisable to apply some sealing compound to the joints, in order to prevent undue corrosion. Bostik or any similar good sealing composition can be recommended.

The holes drilled through the duralumin boom should be a "push fit" and it is only necessary to use two U-clamps for the final anchoring. In order to keep the rain out, the ends of the tubing should be plugged with corks which may be painted over—these are easily obtainable from any chemist.

The T-connection is shown in Fig. 2. Polystyrene is used at the centre and every effort has been made to avoid water traps. When a 300-ohm ribbon feeder is employed, these gatherings of moisture often cause very noticeable changes in impedance.

It is well worth while to take a little care in the connection of the 300-ohm feeder to the T-match—the wire ends of the feeder should be sweated into telephone type spade terminals, then some wasted feeder can be moulded around the terminals to make a rigid termination. Some 2 BA screws should be fixed through the 1 in. o.d. T-match tube, for fixing the terminals to the tube. In this position there is usually trouble from the corrosive action of dissimilar metals in the presence of moisture, and it is recommended that the terminals should be coated with polystyrene solution, after the connection has been made.

At this stage it is advisable to make a slight upward set in the elements—when erected there is bound to be a certain amount of sag (as no strainers are used) and this helps to counteract the natural sag ; at the end of the elements this is relatively unimportant.

Having described how the beam is constructed, it is now necessary to show how it may be erected in as small a space as 16 ft. by 40 ft.

Erection

Fig. 4 shows a 2 in. o.d. steel section type of pole, 35 ft. long. (A better one could be made by using 2 in. o.d. hardened duralumin.) Guys should be fastened as shown, while the

pole is on the ground. As only two people are required for the erection of this beam, elementary calculation will give the length of the back guys when the aerial is erected. The angle between guys and pole will vary according to each location, but as large an angle as is conveniently possible should be used for maximum safety. A small groove should be made in the ground at the base of the mast to prevent it from slipping when it is being pulled up.

Fig. 5 shows the pole raised to a height of approximately 16 ft. Care must be taken to keep the centre of the pole from bending by pulling upon the centre guy through the required pulley. A ladder 15 ft. high may be temporarily guyed in a vertical position or, as the author has done, an "inverted-V" step ladder may easily be constructed and again temporarily guyed. It should be in such a position as to permit easy access to the T-junction at the end of the pole.

Everything is now ready for placing the beam on top of the mast. Keeping the elements lengthwise down the garden, climb the ladder and place the channel boom on the T-junction at the end of the pole; with the aid of a friend the elements may be pulled down so that the beam is in the position shown in Fig. 6. It will then be easy to locate the fixing holes—$\frac{3}{8}$ in. carriage bolts should be used to fix the beam on to the mast. The step ladder may be removed after this operation. A "steering" handle should be added at the base of the mast, consisting of any odd piece of metal bent into the form of a clamp.

The stage of final erection has now been reached. One person should hoist up on the pulleys while the other "steers" the direction of the beam lengthwise down the garden. As previously mentioned, care must be taken to keep the centre from sagging and, accordingly, the person who steers the beam can also pull up on the centre portion of the pole. The final position is shown in Fig. 7.

The guy ropes, hitherto unmentioned, should be made of waxed rope. Grade 4 waxed sash cord is to be recommended. Shrinkage is kept to a minimum, and as for wear—some guys were recently examined after

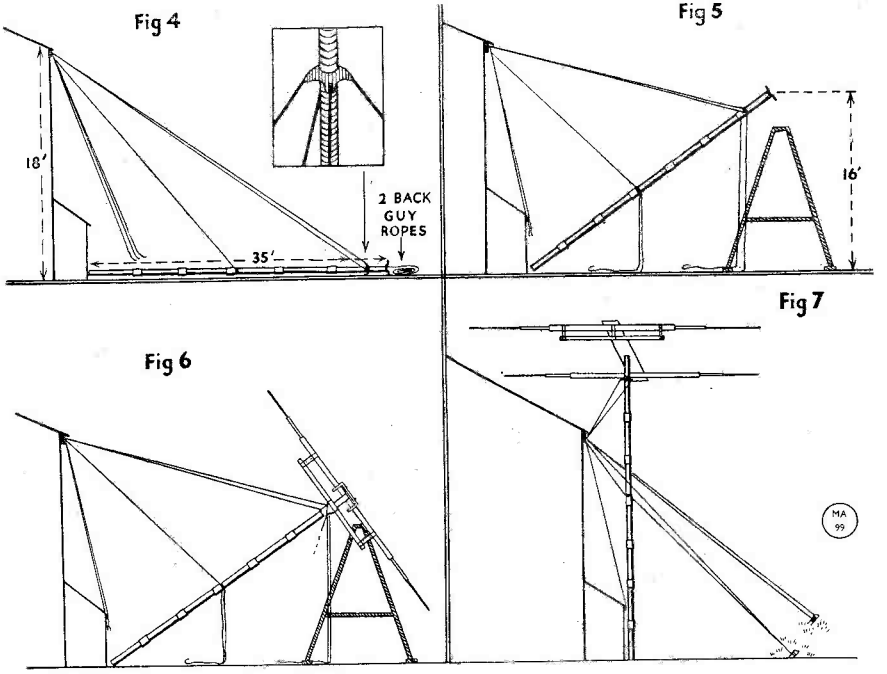


Fig. 4. Side view of the mast before fixing the beam assembly. Fig. 5. The aerial mast in position for attaching the beam section, as described in the text. Fig. 6. How the structure should appear with the beam mounted, before hoisting Fig. 7. The whole assembly finally in position. To get it there need only be a two-man operation.

two years' continuous use, and they were found to be in excellent condition.

When in position, provision must be made for anchoring the beam in the desired direction ; it is surprising how much a moderate wind can change the direction. The above assumes only a manual method of turning the beam, but as can be seen it would be quite easy to add a motor at the base of the mast for remote control ; in fact, this method of control is to be recommended, although as yet the author has not tried it.

Results

Results seem to be very reasonable ; in some cases the beam will be over one half of the house. In the author's case the roof is only 7 ft. below the aerial head and when swung over the garden, it lies over a metal garage. But even in such conditions a great improvement has been found over a simple dipole, and it certainly enables one to hold one's own with other stations using beams. The difference in gain between a two- and a three-element beam is not as great as the difference between a two-element beam and a dipole.

Mechanically, the aerial has proved its worth by coming unscathed through several gales, when on at least two occasions gusts up to 80 m.p.h. were recorded. Under windy conditions, the elements certainly bend and bow, especially when broadside on to the wind—but no harm results, and they always return to their normal positions.

It might possibly be worth while adding wire strainers (broken by insulators), to the elements in order to stop the bending under high winds, and experiments will be carried out on this shortly.

Finally, a word about cost. Duralumin tube is easily obtainable from most scrap metal merchants, and at present-day prices an outlay of £2 should amply cover the cost of the beam ; and further expenditure of £2 10s. should be more than sufficient for the pole, guy ropes and so on—but not including the ladder, which most amateurs, or their neighbours, possess !

XTAL EXCHANGE

A larger offering than usual this time—readers who would like to make use of this free facility are referred to previous issues for the few simple rules under which "Xtal Xchange" is operated.

G2NX, 46 Oak Drive, Oswestry, Salop.

Has RCA VC-5-KS 100 kc sub-standard. Wants 1000 kc, 10 mc or 5·6555 mc crystals.

G2XV, 89 Perne Road, Cambridge.

Has American enclosed crystal, harmonic type, 29265 kc, ½-in pin spacing, new, unused, boxed. Wants similar crystal near 28800 kc.

G3BPE, 35 Bladindon Drive, Bexley, Kent.

Has QCC Type P5 1733 kc crystal, with certificate. Wants similar crystal 7015-7040 kc.

G3DJD, 2 Canfield Road, Brighton, 7, Sussex.

Has QCC 1790 and 7040 kc crystals in standard ¾-in. holders, with certificates ; Premier 7178 kc, ¾-in. holder ; ex-Service 7008 and 7012 kc, ½-in. pin spacing ; also RCA 100 kc bar in American 3-pin mounting. Wants 250 kc bar with holder and base, and crystals 1845-1895 and 7075-7100 kc.

G3ENI, R.N. Air Station, Culham, Abingdon, Berks.

Has 8001 and 8194 kc crystals, ¾-in. pin spacing, no certificates. Wants 7000-7035 kc crystals, ¾-in. spacing.

GM4NR, 4 McVicars Lane, Dundee, Angus.

Has QCC holdered crystals 1765·5 kc, 3594 kc, 7100 kc. Wants similar 3515-3530, 3535-3550, and 7035-7060 kc.

G4PH, Winneydene, Wooldale, nr. Huddersfield, Yorks.

Has QCC Type Q5 100 kc bar, with certificate. Wants 1000 kc crystal, certificated.

G4RS, 17 Tudor Avenue, Bebington, Cheshire.

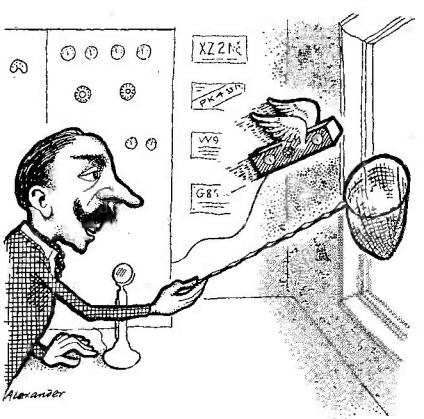
Has 1000 kc and 3500 kc ex-Govt. crystals, no certificates, but guaranteed. Wants crystals LF end 7 mc in standard holders.

G5KC, 123 Kingsway West, Acomb, York.

Has QCC Type P5 3510 kc crystal, certificated. Wants QCC 1800-1900 kc, with or without certificate.

GM8RV, 6 O'Connell Street, Hawick, Rox.

Has ex-AM 500 kc crystal with associated coil. Wants crystal in 3·7 mc phone band, ¾-in. pin spacing.



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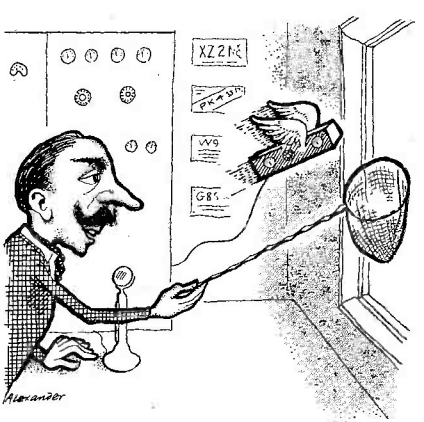

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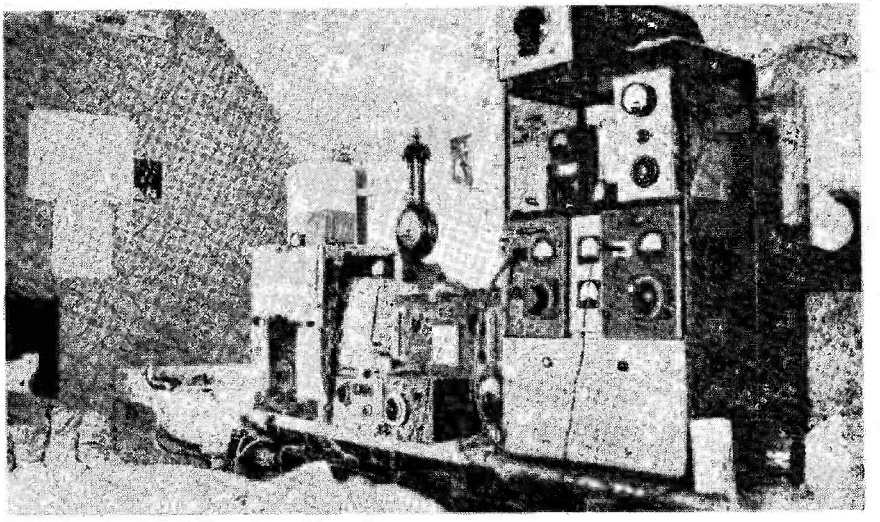


G3EGR, the Bedside Station, at Mundesley, Norfolk. Arranged for keying in comfort, G3EGR (three score years and three) says he likes to keep snug when the cold winds of winter blow across the grey North Sea.

when he came in like a DL1 at mid-day it was too much !

G4QK (Croydon) says he didn't raise AC4AR, perhaps because he added " /D " to his call ; and, he asks, how about Oscar, SP5RA, giving QTH as Warsaw and having a party with East Coast W's ?

G5OQ (Tunbridge Wells) sends quite a screed about AC4AR, and describes him as having "same squashy note, all dots, same fist, same lid" as ZA1A, heard just before on the same frequency. He came up and called "CQ DX No G de AC4AR" and said "QSL *via* ARRL." Then an unknown station came up and called AC4AR/ZA1A/I1??/EA??/ Pirate Pse QRT, to which AC4AR replied with a QRZ ? And so it went on. After such a display of virtuosity it is almost a pleasure to recall some of the really *clever* piracy such as occurred on 80 metres early in the year ; this corney AC4 stuff doesn't even give one a run for the money !

3·5 mc

The stalwarts continue to use 80 metres, and G8VB (London, W.5) had reports of S9-plus from VO2CO, VO2BL and VO2BV on June 9 at 0330. Transatlantics, he says, are only possible now between 0300 and 0400.

G3EIZ (Liverpool) managed to collect PY5EO (CW, 3520) at 2355 one night, using only 20 watts, and also had a good one with OX3WE (3604 kc at 0140).

7 mc Activity

This is best summed up by saying, "Not much, if any." G5FA (London, N.11) is about the only correspondent, and he mentions working FT4BF but thought the call-sign somewhat sinister. All the rest of the letters were on the subject of local phone, which we have already dealt with and will henceforth eschew in no mean fashion.

The DX on 14 mc

G4CP (Dudley) sends a report that makes the band seem better than it has been, until we see that most of the dates are in March or April. Eight new countries put him nearly at the head of the list, and if Jules of ON4JW has not reported by next month it looks as if G4CP has a chance of being Top Man. He has 160 confirmed, but would like to know if anyone has a card from FF8GP, ET3Y, EA6AZ, VR2BD, FM8AD, YN1MH or VS4WL.

G8OJ (Manchester) filled up some of his time with CT3AV, MP4BAD, SV1VS/MM (near Chagos Isles), FE8AB, KG6DI, FF8GC and EL3A, who has just ordered 3,000 QSL cards ! G2SO (Leigh-on-Sea) admits to a good location, but says he can't understand how some of the fellows report the super-DX month after month. He is rock-bound on three frequencies, but his CQ's have raised HC1DN (0300), OA4CJ (0535), ZD4AD (1800) VS2CH (1825), TI2EXO (0040). By calling them he has raised some even better pieces of

DX. 'SO asks whether QSL's come from VR6AB, KB6AD, OX3BC and W8OZG/C6.

G4QK (Croydon) weighs in with FM8AD (2330), PZ1Z (1950), KZ5IP, EK1DO, VS1BJ, VP5HQ and lots more. He also raised KH6IJ, but admits that at the time one could raise him "by striking a match." From G3BNE (London, N.W.3) comes a list including XZ2FK, TA3GVU, EA8MC, CR6AI, ZD2RGY, VS6AC, KG6DI and UAØKFD—all between 1800 and 2100 GMT. So 'BNE has just passed his Century, and all with 45 watts to a dipole which is 6 ft. above the lead roof at one end and 2 ft. 6 in. at the other.

G8IP (Hampton) is now busy on 145 mc, so DX suffers slightly. But he comments on the evening of June 5, when all signals were watery and the more distant G's had pronounced echoes. Then two "beefy" and conspicuous signals started to come through and turned out to be PY7WO and PY7WS. PY7WO was worked—off the end of a dipole—and an S8 report received. Just another of these queer ones ! 'IP is pleased with life, having just received his WAZ Certificate—No. 120.

From Malvern G8QX reports adding to his score on 14 mc phone with ZD4AD, MP4BAC, CR6AI, CR7BB, OQ5RU and ZA1AR(?).

28 mc Still Kicking

Quite a few of the followers of Ten have worked some good DX ; those who haven't have been filling up gaps in their List of Countries by collecting Europeans during the short-skip openings. DX from G5FA includes VU2DX, SVØAJ, KZ5PA, VQ4CUR, VS9AL and lots of PY's and ZS's.

G2VD (Watford) discovered, during a short-skip period, that a host of DL phone stations were working between 28100 and 28200. Small wonder, as he says, that CW activity is not very productive in this region.

G8QX has been raising a few VK's and mentions the excellent signal from PK4KS

FOUR BAND DX

Station	Countries Worked					Power	Station	Countries Worked					Power
	14 mc	7 mc	3·5 mc	28 mc	Total			14 mc	7 mc	3·5 mc	28 mc	Total	
ON4JW	190	68	24	4	191	35/75	G6XL	105	41	15	35	127	35/100
G4CP	186	45	3	64	186	150	G3CBN	105	44	13	25	116	50/150
G8IH	171	57	14	30	178	7/150	G2YS	105	23	21	25	116	100/150
G6QB	161	67	32	115	183	150	G3FNJ	100	26	19	42	113	150
G2VD	159	50	26	84	164	150	G6BB	93	34	18	28	110	10/70
G3ATU	156	60	26	81	165	10/150	G4QK	91	26	19	3	95	150
G2AVP	156	55	28	32	163	25/120	ZB1AR	87	38	29	40	100	25
G2WW	155	31	21	76	165	60/150	G2HKU	83	32	1	7	91	4/25
G6BS	150	93	28	4	164	150	G3ABG/A	76	36	21	3	79	45
G3DO	147	37	19	97	177	150	G2DHV	75	20	18	4	78	25/60
GC2CNC	134	55	14	61	163	10/50	G2BJY	71	24	4	85	117	25
G3AKU	129	45	29	21	137	30/70	G2VJ	66	12	4	41	85	25/150 Ph.
G8VB	119	44	50	59	140	120	G3DOG	62	24	3	2	71	25/150
G5FA	118	83	17	55	134	35/150	G2HIF	42	9	6	44	71	150 Phone
G8KU	117	24	9	47	127	120	G3EIZ	37	23	32	15	51	25
G5WC	144	50	1	12	115	45	GW3CBY	37	20	13	4	48	15/30
G8IP	111	34	13	62	127	3/150	G3FGT	28	15	13	4	40	25
G8QX	107	18	12	70	129	150 Phone	G6CB	21	5	1	81	89	20/130 Ph.
G3BDQ	107	26	18	9	109	25/150							

A. Oblifork, on the Rx at G6QB, not a thousand miles from Bexhill, Sussex. A.O.'s other name is Crystalmike—though he is better at rabbits than DX.

on Banka Island, which, by the way, does *not* count as a separate country—yet. 'QX has just received his Phone DXCC—No. 81. Very nice, too.

G3ATU (Sunderland) reckons it was his 150th call that raised AR8AB. He has been calling him for two years !

And now here's another Hornet's Nest, stirred up by G8KP last month concerning KL7's on 28 mc. G2FLC (Newmarket) worked KL7DY in October, 1947 ; report was S9-plus-30. G2ZF (Bramhall) had a similar QSO at about the same time. G4JZ (Witcombe) mentions a five-way contact (also in October, 1947) with himself, G2BY, G5JY, G8DT and KL7DY. At that time the KL7 mentioned that he had worked two G's in the winter of 1946. G2PL (Wallington) worked him round about the same time in 1947 but thinks he was the tenth or eleventh QSO ; G5UX and G6LX both preceded him. From all of this it seems that KL7DY was probably the only one to achieve contacts of this sort, and it would be interesting to know why. Can it be that the rarity of 10-metre QSO's with Alaska is just due to lack of activity at the far end ?

News from Overseas

From VK9NR on Norfolk Island, *via* G2ZC, comes an interesting letter in which he says that ex-ZL2FP will shortly be set up as another Norfolk Island station ; Noel won't be sorry to have someone to share the work, and, of course, he himself will be able to QSO Norfolk Island. VK9NR has been listening on 3·5 mc for Europeans in the evenings (this was prior to May) but heard nothing but W's and one South American. He is only running QRP at present, and seems to find it easier to work Italians than anyone else on 14 mc. But he does nearly break our heart by saying that he called G6QB ten times without result—and we've never heard him yet. (See last month : "If I could only *hear* him I could work him !")

VS2CH is, by now, well on the way back to England and G2CQJ. He appeared to be on the air right up to the last day before sailing, but we have not heard direct from him since May. His worry then was whether VE8MA was in Zone 1 or 2 ; if it's Zone 2, he has worked them all.

Peter Lovelock, ex-G2AIS, who is one of the ops. of K2UN, met ZC8PM early in June. ZC8PM, strangely enough, was operated by Pat Miller of W2AIS, and now he's leaving for the Virgin Islands. During his spell in Palestine he was not licensed by the Iraq Government (within whose military area he worked) but had the sanction of the United Nations communications chief.

K2UN went off the air for overhaul some time back, and when the Secretariat moves into buildings in New York it is planned to move K2UN as well.

Peter Lovelock asks us to mention that he will be delighted to welcome visiting G's ; so if you find yourself in the vicinity of N.Y.C., just phone GRamercy 5-4127.

Cap'n Harry of VQ4CUR reports that it is easier to raise G these days, and at the time of writing he had worked G8GJ 143 times, only missing their sked twice on account of conditions. All contacts were on 28 mc, and 'CUR asks me to tell those G's who still, apparently, use super-regen. receivers for ten metres that the device is now obsolete and that they will hear stations calling them if they get a receiver.

VS1AY writes from Singapore with some interesting sidelights on conditions out there. He runs 120 watts to a pair of PT15's with a 3-element Plumber's Delight, and operates phone on 14 and 28 only. He has worked 32Z and 82C but says that the large tin content of the hills and mountains of northern Singapore makes it difficult to get out to the North. He has never even heard a Russian ! "Locals" are VK1ADS on Macquarie Island, HS1SS (14200), FO8AB (14 mc phone, but irregular).

East African Awards

From the Radio Society of East Africa comes news of yet another certificate, but this is rather special and an annual affair. It is offered to any amateur proving contacts with one VQ3, one VQ5 and three VQ4's *in one year*. Each certificate will be in the form of a special souvenir card bearing a large photograph of East African big game, and so on, with a different photograph for each year. The possession of *five* of these certificates, together with proof of contact with one VQ1 station, will entitle the holder to claim the WEA (Worked East Africa) Award, which will be a *very* special trophy.

Limited finances out there make it impossible to offer these certificates free, so you are asked to remit 5s. with your claim to the address below. Log extracts (not QSL cards) are required for confirmation. Two certificates are now ready—one for 1946-47 and one for 1948. Claim for 1949 when you have enough contacts. Any profits that may accrue will be devoted to providing and maintaining a Headquarters Station for the East African Society.

Further details may be had from VQ5PBD, c/o the East African QSL Bureau, Box 1313, Nairobi. We wish them luck in their venture.

And now to West Africa, where Harold of ZD4AM is still receiving G's on 7 mc despite the static. He says that some of the boys are getting very impatient for their QSL's these days ; he replies to every one, so please hold your horses and don't chase him before the return card has had time to come through.

Roger Thorn (s.s. *Student*) writes from CR7, where he has been having personal QSO's with CR7IS, 7IZ and 7LV. From 7LV's shack he heard numerous G's calling CQ DX on 7 mc, and went back to lots of them, but with no result ! But why, he asks, do these characters who call "CQ DX" go back almost immediately to another G ? If only they would *dig* !

As Roger joined his present ship at Mombasa, and restrictions on personal luggage were stringent, he has no receiver with him on this trip, and regrets that the ship's gear is useless for the amateur bands.

G3ERB (Wirral) will be in California from August until December, and wants to arrange skeds from there with stations in the Liverpool/Birkenhead area. He will also be glad to forward reception reports to specific stations if time permits. We hope to hear more of him from W6.

Another traveller will be G2AVP (Mildenhall) who is off to SU and HZ for a month until August 7 ; he hopes to try Eighty during the evenings with an HZ call, and may also be heard from ST2—the lucky chap !

Vive Le QRP !

There is much enthusiasm for QRP work from time to time, generally damped down in due course by the steamroller effect of QRO stations who take no interest in the little fellows. In an interesting letter, G5OQ (Tunbridge Wells) points out that had he worked all the stations he lists on 1 watt

ZONES WORKED LISTING

POST WAR

Station	Z.	C.	Station	Z.	C.
Phone and CW			Phone and CW		
ON4JW	40	191	G2YS	35	116
G4CP	40	186	G5WC	35	115
G2FSR	40	184			
G6QB	40	183	G3ACC	33	106
G8IH	40	178	G2FYT	33	100
G3DO	40	177			
G3ATU	40	165	G3CVG	31	106
G2WW	40	165	G4QK	31	95
G2VD	40	164	G2DHV	31	78
G2AVP	40	163			
G8IP	40	128	G2SO	30	82
VS2CH	39	158			
G3AKU	39	137			
GM3CSM	39	119	Phone only		
G5MR	39	118			
G6PJ	39	87	G2ZB	39	160
G8VB	38	140			
G5FA	38	134	G2XK	38	126
G8KU	38	127			
			G3DO	37	142
G2BJY	37	117			
G3FNJ	37	113	G8QX	35	129
G6BB	37	110	G2AIN	35	120
G3BNE	37	104			
			G6CB	32	89
GC2CNC	36	163			
ZB1AR	36	100	G2VJ	31	85

instead of 45 watts, he would have got a huge kick out of it—especially if an indoor aerial had been used. He adds that several people have only very poor aerial facilities, and also that there *are* people who can't afford high power and expensive gear. They should be catered for by "One-Watt Contests," "Indoor-Aerial Only Competitions" and so on.

We agree, and will think very seriously over it. As 'OQ says, if everyone reduced power the QRM would abate and the old original amateur spirit might stir once more. So have a shot at WAZ on 1 watt, some of you big noises—and if you find it too easy, use an indoor aerial on the ground floor.

G2HKU (Sheerness) has at last found a receiver he can run on his DC mains—a National NC81X. He is a "25-watt Max" station and also pleads the cause of QRP.

G5UJ (Rotherham) is likewise interested mainly in QRP, and on 7 mc with about 10 watts he has worked all Europe plus VO, CN, LU and TF3. The transmitter uses a 6J5 and 6V6 !

Finally, on this subject, we hear from G3EIZ that GC2CNC recently put out a CQ on 14 mc, using 20 watts and a screwdriver as an aerial. Yes, back came a W . . . Anyone tried a rusty nail yet ?

Miscellany

From G4JZ comes the news that Ben Wallich of G6BW has passed on from ZL to VK and expects to settle there . . . G6BB (Streatham) has a VFO going at last, and now

PIRATES

Complaints of misuse of their calls come from G3CEC (Canterbury) and GM3EFS (Dumbartonshire). Please look out for them !

wonders how he ever worked DX before . . . He would like to be told how to raise EL3A on 28 mc.

GM6IZ (Aberdeen), who is a real Old Timer, is gathering in such DX as KH6, YK1, TA, LU, CP, KG6, KZ5, TI, OA, KP6, KV4—all called (no CQ's) and all raised on 100 watts Class-B to a half-wave horizontal J fed with co-ax. Plenty of life in the old dog yet, it seems. . . .

Harry Pain, ex-ZB2A, ex-XZ2HP, ex-VS7PH, is now back in England and G3ATH once more. He has had to order another 500 VS7PH cards, which shows that a DX man's lot may be happy but can be expensive ! Catching up on his QSL's is also responsible for keeping him off the air.

G2BJY (West Bromwich) is displeased with the QSL situation and says some of the worst offenders are the W's in remote parts of the world. We agree, with feeling—we just can't get cards out of KW6, KM6, KB6 or KJ6.

G2HIF (late of Didcot) is now in Wantage and has been on 28 mc with a four-element beam. He finds summer conditions on Ten preferable to the cacophony on the other bands. 'HIF refers to our remarks about thermo-ammeters last month and says that he has been led up the garden by some co-ax ; he found that RF current into the feeder bore no relation to what came out up top, even with a low standing-wave ratio. Since changing over to flat 300-ohm line his worries have ended.

Will amateurs in or near Gateshead please look out for W8QH ? He was born there and wants to QSO his birthplace (this from G3BDS of Worcester).

GM3CSM (Glasgow) sends in a two-months' list of DX on 28 and 14, and he also managed to work all over Europe on 7 mc with 6 watts to a doubler—best DX Leningrad !

GC2CNC (Jersey) wants to see a Top-Band column added to the Four-Band Table, and

DX QTH's

AR8BM	Box 1119, Lebanon.
EL3A	Box 98, Monrovia, Liberia.
EQ1RX	c/o 24 Wendover Road, Yonkers 5, N.Y., U.S.A.
FF8MM	Marcel Morel, Box 207, Dakar.
HP1JO	Box 1039, Panama City.
HP1RA	Box 1567, Panama City.
KG6DI	Box 160, Guam.
MF2AC	D. Watkins, c/o British Army Broadcast Station, British Element, Trieste Force.
TA3AA	American Mission for Aid to Turkey, APO 206, c/o PM, New York.
VP4TB	Bob Wilson, PAA, Port-of-Spain, Trinidad.
VQ4KRL	Box 1979, Nairobi.
VS1DA	Naval Radio Station, Kranji, c/o FMO, Singapore.
VS6AC	Box 541, Hong Kong.
VU2LK	Box 5588, Bombay.
XE2GZ	Box 6, Culiacan, Mexico.
XZ2DA	Box 833, Rangoon.
XZ2KW	Box 157, Rangoon.
ZD1CL	H.M. Naval Base, Kissy, Freetown, Sierra Leone.
ZE2KL	RAF Thornhill, Gwelo, Southern Rhodesia.
4X4ES	Box 163, Haifa, Israel.

he would like a contest for working Counties (some 96 of them) on that band. This is quite an idea, although there are rather a lot of Top-Band Contests already. What do 1·7 mc operators think? We will certainly lay something on if there is sufficient support.

G6AT (Hampton) says it is time we settled "What is a contact?" There is no doubt between a 100 per cent. one or a complete failure, but many of them come on the border line owing to QRM or QSB or local noise. This query was prompted by the fact that quite a lot of stations put "QSO No. . . ." on the QSL. Doubtless these were all 100 per cent.—or were they?

And that seems to be the extent of this month's news. So please start getting together your facts and figures for the next issue, and let me have them by first post on July 13, addressed DX Commentary, *Short Wave Magazine*, 49 Victoria Street, London, S.W.1. Until then, 73 and Good DX.—SK (or VA)!

FIRST CLASS OPERATORS' CLUB

The new membership list has now been distributed to every FOC member. In the event of anyone not having received his copy, a duplicate will be sent on application. Blank pages have been provided in the list for the insertion of new names, and changes of QTH; as each Circular Letter contains the latest information, members are asked to keep their copies up-to-date. A reprint of the Rules and By-rules of the Club will also be distributed at an early date.

On behalf of all members, we would like to express our appreciation to the Old Timers who, at their dinner in May, were courteous enough to include the well being of the FOC as one of their toasts. It is interesting to note that in the "Zones Worked" listing in the June issue of the *Magazine*, out of the first five named, four are members of the Club. Congratulations to ON4JW who (despite having recently got married) still manages to keep in front.

Club Dinner

While some months have yet to elapse before we hold our second Dinner, a number of reservations are in and already we know that at least three of our overseas members wish to attend. Will all who think they have a reasonable chance of getting there please notify the Honorary Secretary as soon as possible. Any such bookings made now will of course be treated as provisional. On the other hand, the Dinner Secretary must know approximately the number to be catered for, as the booking of the accommodation has to be fixed a long time in advance.

This year we are arranging a "Hospitality List" of those living in or near London and prepared to act as hosts to members coming from afar. This plan should solve the problem of some who last year could not attend the dinner owing to the impossibility of returning home the same night. Will those who can be "hosts" and those who wish to be "guests," inform G2ZC as early as possible, so that from the two lists, mutual arrangements can be made in advance. This particularly concerns overseas members, who will be given priority; in fairness to all concerned, all such accommodation bookings should be definite, and not provisional.

President:
GERALD MARCUSE, G2NM

Hon. Secretary:
Capt. A. M. H. FERGUS, G2ZC

Election Notices

As FOC Notes only appear in alternate issues of the *Magazine*, the Editor has agreed to provide space in the intervening months for the names of those newly elected to membership of the FOC. This will avoid the gap and keep the election notices up to date.

In accordance with the Rules of the Club, the following are declared elected to the active membership list of the FOC:

J. P. Wilson, G3BGP (Canterbury)
R. V. Duesbury, G3CTE (Roker)
L. R. Harper, GM5JK (Aberdeen)
P. J. Smyth, EI9J (Cavan, Eire)
J. H. Goodliffe, G6LF (Sheffield)
C. W. Dickinson, G3EQQ (Tean)
C. W. Howes, G2CG (Royston)
G. F. Eglesfield, G2CLL (Feltham)
G. B. Moss, G4NB (Coventry)
R. Campbell, VK4RC (Brisbane)
J. C. Evans, G3BKO (Manchester)
A. G. Wood, G5RZ (Leighton Buzzard)

All correspondence regarding the First Class Operators' Club should be addressed direct to Capt. A. M. H. Fergus, G2ZC, 89 West Street, Farnham, Surrey.

Transmitter Design

General Planning & Choice of Valves

By **W. R. JOSS (G2AJ)**

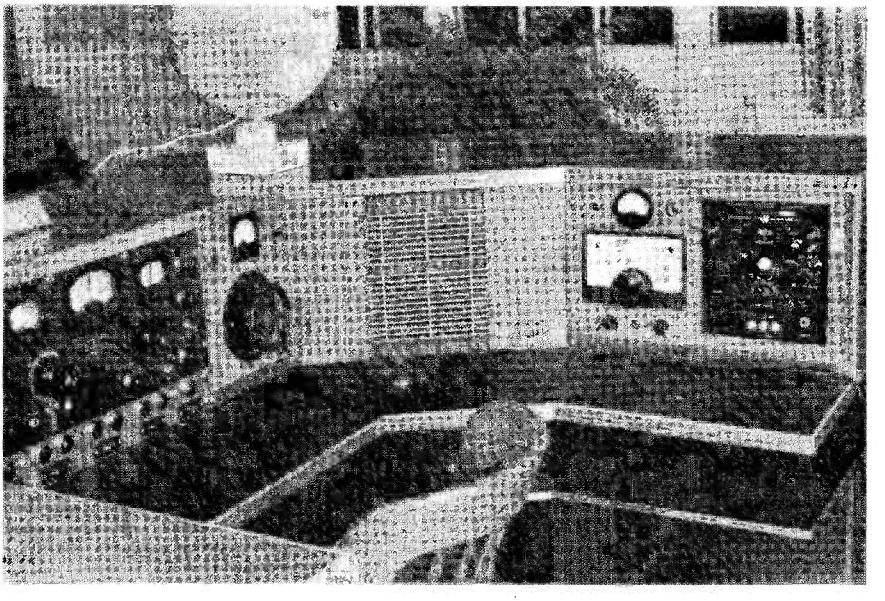
There is a good deal of hit-or-miss "design" in amateur equipment, often dictated by force of circumstances or the bits of gear happening to be on hand. When starting from the beginning, however, it is as well to build the new transmitter with due regard to established design principles. This article suggests the lines on which the problem should be approached.—Ed.

MONTH by month articles appear in Amateur Radio publications describing various pieces of equipment, many of which can form, or do form, part of a complete transmitter. Few articles, however, deal with the *principles* involved and problems encountered when designing one's own equipment, or when combining a number of units together to form a complete high-power transmitter. In the notes following it is intended to cover some of the aspects of transmitter design and to provide the newly licensed amateur with some at least of the basic information required to evolve a transmitter suited to his own particular needs and pocket.

Approach to Design

When designing a complete transmitter to which no additions are to be made, it is undoubtedly best to decide, first, upon the final amplifier and then to work back from there, as the drive requirements of the final stage largely determine the design of the preceding exciter. However, as many amateurs do not actually start off with high power, and as a newly licensed station in this country is restricted to 25 watts, it is more often necessary to consider the exciter first and then the addition of a high-power final at a later date. This fact is in no way a disadvantage to the new station as a 25-30 watt low-power transmitter is ideally suitable as the exciter for a higher-power amplifier running in the region of 150 watts. There is never any disadvantage in having an over-abundance of drive available for a final stage, but there *is* a distinct disadvantage in not having enough. As in so many other aspects of life, it is always as well to have a little in hand.

The choice of valves for a proposed transmitter is often governed by what one already possesses or what the pocket will allow. Low-



Operating position at VE3HC, Guelph, Ontario. The transmitters are ranged round the back of the room.

power exciters invariably use receiving types for the sake of economy, and the general tendency in this country is to employ the American 6L6, 6V6 or 6F6 types, together with the 807, which falls into the low-power transmitting class.

There are other valves, some of them of British manufacture, which deserve wider use, and they are well worth considering when a rebuild is in view. The 6AG7 makes a very good crystal oscillator and has a high harmonic output, while the Mullard EF50 and QVO4-7 are excellent types for the earlier stages of an exciter. Of more recent design, many of the B7G (button base) valves offer possibilities where space is at a premium. The Mullard EL91 output pentode is particularly useful.

For final stages many prefer to run beam tetrodes such as the 807 previously mentioned. The 814, 813 are probably the best known American types in this class, the latter having two British equivalents made by Standards and Mullards respectively. Eimac's have some newer tetrodes which are not at the moment available in this country but which should become popular in due course. The 4-65A is the smallest of these, being capable of a 150-watt input with 600 volts on the plate up to 200 mc. Tetrodes have the advantage of requiring far less drive than triodes of equivalent plate dissipation and price, but it must always be borne in mind when planning a transmitter that much more attention must be given to shielding and elimination of parasitics when using tetrodes than with hard-driven neutralized triodes. This is, of course, due to the very much greater power sensitivity of the beam tetrode.

When considering valves for use as modulators it should be remembered that good emission and plate dissipation are very important while inter-electrode capacities matter little. The most popular type of modulator is that running in Class-B, and the use of types with a high μ obviates the need for a bias supply, as these types can be run at zero bias. The TZ20 or TZ40 are useful valves with this characteristic, the latter having its British equivalent, the Osram DA41. Another type which can be run at zero bias is the familiar 807. This is not so generally known, and the reader is referred to the February 1948 issue of the *Short Wave Magazine*, where full details are given of zero bias operation of 807's. Economy in design can often be achieved by running both the final stage and modulator stage from the same power supply. This results in a considerable saving in expense and need not be detrimental, provided the supply has good regulation and is capable of giving the current required at the voltage. Before leaving the question of valves, one warning: Always choose types which are capable of efficient and safe operation at the highest frequency to be used; all manufacturers specify ratings at upper frequency limits.

Drive Requirements

As stated earlier, it is always advisable to have a small reserve of driving power in order to be on the safe side, and any exciter should be capable of furnishing enough drive on the band on which its output is least. This in most instances is the highest frequency band.

The drive requirements for final stages vary according to the type of circuit and valves selected, and whether or not modulation is to be applied. Plate modulated Class-C amplifiers require the most excitation and the full maximum rated grid current is necessary. Where the full plate input is run at least two to three times cut-off bias is required. For CW working, as well as in buffer amplifiers, the full amount of grid current is not essential and one or two times cut-off bias is sufficient. There is no harm, however, in running the maximum amount when this is available.

When using cathode or grid modulation the drive requirements are considerably reduced and such forms of modulation are much more economical so far as drive and audio power are concerned. A little more bias is required, however, and up to four times cut-off is not uncommon. Plate efficiency, of course, is not as high as that achieved with anode modulation.

The following data are quoted as a matter of interest. The grid drive required for a triode amplifier running at 200 watts input varies as follows:

With plate modulation ..	**35 watts**
CW or Buffer operation ..	**20 watts**
Cathode modulation	**15 watts**
Grid modulation	**8 watts**

Before leaving the question of drive, a word concerning doubler stages would not be out of place.

Excitation depends very largely on the efficiency desired and many amateurs do not

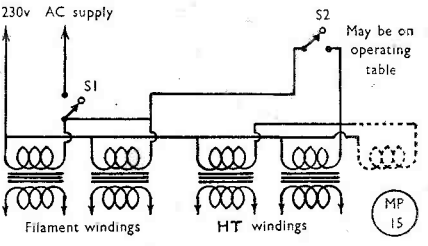


Fig. 1. Circuitry for separate filament supply, with safety inter-connection between S1 and S2.

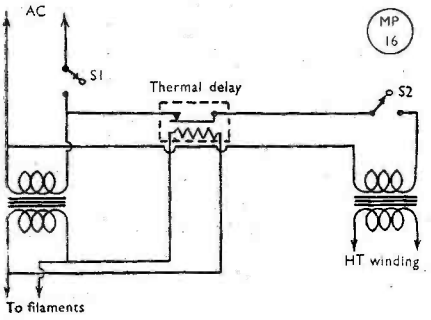


Fig. 2. Thermal delay HT switching for protection of mercury vapour rectifiers, the heaters of which *must* be run for an appreciable period before HT is applied.

appreciate that by increasing the bias considerably, a very great improvement in efficiency is possible. For high efficiency the bias should be at least five times cut-off and the grid current about half the maximum value for the valve. To maintain grid current against increased bias is, of course, to increase the driving power.

Choosing Components

Great care should always be exercised when choosing components, especially for final stages where the HT voltages are high. Condensers, both variable and fixed, are probably the most important. The value of the variable tank condenser depends largely on the frequencies to be covered. When selected for one particular frequency the condenser should have a capacity of about one micro-microfarad per metre when the tank is tuned to resonance. This should give the circuit a Q of about 12, which can be considered about right for good efficiency. Thus, a 20 $\mu\mu$F condenser tuning at mid-capacity would be satisfactory for 28 mc. For all-band operation the condenser should be just large enough to cover the LF end of the 7 mc band. This will also cover the higher frequency bands 14, 21 and 28 mc and with addition of fixed padding condensers the 3·5 mc or even the 1·7 mc band may be brought in as well.

By-pass condensers for a modulated final stage should have a test voltage of two and a half times the full working HT voltage. To put in a condenser with a lower rating is a risk.

The insulation material used in the construction of components and transmitter is also important and should be considered. On frequencies above 14 mc where insulation is necessary, ceramic or polystyrene is recommended, although the very best insulation, where this is mechanically possible, is air.

Coils where possible should be air-spaced, and to obtain the best Q the winding should be such that its length is approximately equal to its diameter. Interstage coupling should be reduced by placing coils at right angles to each other, or one coil may be placed above a metal chassis and the other beneath.

Transmitter Control and Protective Devices

Many operators seem to pay little attention to this subject judging by the time they take to change from transmit to receive. With a little thought and re-arrangement it is not difficult to adopt a method of single-switch control, and it is certainly worth while. There are two possibilities. If all filaments in the transmitter are supplied from separate transformers then the matter is easy, and a circuit similar to Fig. 1 may be adopted. Here S1 applies AC to all filament transformers and S2 applies AC to all HT transformers only after S1 is closed. The only drawback being that if S2 is closed at the time S1 is closed there is no protection for any mercury-vapour rectifiers that may be in the circuit. The remedy for this is to install thermal time delays as shown in Fig. 2. These prevent AC being applied to the HT transformer until a predetermined time has elapsed.

Another safety method which can be used with lower voltage supplies is shown in Fig. 3. This, of course, is not fool-proof for mercury vapour rectifiers, but it does ensure that no matter which switch is closed the filaments always come on first and go off last.

For greater versatility and to facilitate remote control the writer uses relays on all power supplies. This permits any supply to be switched on or off individually from a remote control panel and gives a greater degree of flexibility for control purposes.

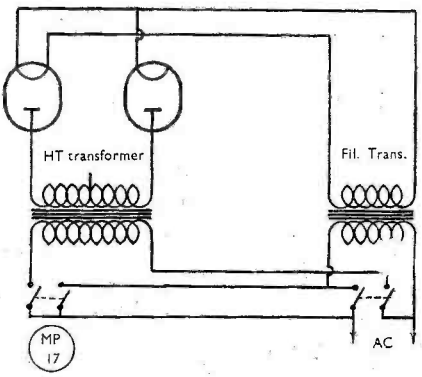


Fig. 3. Another power control switching circuit suggested by G2AJ.

Simple Top-Band Tx

Stand-By Phone Transmitter for 160 Metres

By A. P. KERFORD-BYRNES (G6AB)

While there is nothing special about the design discussed here, it may (as the author suggests) inspire those who are interested in 1·7 mc to provide themselves with the sort of equipment which can be conveniently taken on holiday, or used from the fixed location.—Ed.

SOME time ago the writer decided to build a compact phone transmitter which would be suitable for taking on holiday, to enable contacts to be made with the Top Band lot in the evenings using the /A call sign.

The first consideration was size. The Tx had to be reasonably small and suitable for phone or CW. A sheet copper chassis was constructed, 6¼ in. long by 4½ in. wide by 4 in. high and four 1⅛ in. holes were punched at the corners to accommodate the valveholders. Other holes were also drilled for the tuning condenser, microphone jack, crystal holder and keying jack. The various components were gathered together from the junk box and valveholders and components were screwed into position. The wiring was then commenced and this was found easier than was anticipated—the whole rig was wired and on the air in one evening.

Circuit and Construction

The circuit consists of a 6V6 crystal oscillator choke modulated by the Heising method, with a 10 Henry choke and a 6L6 modulator valve. The 6J5 speech amplifier was transformer coupled to the modulator by an old R.I. "Hypermu" audio transformer, the last component to be fixed under the chassis.

Should anyone consider building a similar transmitter, it is recommended that the fixing holes for the audio transformer be made in the vertical "back wall" of the chassis, leaving the actual fixing of the audio transformer until all the other wiring is completed. The leads from the audio transformer terminals should be left sufficiently long for the transformer to be kept in circuit with the chassis upside down and the transformer hanging by its leads over the side.

This is no new circuit technique ! The whole idea is that the transformer fixing screws can be removed so that it is out of the way, and all the other mounted components can be reached with test prods or soldering iron ; the transmitter can be tested on the air in the upside-down position.

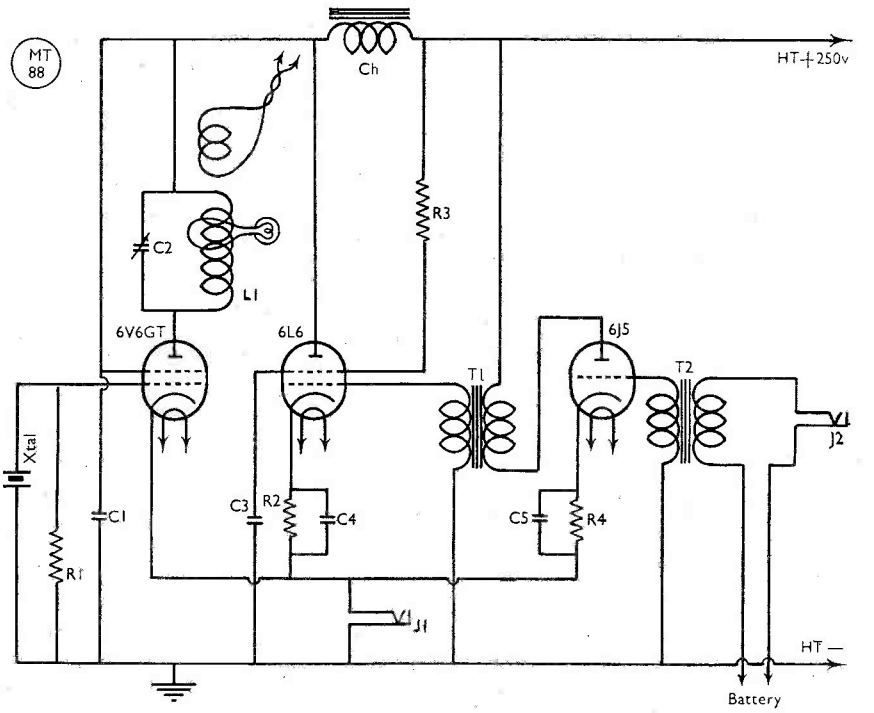
The microphone in use is an American T17, fairly plentiful on the surplus market. One advantage of this microphone is that a pressure switch is incorporated in the handle, of the two-pole "on-off" type, with one pair of large contacts and another pair of small. A twin plastic flex with a jack plug is connected to the larger pair of contacts, and when operating phone this plug is inserted into the keying jack, which is mounted underneath the crystal sockets. Another length of plastic twin flex with a second jack plug is inserted into the microphone jack. Thus, when the pressure switch on the microphone handle is squeezed, the microphone battery is brought into circuit, and the cathodes of all the valves are brought down to HT negative, so putting the carrier on the air by pressing the switch. A twin lead terminating in a pair of crocodile clips is brought out from the rig and clipped on to an Ever Ready Type 800 3-volt cycle lamp battery for energising the microphone. It is advisable to have the two flexible twin leads from the microphone of a different colour, to ensure that the plugs are inserted into the correct jacks.

The layout above the chassis and the position of components underneath the chassis do not matter much. Direct wiring between all components was used and although none of the wires are screened it is impossible to detect any trace of hum.

The circuit diagram and aerial coupling are shown and the method of coupling the rig to the aerial is the usual one in use at this station. A four-turn link on the oscillator coil L1 is coupled by means of a three-turn link to a coil 1¾ in. diameter, close-wound with 55 turns of 18 gauge enamelled wire. One end of this coil leads to the fixed vanes of a ·0005 μF broadcast-type variable condenser, with the moving vanes connected to a 102 ft. counterpoise ; the other end of the coil goes to a long-wire aerial 152 ft in length.

Operation

A small torch bulb in a basebound mounting holder has been incorporated in the rig as a resonance indicator. The clearance between the loop and the oscillator coil is about ½ in. The lamp lights up nicely when the crystal oscillator tank circuit is tuned to resonance with the crystal frequency and it can be left in circuit to give the operator some idea of



Complete circuit of the 160-metre transmitter described by G6AB. It can be built up on a very small chassis, as explained in his article.

Table of Values

Circuit of the 1·7 mc Transmitter

C1 = ·002 μF mica
C2 = 100 μμF variable
C3 = 2 μF
C4 = 10 μF 25 volt electrolytic
C5 = 25 μF 12 volt electrolytic
R1 = 100,000 ½ watt
R2 = 240 ohms 1 watt
R3 = 10,000 ohms 1 watt
R4 = 940 ohms 1 watt
J1 = Keying jack
J2 = Microphone jack
T1 = Audio transformer, 1/3
T2 = Microphone transformer
L1 = 70 turns 26-gauge double silk, wound on standard four-pin coil former
Ch. = LF choke, 10 Henry 80 mA

the modulation when using phone. When on CW the writer removes the modulator and speech amplifier valves and inserts a key into the keying jack.

Some excellent reports have been received on the phone on tests at considerable distances. The power supply required for the rig is but 230-250 volts at 80-100 mA and 6·3 volts at 2 amps. The power line is run in four-core cable to an old British four-pin valve base, to make it interchangeable with all the other gear at this station.

This little rig has given the author lots of fun, both in the construction and the operation, and is quite a useful thing to have on hand should the main Tx develop some complicated fault—and it takes up very little room in a suitcase when going on that summer holiday.

VHF BANDS

By E. J. WILLIAMS, B.Sc. (G2XC)

G3BLP/GM3OL Achieve New GDX Record on Two—
Extending Seventy-Centimetre Coverage—
Better GDX Conditions—
Nottingham VHF Meeting

THE past month has seen two outstanding dates for 2-metre working and some very commendable achievements on the 70 cm. band. The good 144 mc conditions occurred on June 6 and 19/20 and numerous DX contacts were made. The morning of the 19th was probably the peak period and (as so often has occurred in the past) it caught your conductor having to write "VHF Bands" while the DX was on the receiver !

First, there is a new GDX record for Two—G3BLP (Selsdon, Surrey) worked GM3OL (Dumfries) over the 296-mile path on the evening of June 20. Just a year ago, these same two operators established the then GDX record on Five. What an achievement ! They will have the congratulations of all VHF men on this fine performance—and who, twelve months ago, would have thought it could be possible. With the progress now being made on Two, one feels that even this record may be broken before very long.

The 70 cm. news which arrived after most of these notes had been written, tells of some excellent contacts between portable stations in Southern England on June 19. How much this was helped by the prevailing tropospheric conditions on that day is uncertain, but it falls to be recorded that G2FKZ/P operating three miles S.E. of his home QTH worked G3BEX/P on Devil's Dyke, north of Brighton, over a distance of 38 miles. Also contacted from G2FKZ/P was G2WS/P at Crowborough (28 miles). The latter station was heard by G3AHB/A at Hayes, Middlesex, 41 miles away, at RST559. G3BEX/P worked G2WS/P at 22 miles with S9-plus reports. All this is excellent work and we congratulate the operators concerned, who are among the pioneers on 420 mc.

"One-Way Paths"

Chief topics of discussion in the general correspondence have again been one-way paths and the G3CYY Band Plan. Of the former phenomenon numerous explanations have been put forward. It is, of course, entirely possible that one-way propagation does occur under certain circumstances, though several writers point out that no such paths were encountered in Service VHF experience. That, however, may not be conclusive evidence of their non-existence, as first, Service VHF was most often over the sea, and secondly, these links were usually over *reliable line-of-sight* paths and were not dependent on getting the most out of that fraction of a microvolt with which we are mainly concerned. (It is also within the experience of many that unusually long distances were at times covered on VHF.)

Nevertheless, it is felt that we should not accept the existence of one-way transmission until we have eliminated all other possible explanations. One or two have written protesting against what they feel to be the allegations last month that bad operating technique at the Rx end may be responsible for many missed calls. In order to avoid any possible misunderstanding it should be stated that it was not intended that *all* the instances of one-way traffic could be put down to bad operating.

In general, the explanation must lie among one or other of the following :

(*a*) Poor equipment, (*b*) Bad luck, (*c*) Bad operating, (*d*) One-way propagation. Considering each of these in turn, under the heading of equipment, receivers are probably the easiest items in which to lose those precious dB, and it is suggested that all those who are being heard by many more stations than you are able to hear at your end, should have another look at the Rx. Run your eye through the 2-metre Activity Report at the end of these columns and see how many DX stations have heard you and whom you have not heard in return. Secondly, it is becoming usual to assume that any old Tx will do. Maybe it's not quite as vital as the Rx, for a fourfold increase in output will only produce about one S-point

TWO-METRE FIRSTS

G/PA	G6DH/PAØPN	September 14, 1948
G/ON	G6DH/ON4FG	September 25, 1948
G/F	G6DH/F8OL	November 10, 1948
G/GW	G5MQ/GW5UO	October 22, 1948
G/GM	G3BW/GM3OL	February 13, 1949

TWO-METRE RECORDS

GDX	G3BLP/GM3OL	296 miles
General	G5BY/PAØZQ	390 miles

improvement at the other end, but when signals are getting down to S3, even half an S-point may make the difference between readability and non-readability. What sort of tank circuit do you use? Have you tried a linear circuit or have you coil and condenser, and if so how much condenser? Thirdly, there is the aerial and its feeder. Is the matching correct at *both* ends? Is your cable lossy? What sort of change-over relay have you? How do you tune the Tx for maximum output? Experience at G2XC shows that any sort of measuring device *inside* the station can be very misleading. Have you tried a field-strength meter some distance away? Our apologies if all this is very elementary, but it is worth saying even if it only helps one or two to get those DX contacts. Do not blame it all on the other man!

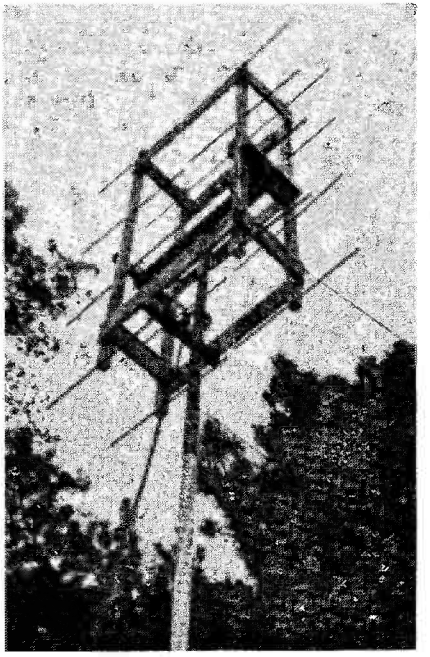
Under the heading of bad luck can be included fading and local interference. The former can be minimised by a more repeated searching of the band and/or by a more restricted band to search. (A point here in favour of the G3CYY Plan). Interference from local stations does lose calls. In the Portsmouth area it is truly amazing how the DX comes up on locally-used frequencies and is often unworkable as a result. (This again would be less liable under the Band Plan.) Ignition and other electrical interference also plays its part.

Bad operating was considered in detail last month, and the last possibility, namely, that it is due to a propagation characteristic, has yet to be proved, but must not be entirely ruled out. The whole problem is one on which those who are keeping regular schedules might be able to provide useful information in due course.

Two-Metre Band Plan

Some interesting letters on the proposed Zone Scheme have been received. The majority show unqualified approval of the revised plan which was set out in these columns last month. Some half-dozen letters reject the scheme, mainly on the score of a general dislike of planning, and the contention that no case has been made out for it. In the main these letters come from locations where local QRM is very slight. Undoubtedly, your conductor's personal liking for the scheme is primarily due to the fact that he has at least 12 very active local, or semi-local, stations whose S9-plus carriers make DX working extremely difficult, and, often, impossible.

It seems ridiculous when, with 2 megacycles at our disposal, the only three DX stations audible a few evenings ago were all within one or two kc of a local. Contact was made with all three, but only about 20 per cent. of their transmissions could be read. This is but one example and one point in favour of the Plan, and the same situation arises in every area of high activity. Space will not permit a more lengthy discussion here. However, it is hoped that the matter will be fully discussed at the Nottingham Fiveband Club meeting on July 9 and it would be appreciated if those with definite views on the scheme (either for or against) would come along prepared to take part in the discussion. In the light of the general opinion of the gathering and of the correspondence received, a definite proposal will be made in the August *Short Wave Magazine*. If the scheme is adopted it is thought likely that it could be implemented by about October; it is fully appreciated that there will be a good deal of frequency shuffling involved.



G2WS has a neat 16-element beam, cut for 436 mc, at his /A location at Crowborough, Sussex, and is obtaining good 70 cm. contacts at very satisfying distances

VHF Contest

Several requests for a VHF Contest have been made and it is proposed to hold the annual *Short Wave Magazine* VHF Contest, once again, in November. Consideration is being given to making it a two-band affair

once more, but this time on Two Metres and Seventy Centimetres. This topic will also be put before the Nottingham meeting and the Contest rules will appear in our October issue.

Station News

It is good to be able to report activity in the extreme south-west. G3AGA (Falmouth) was first worked by G5MA (Ashtead) on June 9, and heard by one or two others in the Surrey area. G2BJS and G3CZZ (both in Redruth) are on 144·027 and 145·63 mc respectively. The Rx side is catered for with converted RF27's, while the Tx's have VR135's in the final. A 3-ele. beam serves both Tx and Rx. More powerful transmitters are under construction and G3CZZ intends to modify a R1481 with two tuned RF stages (the first, a CV66) and then hopes to raise some DX.

G3EHY (Banwell) comments on the outstanding conditions on Whit Monday, June 6. Stations could be heard from all directions, except Hampshire ! G2NH was roaring in at 1630 and G2IQ was an excellent signal an hour later. The schedule G2NH-G3EHY has now passed its 100th contact and both evening and lunch-time QSO's have been equally successful. The new 5-ele. beam is up. It is close-spaced and has three directors and one reflector, and fed by 80-ohm coax into a folded dipole. G3EHY finds it two S-points better than his old beam. Next advance will be a 16-ele. job. G3EHY considers the hills to his south are the cause of his poor showing with the South Coast stations. G4AP (Swindon), on the other hand, thinks that the hills to his north prevent him having much success in that direction. He also found June 6 outstandingly good. G5QA (Exeter) hopes to have an outdoor beam up shortly and then anticipates working to the East as well as to the South-West. He would greatly appreciate listeners' reports, by the way.

G8QX (Malvern) has been on the band and has provided several with a new county. He comments on the excellent TV on June 6. We agree, and it tied up nicely with the 2m. GDX on that evening.

G2ADZ is busy moving to GW2ADZ in Montgomery and anticipates that there will be a queue for him if, as he hopes, he manages to put out as good a signal as he did from his previous QTH. Operating times will be mainly 1930-2030 BST. From his old QTH he found it easy to work Hull, which he points out is nearly as far north of him as London is south. He suggests this disposes of any idea there may have been that north and south working is difficult. Further comment is that when the London stations call CQ West, or South West, they are still audible in Oswestry. (And when they call " CQ North," they can still be heard in Portsmouth however many elements they have in their beams !)

G8KL (Wolverhampton) has worked G3BLP at last. He has a broadband RF amplifier using 6AK5's in front of his 522 Rx. He claims a gain of 10 dB with no increase

TWO-METRE ACTIVITY BY COUNTIES

The South

Beds
G3CGQ

Berks
G6OH

Bucks
G8WV

Cambs
G2FLC, G2PU, G2XV, G3WW, G5JO

Cornwall
G2BJS, G3AGA, G3CZZ

Devon
G2BMZ, G3AUS, G3AVF, G3FDV/A, G5BY, G5QA, G6WT

Essex
G2KG, G2WJ, G6DH

Glam
GW5SA

Glos
G3YH, G5BM

Hants
G2XC, G3CGE, G3DEP, G3EJL, G3LV, G3RI, G4QL, G5PB, G5SP, G6DT, G8AJ, G8BD, G8JB

Herts
G3FD, G4RO

Kent
G2AJ, G2UJ, G3AEX, G3DAH, G4DC, G5MR, G6PG, G6VC, G6VX

London
G6LR, G6OT, G8KZ

Middlesex
G6UH, G8IP

Monmouth
G4GR

Oxon
G5TP

Somerset
G3EHY

Suffolk
G2CPL

Surrey
G2AKM, G2DGO, G2MV, G2NH, G3BLP, G4CI, G5MA, G5MI, G5US, G5WP, G6CB, G6NB, G6NF, G8SM

Sussex
G2JU, G2NM

Wilts
G2BUJ, G4AP

Worcs
G8QX

Northern and Midland Counties next month

in noise. G3CXD (Newcastle-under-Lyme) is a strong signal in Wolverhampton.

We regret the geographical error which put G5CP and G6TL in the wrong county in last month's Activity List. They are, of course, in Cheshire. G5CP (Sale) and G3DA (Liverpool) have both been heard in GI by SWL W. A. Kane (a member of the VHF Listeners' Club), at Ballywater, Co. Down. This is believed to be the first reception of its kind. G3DA was first heard on May 29 at 1815, and his listener relayed G3DA's signal back to him on the landline. Then G5CP was heard in Ballywater on June 4. Congratulations to all concerned. G3DA asks whether slugs in coils at VHF are a desirable feature. His tests say they are not.

G5MQ (Liverpool) informs us that G5BM/GW5SA was *not* the first G/GW on Two. It now appears fairly certain that the first contact was G5MQ/GW5UO on October 22, 1948, and we are accordingly inserting that in the table of " Two-Metre Firsts." G5MQ is, at present, inactive on 2 metres.

G6LC (Lowton St. Mary's) has worked GM3OL about 10 times and comments that as a result the Cumberland hills can be cleared of the charges laid by G2OI, namely, that they were a barrier to 2-metre signals coming from GM. G6LC also thinks he heard G2XC ! He certainly deciphered the G, the 2, and the X, but as there are also G2XS and G2XV on the band, G2XC is keeping calm !

G2IQ (Sheffield) has been beaming north of the Newcastle stations. To the West he cannot get out at all well due to the 1,500 ft. hills. He recently visited the Devonians G2BMZ and G6WT, and was astonished at the length of the former's 22-element Yagi. G6TF (Sheffield) has been busy moving from the spare bedroom into a special edifice he has erected in the garden. For Two he has a couple of converters available. The first has 6AK5, 6J6, while the other is an all-acorn line-up. A new lattice tower has been erected and a 5-ele. w.s. beam is at 36 ft., above his 10-metre beam, fed by 52-ohm cable. A reversible AC motor at the top of the mast does the rotation. G6TF intends to try out a 6J6 broadband amplifier mounted on the beam in a waterproof box. If this is found worth while on the Rx side, two separate beams will be used for Tx and Rx. All this is what one would call an enterprising approach to Two, and should pay a dividend in results.

Two-Metre DX Working

Worked	Station
Over 350 miles	G2IQ, G5BY
300 to 350 miles	G2ADZ, G2BMZ, G2MA, G3DMU, G4LU, G6WT
250 to 300 miles	G2XC, G3BLP, G6OS, G8DM, GM3OL
200 to 250 miles	G2CIW, G2OI, G3AGA, G3DAH, G4AP, G5BM, G5MA, G5MQ, G5NF, G5RP, G5TZ, G6DH, G6PG, G6ZQ

TWO METRES

COUNTIES WORKED LIST

Starting Figure, 14

From Fixed QTH only

Worked	Station
32	G3BLP (118)
30	G2NH (144), G5MA, G5WP
28	G2ADZ
27	G2IQ, G6NB (108)
25	G2AXG, G5BM
23	G2CIW (101), G2MR (110), G3APY, G4LU
22	G5MI
21	G5BY, G5NF, G6PG
20	G2NM, G2XC, G3COJ, G3DAH
19	G5RP
18	G3EHY, G4DC (102)
17	G3ABA, G3AUA
16	G2OI, G8SM
15	G2FLC, G8QX
14	G3DMU, G6LK

Note : *Figures in brackets after call are number of different stations worked. Starting figure,* 100.

Two-metre activity continues at a high level in Hull and reports come from G3ALY, 3COJ, 3CUJ and 5GX. Taking them in that order, G3ALY comments on the remarkable consistency with which G5WP and G6VX are received. 'ALY has worked 22 stations in 10 counties during the past month, using an 832 final in the Tx, a 4-ele. beam and the G6VX 6J6 converter. G3COJ says the QRM problem is getting bad in Hull. His beam is now at 40 ft., but he still cannot get such consistent results as others nearby. So a 16-ele. beam will shortly be up on the pole. G3COJ has measured the noise factor of his Rx and makes it 6·5 dB ; he uses 6J6 RF and 6J6 mixer. At his request, it is pointed out that G3COJ and G3CUJ are both active

and are on very nearly the same frequency, and only ½ mile from each other. The latter hears London stations without difficulty every night. He bemoans the lack of activity between 2030 and 2230. G5GX is using a 522 Tx and a 12-ele. beam 35 ft. high. The convertor is CC, with 6J6 and 3×954 RF stages, into an AR88.

In Newcastle, G3CYY has worked G5GX for his first DX in eight months on the band, and has heard G2MA, while G4LX has logged G2IQ, 2MA, 5GX and GM3OL. The Tx at G3CYY is SCR522, and this feeds a 4-ele. beam. The Rx is the 522 with a modified front-end.

G2XS (King's Lynn) tells us that G5MA, 5WP and 6VX are the only consistent southern stations in Norfolk. (Noticing a serious omission in this list of calls, we wrote to G2XS, and there followed an exchange of views on the efficiency of the Tx at G2XC and the Rx at G2XS, but two days later two-metre contact was established and honour satisfied at both ends !) G2XS remarks, anent the long CQ's, that frequent signing is essential especially when QSB is prevalent. Agreed !

G3VM (Norwich) beams on London and on the Midlands every evening from 1830 to 2130 GMT. He maintains daily contact with G2CPL (Lowestoft). G2FLC (Cheveley) is building a new beam and enquires when some of his QSL's for last November will arrive ? Tut-tut !

G3DAH (Herne Bay) has worked the Hull group on 'phone in mid-afternoon. G5MA (Ashtead) in addition to a fine QSO with G3AGA (Falmouth) has climbed four rungs up the Counties ladder while G2NH (New Malden) has risen five places. G6NB went /A in Bucks and gave many of us a new county, and G8KZ operating /P on June 19 in the same county was kept very busy working everyone except G2XC !

G5WP (Woking) draws attention to the importance of some of the regular schedules that are in operation. He mentions the following :—

G2NH/G3EHY	**1400 & 2230 BST**
G2NH/G2CPL	**1930 BST**
G5BD/G5WP	**2230 BST**

They are most certainly useful in determining whether the band is "open" or not. As a result of his tests with G5BD, G5WP reports that so far two metres has proved nearly as consistent as Five, and when conditions are good, gives a louder signal. What do others think ?

In addition to the fine GM3OL QSO already mentioned, G3BLP (Selsdon) has worked a lot of other DX, although he found the latter half of May to be rather dull. Three counties have been added. Regarding CQ calls, he thinks long ones necessary on VHF, but emphasises the need for frequent signing. This applies equally when calling another station as well as to CQ's. How often have you heard some one calling you for two minutes or more with no mention of his own call and then go down into the QSB just as he signs ? (It happened to G2XC three times yesterday.) G6CB (Wimbledon) again points out that stations do not tune as low as his frequency, 144·036. (They often do not get as far as 144·92 !) By the way, he reports that MF2AA in Trieste is active on Two from 1800 daily—with 1 kW !

Late News

GM3OL (Dumfries) just makes it with a report of working G5GX and G8AO on the East Coast during a recent good opening, and he has been hearing the Preston Police on 146·2 mc at S9 consistently, in spite of those Cumberland Hills. He still wants 15 cards for his VHF CC. . . . G3CYY (Newcastle) worked GM3BDA (Airdrie) on June 16, through a mass of mountains. . . . G2JU (West Wittering) is now at sea level on the Sussex coast and so counts as a new station for VHF CC purposes. . . . G2NH (New Malden) logged many Midland stations engaged in local phone on the morning of June 19, and apparently unaware of the good DX conditions. Among them were three Notts stations, so 'NH still wants a Notts contact ! . . .

In a letter from PAØLU comes a report that DL3FM, Mulheim, near Duisburg, has been heard in PA on several occasions on

70 Cm. ACTIVITY LIST

Birmingham
G3EMY, G3LN, G5JU, G8JI

Bolt Tail, Devon
G5BY

Kirkby-in-Ashfield
G3APY

London
G2FKZ, G2WS, G3BDV, G3BOB, G3CU. G3DSV, G3FZL, G5PY, G6HD

Loughborough
G2KK

Luton
G3CGQ

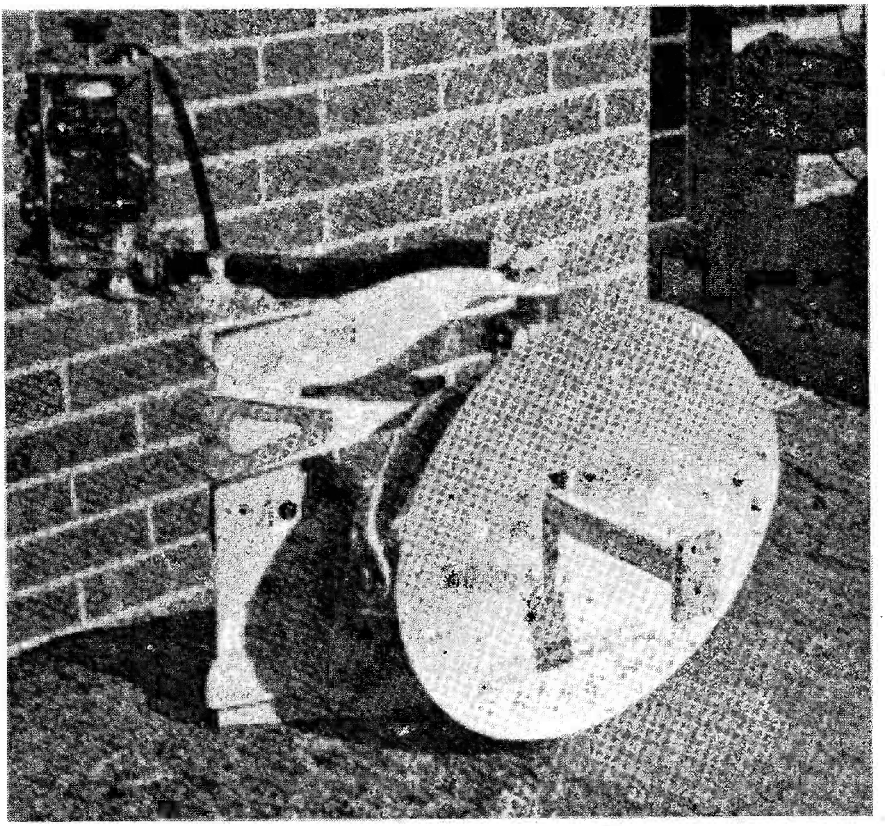
Portsmouth
G3LV

Romford
G2BVN

Sheerness
G2HKU

Southampton
G3EJL

Southwick, Sussex
G3BEX



G8RS, Reading, a well-known VHF worker at present on detached duty in HB, is equipped for our highest frequency band—10,000 mc (3 cm.). The parabaloid is 14-inch, with two 1852's as IF pre-amplifier at 30 mc. A 725A/B klystron with potentiometer controlled reflector voltage is used.

144·7 mc. PAØLU is using 29 watts to an 829A. He says several of them in PA are interested in 70 cm. but lack 832A's.

During the Air Defence exercises which took place during the week from Sunday, June 26, the attack bombers were to employ the reflection device known as "Window" (a war time code name) to confuse the defending radar. If the bombers did succeed in forming Window clouds of any density, it is conceivable that unusual "propagation conditions" on the two-metre band might have been noticed for short periods ; a Window cloud of sufficient density and duration would have had some reflection efficiency at the frequencies in which we are interested.

Six-Metre Opening

For a final news item, we are indebted to G3BYS (Southend-on-Sea) who reports an interesting 50 mc opening, effective G/SM, during the late afternoon of June 18. G3BYS worked SM5VL on 28 mc, who relayed back the A.P. TV signals on both channels. SM5VL then changed over to 50·04 mc transmission and worked G3BYS duplex at S9-plus, G3BYS being on Ten and finding it possible to receive SM5VL on a 5 ft. piece of wire dangling on the floor ; the Rx at the G end was an S27. SM5VL's QSL has arrived to confirm the QSO, and shows that he was using 100 watts with a 3-element beam.

Fiveband Club

Membership of the Fiveband Club has now passed the 100 mark, and by the time this appears in print all members may have received Club Circular No. 3 and the latest list of two-metre band frequencies. A few PA

frequencies which reached us too late for the Circular are printed in this column.

The Midland area Fiveband Club meeting will be held in Nottingham on July 9 at the Victoria Station Hotel. There will be some VHF gear on show, and as already mentioned dinner will be followed by discussions on the Band Plan and the November Contest, amongst other things. Anyone who intends to be there and who has not yet notified G3APY should do so immediately. His QTH is J. Spragg, Wendover, Frederick Ave., Kirkby-in-Ashfield, Notts.

In Conclusion

Thank you for the load of mail this month—and both G6FO and G2XC hope to meet many of you at Nottingham. Latest date for next month's reports and comments is July 15. Address is E. J. Williams, G2XC, *Short Wave Magazine*, 49 Victoria Street, London, S.W.1.

Frequencies of Dutch VHF Stations

PAØHA	144·1	PAØZQ	144·96
ØPAX	144·18	ØUK	145·00
ØMU	144·2	ØPD	145·2
ØJHK	144·42	ØJU	145·22
ØUW	144·60	ØIK	145·44
ØLU	144·68	ØDT	145·44
ØUHF	144·71	ØPJ	145·54
ØAD	144·72	ØVT	145·62
ØPN	144·92		
ØCB	144·94	ON4FG	144·74

TWO-METRE ACTIVITY REPORT

To maintain the usefulness of this section, please set out your list on a separate sheet and exactly as shown below. That is, with callsigns in numerical and alphabetical sequence, arranged horizontally, repeating the numeral but not the prefix, and divided into "worked" and "heard" listings. And please print all calls clearly!

G3EHY, Banwell, Somerset.

WORKED: G2ADZ, 2AJ, 2IQ, 2MR, 2NH, 2NM, 2OI, 3ABA, 3BLP, 3YH, 4CI, 4DC, 4GR, 5BM, 5BY, 5MA, 5NF, 5WP, 6NB, 6VX, 6WT, GW5SA.

HEARD: G2BUJ, 2XC, 3DAH, 3DEP, 4RO, 6UH, 6VC, GM3OL. (*May* 13-*June* 14.)

G2FLC, Newmarket, Cambs.

WORKED: G2XS, 2XV, 4MW, 5JO.

HEARD: G2PU, 3DAH, 3WW, 5UD, 5WP.

G5BY, Bolt Tail, Devon.

WORKED: G2NM, 3AGA, 3BLP, 3DEP, 3EHY, 3EJL, 3LV, 4GR, 4QL, 5MA, 6DT, 8AJ, 8JB.

HEARD: G2AOK/A, 2NH, 2WJ, 3DAH, 4DC, 5NF, 5PB, 6OH, 6VX.

G3DAH, Herne Bay, Kent.

WORKED: G2ADZ, 2AJ, 2BMZ, 2CPL, 2IQ, 2KG, 2UJ, 2WJ, 3ALY, 3BTL, 3CC, 3CGQ, 3COJ, 3CUJ, 3GW, 4AP, 4AU, 4DC, 4RO, 5BD, 5GX, 5MA, 5MI, 5MI/A, 5TP, 5UD, 5WP, 6DH, 6NB, 6NB/A, 6OT, 6PG, 6VC, 6VX, 6YP, 8JB, 8KZ, 8QY.

HEARD: G3AUA, 3BBA, 3BKQ, 3EDP, 6XY. (*May* 16-*June* 13.)

G3BLP, Selsdon, Surrey.

WORKED: G2ADZ, 2ATK, 2BUJ, 2HCG, 2OI, 2XC, 3CXD, 3DUP, 3EEZ, 3EHY, 4AP, 4GR, 4LU, 4OS, 5BM, 5BY, 5JU, 6LC, 8KL, 8QX.

HEARD: GA2VQ, 3EGP, 3FVD/A, 8JB.

G3EJL, Southampton, Hants.

WORKED: G2NH, 2NM, 2XC, 3AVF, 3CGE, 3RI, 4QL, 5PB, 5SP, 6DT, 6WT, 8AJ, 8BD, 8JB.

HEARD: G2JU, 2OI, 3AUS, 3BKQ, 3EHY, 3FDV/A, 5MA, 5WP.

G2XC, Portsmouth, Hants.

WORKED: G2ADZ, 2AVQ, 2BMZ, 2IQ, 2WJ, 2XS, 2XV, 3DAH, 4LU, 4RO, 5BM, 6NB/A, 6WT, 8QY.

HEARD: G2OI, 2QV, 3BKQ, 3DA, 3EHY, 4AP, 5JU, 8UZ. (*May* 15-*June* 20.)

G3DA, Speke, Lancs.

WORKED: G2ADZ, 2IN, 2MA, 2OI, 3ALY, 3AYT, 3COJ, 3CXD, 4OS, 5BD, 5CP, 5KX, 6LC, 6OS/A, 6TL, 6YO, GM3OL, GW3ELM.

HEARD: G3BY, 3DMU.

G8QX, Malvern, Worcs.

WORKED: G2ATK, 2AVQ, 2NH, 3BLP, 4DC, 4RK, 5WP, 6FK, 6XY, 8QY.

G6LC, Lowton St. Mary's, Lancs.

WORKED: G2ADZ, 2AYT, 2IQ, 2OI, 3BLP, 3CHY, 3CUJ, 3CZP, 3DA, 3DH, 3FFT, 3VX, 5CP, 5GX, 6TL, 6YO, GM3OL, GW5UO.

HEARD: G2BUJ, 2DRG, 3ALY, 3BKQ, 5BD, 5BM, 5KX, 5TP, 6MI, 8AO, GM3BDA. (*Five weeks to June* 14.)

G3CUJ, Hull, Yorks.

WORKED: G2ADZ, 2IQ, 2MA, 2TK, 2XS, 3APY, 3DAH, 4CI, 4DC, 5BD, 5PI/P, 5WP, 6BX, 6LC, 6VX, 6YO, 6YP, 8SJ.

HEARD: G2AJ, 2AUA, 2OI, 3AEX, 3DA, 4JB, 5CP, 5MA, 5UD, 8AO.

G5GX, Leven, Yorks.

WORKED: G2ADZ, 2FZX, 2MA, 2TK, 3ABA, 3ALD, 3ALY, 3CUJ, 3CYY, 3DMU, 5BD, 6OS, 6VX, 6YP.

HEARD: G2AJ, 2IQ, 2MR, 2NH, 2OI, 2XS, 3AEX, 3BKQ, 3BW, 3DA, 3DAH, 3DRG, 3EHY, 3ENS, 4DC, 4LX, 5BM, 5CP, 5MA, 5UD, 5WP, 6BX, 6DH, 6LC, 6NB, 8AO, 8QY, 8SJ, GM3OL.

G6NB, Chertsey, Surrey.

WORKED: G2ADZ, 2IQ, 2OI, 2WJ, 2XS, 2XV, 3ABA, 3EHY, 5BD, 8JB, 8QY. (*Four weeks to June* 14.)

G2OI, Eccles, Lancs.

WORKED: G2ADZ, 2BUJ, 2IQ, 2NH, 3AYT, 3BLP, 3BW, 3CNY, 3CXD, 3DA, 3EHY, 4OS, 5BM, 5MA, 5WP, 6LC, 6NB, 6TL, 6VX, 6YO, 8QY, GM3OL, GW5UO.

HEARD: G2AOA, 2AVQ, 2MA, 2XC, 3ABA, 3AOO, 3BY, 3DEP, 3DH, 3EEZ, 3FFT, 4DC, 5CP, 5JU, 8WV. (*May* 9-*June* 10.)

G2ADZ, Oswestry, Salop.

WORKED: G2AJ, 2BUJ, 2IQ, 2MA, 2NH, 2OI, 2XC, 3ALD, 3ALY, 3BY, 3CC, 3COJ, 3CUJ, 3CXD, 3DEP, 3DMU, 3EHY, 4OS, 5BD, 5BM, 5GX, 5MA, 5WP, 6NB, 6UH, 6VC, 6VX, 8KL, 8SM.

HEARD: G3EEZ, 3TF, 5ML.

G8KL, Wolverhampton, Staffs.

WORKED: G2ADZ, 2AVQ, 3BLP, 3DJQ, 4LU, 8QX, 8QY.

HEARD: G2ATK, 2BUJ, 2NH, 3EGP, 4RK, 5BM, 5JU, 5WP, 6VX, 8WV. (*June* 5-*June* 12.)

7193's on Two Metres

Triode Push-Pull RF Stage

By J. H. JOWETT (G3CFR)

These 7193's are triodes of a type frequently found in surplus VHF equipment. The author of this article shows how they can be applied to a low-power push-pull neutralised RF amplifier for the 145 mc band.—Ed.

MANY amateurs have no doubt come into possession of an excellent little valve now obtainable quite cheaply in the surplus market; they may have wondered just what it was and how it could be used. The valve in mind is the 7193. It is designed primarily for VHF purposes and has two top caps—one for the grid, the other for the anode; the cathode and filaments are brought out to the usual connections on the base. The actual connections to the grid and anode may easily be checked through the glass envelope.

Some idea of its useful characteristics at VHF may be gathered by considering inter-electrode capacities of the 7193. They are as follows: Capacity grid-to-anode, 3·6 μμF; capacity grid-to-cathode, 2·2 μμF capacity anode-to-cathode, 0·7 μμF. Thus a low-capacity high-efficiency output circuit can be built round these valves.

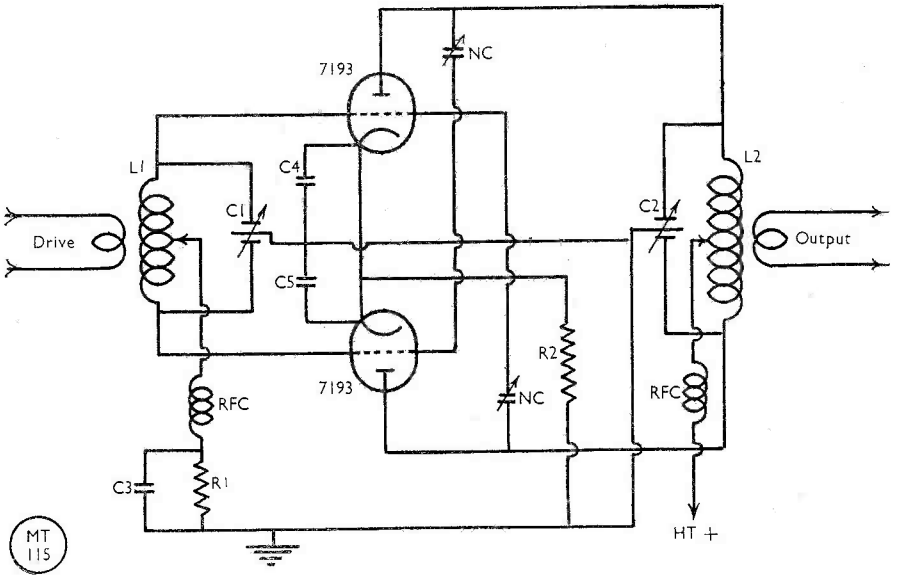
The writer has noticed 7193's used in numerous VHF applications around 200 mc, *e.g.*, in a push-pull self-excited oscillator using Lecher bars for tuning grid, anode, and cathode circuits; and for the variable sweep oscillator in American IIF equipment. They are capable of output of the order of 5-6 watts when used in this manner, with efficiencies of 40-50 per cent. easily obtainable. The writer has also seen them employed for super-regenerative reception, where they are as good as acorn valves like the 955.

Having seen these valves working so happily, it was decided to incorporate a pair of 7193's,

Table of Values

Fig. 1. Circuit of the 7193 P/P 145 mc RF Amplifier

C1, C2 = 20 μμF, split stator
C3, C4, C5 = ·0005 μF
NC = Neutralising condensers (*see text*)
RFC = *See text*
R1 = 2,500 ohms
R2 = 200 ohms
L1 = 3 turns 16 SWG, ⅝ in. diameter, spaced ¾ in.
L2 = 2 turns 16 SWG, ⅝ in. diameter, spaced ¾ in.



RF amplifier using 7193's.

on a separate chassis, into the existing 2-metre transmitter to make a push-pull PA.

Circuit

The circuit used is standard for push-pull RF amplifiers, and is as shown in Fig. 1. This circuit and the values of the components are self-explanatory. The chassis layout was of course arranged to obtain shortest possible leads, and is important from the point of view of efficiency. All wiring is 16 SWG, tinned copper. The coils specified can be trimmed quite easily by pulling them out or pushing them in, and their inductance should be such that the tuned circuits resonate with minimum capacity of the tuning condensers. Incidentally, the tuning condensers are mounted above the chassis by means of four lengths of 6BA threaded rod, which makes quite a good mechanical job.

The two RF chokes each consist of 30 SWG DCC wound on a high value resistor to fill the length of it. The wire can be held in place and a neat job produced by allowing wax from a candle to be melted from the soldering iron on to the resistor-cum-wire. The neutralizing condensers are made from tin plate. One plate of each condenser is fixed to the grid top cap ; the second plate is soldered to 16 SWG wire which goes to the anode of the opposite valve, and this wire acts as a support for the plate ; it can be bent to hold the plate in any position. The spacing between the plates is about $\frac{1}{8}$ in. when the plates have an area of 1·4 sq. in., but must be determined by experiment. The correct setting for neutralization is obtained when rotation of the anode tank through resonance (no HT on the PA) produces no change in grid current. This adjustment is critical but a point *can* be obtained where no deflection of the grid meter is observable at all. HT can then be applied and the amplifier will be found to be quite stable.

Driver Stage

The valve used to drive this amplifier was a 6C4, used as a neutralized BA giving about 1 or $1\frac{1}{2}$ watts of RF output. This seems to be quite enough to drive the 7193's. Using a power supply of 300 volts, the anode current taken by the valves with drive applied and no load off resonance is 65 mA. On resonance the plate current drops to less than 25 mA. The estimated output when the PA is loaded to about 18 watts, *i.e.* 60 mA at 300 volts, is in the region of 8 watts. The efficiency is 47 per cent.

This could certainly be improved upon using more efficient condensers but is tolerable considering the cost of the whole PA (the writer made his for about 5s. !).

Grid current as low as 2 mA has been used and still excellent output is given. The valves keep reasonably cool and do not appear to be over-worked.

This PA can be recommended to any operator desiring to become active on 2 metres, and requiring a moderate powered RF amplifier at a modest cost.

Cathode Follower for the VFO

Better Isolation for the Driver

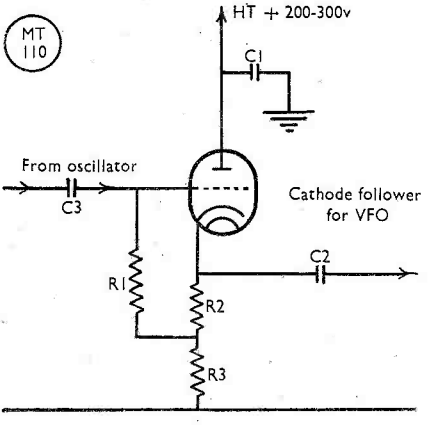
By J. HUM (G5UM)

NEARLY every user of a variable frequency oscillator employs some sort of buffer stage between the oscillator and the driver stage. Dissatisfaction with the buffer stage is commonly expressed, either because it gives no amplification (what do you expect anyway ? It *is* a buffer stage !), or more seriously, because it does not provide the degree of isolation hoped for. Again, it may *appear* to be functioning properly and the VFO may *seem* to be stable, but when the latter is keyed the resulting chirp quite clearly indicates that it is not.

In most VFO buffer positions a pentode is generally used. Very few amateurs appear to have considered employing a cathode follower instead—perhaps because they regard a cathode follower as an occult bit of circuit trickery derived from radar techniques and not to be used by a straightforward amateur for communication work.

In practice the cathode follower is an extremely simple device demanding nothing more than three resistors, three fixed condensers and one triode valve. As an isolating buffer stage in a VFO it is hard to surpass and certainly much more effective than the more usual pentode. The circuit diagram shown here reveals the simplicity of the thing. Any medium impedance triode will serve, the ubiquitous 6J5 being as good as any. The output from the oscillator is fed to the grid and drive is produced from its cathode ; the anode circuit is earthed through the fixed capacity.

Theoretically the cathode follower cannot give a stage gain exceeding unity. Be that as it may, the user will find that if its output is



Circuit of a suitable cathode-follower buffer stage, values for which are given below.

Table of Values

The Cathode Follower Buffer Stage

C1 = ·01 μF
C2 = ·001 μF
C3 = VFO coupling condenser
R1 = 100,000 ohms
R2 = 330 ohms
R3 = 10,000 ohms
Valve = 6J5

fed into the grid of, say, a 6V6 driver stage with a broad-band anode output circuit, as much as 2 watts can be produced into an 80-ohm link coupled line, with 350 volts on the plate of the 6V6.

Considerations of drive apart, the cathode follower has as its main attraction the fact that it provides such complete *isolation.* Operators who instal one should almost certainly find that where once their VFO note was—well, hardly crystall (even with a stabilised power supply)—it will now be T9 every time, even when full break-in of the VFO itself is being worked.

BRITISH OLD TIMERS' CLUB

Membership now stands at the total of 156, a considerable increase since the first list was issued six months ago. It is much to be hoped that as they achieve "20-year status," those eligible to join will make themselves known to us. Membership costs nothing, as the Club exists only to bring on record all those who, having been first licensed not less than 20 years ago, still hold a radiating permit. It does not matter if there has been a break, or if the call-sign is different, or even if it has not been issued by the same authority as the original licence—so long as it has always been a British ticket. This means that our VE, VK and ZL cousins are all eligible for membership of the British Old Timers' Club if they qualify under the 20-year rule.

This month there are ten new members to enrol, as follows :

J. N. C. Bradshaw, G2NY (1919)
F. A. Bird, G4WA (2KP in 1921)
F. Illidge, G5HG/ST2C (1922)
F. C. McMurray, G2FM (1923)
A. L. Jeffrey, G5UV (1925)
Miss B. M. Dunn, G6YL (1927)
G. G. Livesey, M.A., FO3SRB/G2LX (1927)
E. Johnson, G2HR/G2ZN (1928)
J. J. Curnow, G6CW (1928)
J. N. Roe, G2VV (1929)

It is with deep regret that we record the death of one of the original members of the B.O.T.C.—G4MH, Blackpool. He obtained his first licence in 1913 and belonged to that very exclusive band of pre-1914 War amateurs, of whom there are still quite a number active to-day.

NEW QTH'S

As we have started to run behind again with the new callsigns and changes of address for this feature, we propose taking some extra space for "New QTH's" in the August issue, which should enable us to absorb most of the back-log. Entry in this feature is open to any operator who cares to send us the necessary information, but addresses are never published except at the direct request of the owner of the callsign. Appearance in "New QTH's" also ensures eventual publication of the address in the *Radio Amateur Call Book.*

DX OPERATING MANUAL

All those who aspire to an understanding of the vast subject of DX on the amateur bands need a copy of the *DX Operating Manual,* which is a work of reference complete in itself. The *Manual* sets out to guide the beginner and inspire the uninitiated. Of seven chapters and 36 pp., it tells you everything you want to know about DX—so far as that is possible by the printed word. The price is 2s. 8d. post free, of the Circulation Manager, Short Wave Magazine, Ltd., 49 Victoria Street, London, S.W.1.

NEW QTH's

This space is available for the publication of the addresses of all holders of new callsigns, or changes of address of transmitters already licensed. All addresses published here are automatically included in the quarterly issue of the Call Book in preparation. QTH's are inserted as they are received, up to the limit of the space allowance. Please *write clearly* and address on a separate slip to QTH Section.

DL2MP F/Lt. R. L. S. Hathaway, Officers' Mess, R.A.F. Wunstorf, B.A.F.O., B.A.O.R. 5.

EI4X V. Patterson, 114 Stiles Road, Clontarf, Dublin. Eire.

G2AFU J. T. Sawyer, 16 Sanctuary Road, Gillingham, Kent.

G2ANL A. C. Martin, c/o W. Martin, Newton Harcourt, nr. Leicester.

G2AVQ W. R. Stokes, 18 Murdock Road, Handsworth, Birmingham, 21.

G2BDR L. Fox, 57 Bradwell Avenue, Stretford, Manchester.

G2BNY H. Newman, 3 Leighton Crescent, London, N.W.5.

G2DFL D. G. B. Knight, 29 Haylease Crescent, Hunderton, Hereford.

G2HKQ A. R. Knight, 122 Garland Road, Poole, Dorset.

G2PL P. Pennell, 122 Forresters Drive, Wallington, Surrey.

G3BDK K. W. Sheppard, 2 Wesley Road, Chapel Estate, Hillmorton, Rugby, Warks.

G3CPA W. I. G. Reid, A.M.I.E.E., 22 Nightingale Road, Hampton, Middlesex.

G3DGW D. Early, 27 Richmond Road, Towcester, Northants.

G3DKB T. Vallard, 58 Hawthorn Road, Willesden London, N.W.10.

G3DNF G. J. Bennett, 22 Revelstoke Road, Southfields, London, S.W.18.

G3DVE E. J. R. Chilcott, Ty-Fry, Mill Street, Torrington, N. Devon.

G3EAB J. L. Nash, 12 Wensleydale Avenue, Ilford, Essex. (*Tel.: Wanstead* 3577).

G3EBH G. C. Newby, The Vicarage, Nettleham nr. Lincoln.

GM3EHH J. A. Law, 25 Cameron Street, Stonehaven, Scotland.

GW3EHP J. Wilmot, Pantiles, Graig-yr-Eos Road, Ogmore-by-Sea, nr. Bridgend, Glam.

G3EMD M. R. Hassall, 99 Shenstone Valley Road, Quinton, Birmingham.

G3EMR A. H. Hodgetts, Green Bushes, Viewlands Avenue, Westerham Hill, Kent.

G3ENZ A. Johnson, 73 Fenwick Road, Broxtowe Estate, Nottingham.

G3EPJ A. S. Bendell, 26 Alcombe Road, Alcombe, Minehead, Somerset.

GW3EPM I. Hughes, Crud-yr-Awel, Seven Sisters, Neath, Glam.

G3ERB L. N. Goldsbrough, M.A., B.Sc., 54 Kings Lane, Bebington, Cheshire.

G3ETO D. Young, 65 Northwold Avenue, Blackley, Manchester, 9.

G3ETW D. Ward, 64 Crosbie Road, Chapelfields, Coventry, Warks.

G3EZE G. H. Standing, Little Down, Lower Road, Fetcham, Leatherhead, Surrey.

G3EZX S. Wood, 51 Henshall Avenue, Latchford, Warrington, Lancs.

G3FDJ A. Kenyon, 18 Higgins Lane, Quinton, Birmingham, 32.

G3FFK J. H. Bridgewater, 6 Bell End, Rowley Regis, Blackheath, Birmingham.

G3FGU J. G. Foster, 7 Maw Street, Walsall, Staffs.

G3FHL G. C. Bagley, 34 Wharfage, Ironbridge, Shropshire.

G3FHQ K. Gilbert, 25 Lysways Street, Walsall, Staffs.

G3FHZ F. J. Rawle, 16 Kings Road, New Oscott, Sutton Coldfield, Birmingham, 23.

G3FIB G. A. Livesey, 11 Higher Shady Lane, Bromley Cross, nr. Bolton, Lancs.

GM3FIG M. Y. Hawkins, 33 Hazelbank Terrace, Edinburgh, 11.

GM3FIZ D. M. Sangster, c/o Commercial Bank, Lochgelly, Fife, Scotland.

G3FJO A. O. Ellefsen, 10 Seymour Avenue, Heysham, Lancs.

G3FJQ J. O. Dodd, 5 Stanley Avenue, Birkdale, Southport, Lancs.

G3FJV/A F. G. Dutton, 15 Westfield Drive, Skegness, Lincs.

G3FJZ R. Maggs, Lockthwaite, Beach Road, Portishead, Bristol.

G3FKA R. H. Newman, Crowhurst, Haywards Heath, Sussex.

G3FKF Salisbury & District Short Wave Club, 85 Fisherton Street, Salisbury, Wilts.

G3FKH D. Sciller (DL2NS), 42 Cressing Road, Witham, Essex.

G3FKM Dr. E. J. Allaway, 22 Lightwoods Hill, Smethwick, 41, Staffs.

G5PM Royal Military Academy, Sandhurst, Camberley, Surrey.

G8WP A. G. Smith, Cranmere, Lascelles Hall, Kirkheaton, Huddersfield, Yorks.

CHANGE OF ADDRESS

DL2JO F/O. N. Kay, Officers' Mess, R.A.F. Lubeck, B.A.F.O., B.A.O.R. 22.

G2AJF W. J. Ridley, Gablehays Lodge, Springfield, Chelmsford, Essex.

G2BOI K. V. Draycott, Clydedale Avenue, Forest Hall, Newcastle-on-Tyne.

G2CIW J. F. Moseley, 45 Geoffrey Avenue, Harold Park, Romford, Essex.

GC2FMV E. Chapman, Les Quatre Vents, Le Clos des Gelettes, St. Peter's Valley, St. Lawrence, Jersey, Channel Islands.

G3AMT R. R. Elkin, 27 Cove Road, Ensbury Park, Bournemouth, Hants.

G3AQX S. Roberts, 20 Springfield Crescent, Somercotes, Derbyshire.

G3BIH J. Crankshaw, 97 Warwick Street, Daventry, Northants.

G3BXU W. E. Priest, 23 Bank Street, St. Columb Major, Cornwall.

G3BYP G. W. Arnold, 8 Merton Avenue, Hazel Grove, Stockport, Cheshire.

G3CVP W. A. Griffith, 11 Parker Street, Moss Side, Manchester, 14.

GM3DNQ D. H. McLean, Fernlea, Bellevue Road, Kirkintilloch, Dumbs. (*Tel.: Kir* 1834.)

G3DPH W. E. H. Harris, The Street, Rushmere, Ipswich, Suffolk.

G3EHX J. Wright, School House, Lower Peover, nr. Knutsford, Cheshire.

G3EJR J. B. Armstrong, 13 Quemerford, Calne, Wilts.

G3EVE Brighton & District Radio Club, Eagle Inn, Gloucester Road, Brighton, Sussex.

G3WD A. J. Ward, 42 High Street, Buriton, Hants.

G4HQ F. D. Roberts, 23 Lansdowne Road, South Woodford, London, E.18.

G4HW R. C. Wilkinson, Elstree Aerodrome,
G4HW/A Elstree, Herts.

G4RW R. A. Wilson, The Hollows, Newry Avenue, Felixstowe, Suffolk.

CORRECTION

G3EKT Middleton St. George Amateur Radio Club, R.A.F. Station, Middleton St. George, nr. Darlington, Co. Durham.

Here and There

Correction Note

Two errors that have crep' in recently need to be put right. On page 188 of the May issue, G2HNO quite properly points out that he did *not* say (in his original manuscript) that a beam one-half wavelength above ground will give the required low angle of radiation. The passage should read "a system one half wavelength above ground will give an *excellently low* angle of radiation"—the point being that though a half-wave of height is not the optimum, it is the best G2HNO could manage and does give him satisfactory results.

In G2PL's article in our June issue, the sketch on page 263 should show a dimension of 16 ft. 9 in. for that section of the aerial hanging down parallel to the pole. The total length given by G2PL is thus made up to the required 134 feet.

More Paper

With this issue of the *Magazine*, we are able to print a small number of extra copies by reason of our increased paper allocation. This certainly does not mean any spectacular improvement in the position, but it does enable us to increase home circulation—which is a step in the right direction.

As the format in which the *Magazine* has appeared since our issue for March this year —the beginning of Vol. VII—has enabled us to give approximately a ten per cent. increase in actual reading matter, we have in effect already enlarged each issue by an average of nearly five extra pages of text.

Reprint Articles

As mentioned here some time ago, we can always provide reproductions of any article now out of print, though the cost, at 3s. 6d. per page, is necessarily high in such circumstances. Readers requiring reproductions should ask for a quotation, which we are glad to give before putting the work in hand. Incidentally, it should be explained that we undertake this service at its bare cost to the *Magazine*.

Post-Graduate Research

That the great firms in the Electronics Industry have a deep appreciation of their obligations and responsibilities in the field of technical education is shown once again by the Standard Telephones endowment of a Readership in Telecommunications at the Imperial College of Science and Technology. This will be known as the Henry Mark Pease Readership, after one of the pioneers of the British telephone industry, who was managing director of Standard Telephones & Cables, Ltd. until 1928, and also on the original Board of the BBC.

Mr. E. C. Cherry, M.Sc., A.M.I.E.E. has been appointed to the Readership. During the war period, he was attached to T.R.E.

For Small Advertising

Our *Short Wave Listener* enjoys the steady support of a wide circle of readers ; it is now well into the third volume and has become established as the only periodical of its kind in the world. The *Short Wave Listener* is a particularly useful medium for small advertising in the readers'-disposals-or-wants category, for such items as are of interest to SWL's. Rates are only 2d. per word (minimum charge 3s.). Date for the next issue is July 8, and for the issue following August 5. Address copy to the Advertisement Manager, Short Wave Magazine, Ltd., 49 Victoria Street, London, S.W.1.

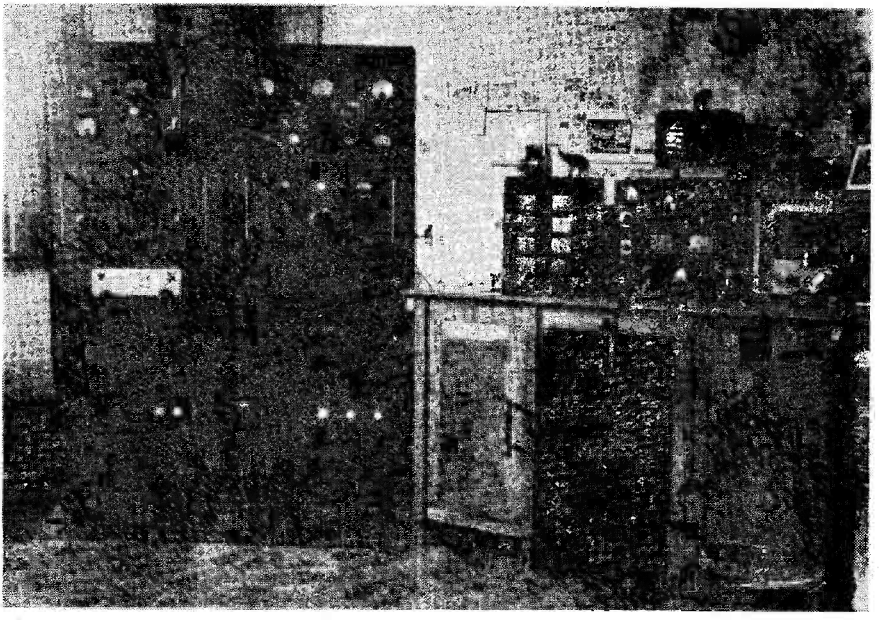
Death by Electrocution

From time to time, it is our sad duty to record the passing of some amateur who has met an untimely death due to an accident with his gear. On Sunday, June 12, VE3ZM of Guelph, Ontario, was electrocuted while operating his station. He was in QSO with VE3IY on 75-metre phone, and was killed instantly. The path taken by the 1250 volt HT was final tank-modulation monitor-headphones-body-microphone case-earth. If only that tank had been parallel-fed, or the microphone fully insulated. . . .

Well known over here on Ten, Mac Gammon was an amateur of the finest type, and will be much missed ; during the war he held a commission in the R.C.A.F. and latterly was on the staff of the Ontario Agricultural College at Guelph.

Radiocraft Services

The firm of Radiocraft, Ltd. offer three services of considerable value—Construction, Maintenance and Calibration, covering all requirements in the Amateur Radio Field. They are also always ready to advise on any matter relating to Amateur Radio.



The other man's station G8NY

This is an impression of G8NY, the station owned and operated by L. H. Luscombe at 98 Denton Road, Hornsey, London, N.8.

G8NY incorporates a number of very interesting design features, and includes the use of a two-element 14 mc rotary beam with *both* elements driven, but out-of-phase as distinct from the in-phase connection of the G8PO system. The Telcon 300-ohm ribbon feeders are T-matched to the elements built as folded dipoles, with the vertical feeder lengths each 27 ft. 9 in. and a 65-in. delay section ; the spacing between elements in G8NY's system is 86 in. The beam itself, which is electrically rotated by remote control with a direction indicator at the operating position, is carried on a short lattice tower on the roof of the house. It has given exceptionally fine results on Twenty from a poor location.

The transmitter at G8NY runs Franklin VFO 6SN7-6D6-6V6-6V6-6V6-807-P/P 807's-P/P 35T's, with a pair of 807's in AB2 push-pull as parallel-fed modulator. The speech amplifier-sub modulator is 6L7-6J5-6J5-6J5.

The whole station is relay-controlled and except for the HRO receiver and BC-221 frequency meter, is home-designed and built. It shows a well-planned operating layout, with built-in phone/CW monitors, modulation indicator and 100-1,000 kc crystal sub-standard.

Sad part of it all is that G8NY has just had to QRT for a twelvemonth, so will be reading this brief outline of his fine outfit during a period of enforced inactivity ! He was first licensed in April 1937, and after serving as a Captain, Royal Signals, during the war years, came on the air again in January '47 with 14-28 mc CW and phone. Specialising in phone on Twenty, he had collected 35 Zones and over 100 Countries by May 1948.

THE MONTH WITH THE CLUBS

FROM REPORTS

Activity reports from 31 Clubs have been received this month. Many of them took part in NFD and many more are arranging portable Field Days and D/F Hunts during the summer season.

This high level of activity shows that there need be no close season for an energetically managed Club, and we are very glad to see enthusiasm maintained so well.

Next month's reports should be addressed to the Club Secretary, *Short Wave Magazine*, 49 Victoria Street, London, S.W.1, and posted to reach him not later than first post on July 13. Photographs will, as always, be welcomed.

Kingston & District Amateur Radio Society.—Meetings are still well attended : a recent Brains Trust produced some interesting queries and much general amusement. The Club now runs a "net" on Sundays, 12 noon, on 3750 kc. Next meetings, July 6 and August 3, both 7.30, at the Kingston Hotel ; note QTH of new Secretary—in panel.

Clifton Amateur Radio Society (South London).—A very enjoyable evening was recently spent with Grafton in North London, who gave a cordial welcome to the Clifton members. Other activities have included a lecture on the CRT and the usual Morse classes. New members will be welcomed at any meeting.

Enfield Radio Society.—Members of this Club visited the Grafton Radio Society during May, and were much impressed with the array of equipment on show and the spacious accommodation. The Club meets on alternate Tuesdays at Chase Side School, Enfield, and new members will be welcome at any of these meetings.

Cannock Chase Radio Society.—At recent meetings there have been discussions on varied topics and a talk on Valve Theory. Morse practices at all speeds are now a regular part of every meeting—alternate Tuesdays at the Unicorn Inn, Cannock.

Reading Radio Society.—During May the usual meetings were held ; on the 12th a visiting team of experts formed a Brains Trust ; on the 14th Dr. Lemon gave the first talk to the Instructional Section, on the Complete Frequency Spectrum of Radiant Energy. May 28 saw G8TH lecturing on the directivity and gain of aerial arrays, with demonstrations. Visits were paid to the BBC at Caversham Park and to the Grid Switching station at Earley.

We have also received a letter from the Reading and District Boy Scouts' Signals Group extending their grateful thanks to the amateurs who co-operated in working their portable station, G3BHK/P, during the Whitsun holiday.

Lincoln Short Wave Club.—Membership is improving, but the Committee still feel that too many people, some of whom had a lot to say about the forming of the Club in the first case, fail to come forward and pull their weight. It has now been decided to run a Morse class from 7 to 7.30 before each meeting ; a Club library has also been formed. Several offers to build mobile receivers for the 1·7 mc band (for a D/F Hunt) have been received, and it is hoped to run such an event during August. Note the Secretary's change of QTH—see panel.

London Short-Wave Club.—This Club's headquarters is now at Ostade Hall, Brixton, where much more space is available, and it is hoped that the membership will increase accordingly. Meetings will in future be held every Thursday at 8 p.m.

Southport Radio Society.—On May 16 G2ART demonstrated a home-built communications receiver and a very successful Junk Sale was held afterwards. On June 20 there will be a Film Show, radar being among the subjects covered. The Club transmitter is rousing a good deal of interest—it is on the air on Monday and Wednesday evenings.

Solihull Amateur Radio Society.—A discussion on D/F receivers was the highspot of the meeting on June 1. The visit of Mr. Griffith of Slade Radio, who related some of his experiences, was also greatly enjoyed. The second D/F of the season is being held on June 19. The Hon. Treasurer, G5TU, has presented to the Club a new Headquarters building, 60 feet long, in which every form of amateur activity can be indulged in. This gift was received with great appreciation and the Club is looking forward to a record season.

B.T.H. Recreation Club (Rugby).—The main activity is now devoted to D/F Field Days. One of these was held on May 28 in the spacious grounds of Stanford Park, Warwickshire, and proved a very exciting day, with G3BJQ's party in the lead and G8VN's party following. On June 25 the Club's D/F Shield Contest is being held, and any other Midland Clubs are cordially invited to an "Open D/F Day" on July 23, details of which are available from the Hon. Sec.

Gillingham Telecommunications Society.—This Club now has eleven members, eight of them being licensed. The

subject of TVI was hotly debated at the last meeting, and it was decided to approach the GPO for an official ruling. Several members, in spite of trying all the usual precautions and with full co-operation from the viewers themselves, are still causing interference, and some outside assistance as to the official attitude is hoped for.

South Manchester Radio Club.—New members are still appearing, and the Club is approaching its first anniversary with some pride. On May 27 there was an interesting talk on Valves; on June 10 there will be a Junk Swap/Sale; on June 24 a start is being made on the Club station; and the A.G.M. is booked for July 8.

Rhigos & District Radio Club.—Rhigos is now one year old, and has fourteen licensed amateurs among the members. In May a lecture was given on Methods of Modulation, and another meeting was held on June 9. Morse lessons and theory classes for the Radio Amateurs' Examination are "available" if required by members.

Isle of Man Amateur Radio Society.—The A.G.M. was held on May 17 and the 1949-50 officials were balloted for and elected. The First President is GD6IA, the Chairman Mr. L. A. Higgins, and the Hon. Sec. GD3FBS. The Club now operates its own station, GD3FLH, at The Nook, Quarter Bridge, Douglas.

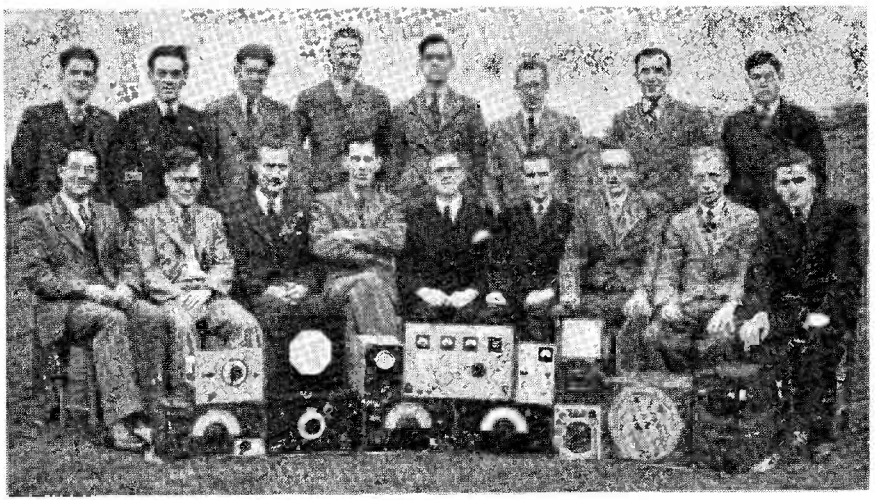
Hayes, Middlesex.—The first Hamfest of the Hayes Group took place late in May and was a great success. Well over 100 attended; the guest of honour was Air Commodore R. L. Phillips, and the principal speakers were G6CJ and G6OT. Regular meetings are held on the first Monday at the Vine Hotel, Uxbridge Road, and the Top Band net works on Thursdays from 8.30 p.m. onwards.

Basingstoke & District Amateur Radio Society.—During May the Club visited the residence of Mr. J. A. Lowe to see the "Electronic Televisor" that he has built. The "televised lecture" given was perfect in every way and a very instructive evening was spent. At another meeting Mr. E. Bull gave a talk on the Basic Principles of the Superhet.

Gravesend Amateur Radio Society.—Weekly meetings continue at the Clubroom, at which regular talks are given by members, and the Morse class is also a feature. The Club visited the Medway society during the month and now plans to visit a number of radio firms in the near future. Strength is approaching the 40 mark, with some keen juniors.

Edgware & District Radio Society.—A recent Top Band contest was highly successful, and one of the June highlights was a visit by about 15 members of Grafton. A return visit followed, and later the Wanstead club is being met on its home ground.

Wirral Amateur Radio Society.—A Film Show sponsored by the C.O.I. included films on Radar, BBC Wavelength Changing, and Electro-Magnetic Induction. A successful Junk Sale was also held. The July meetings are on the 6th and 20th at the YMCA, Whetstone Lane, Birkenhead,



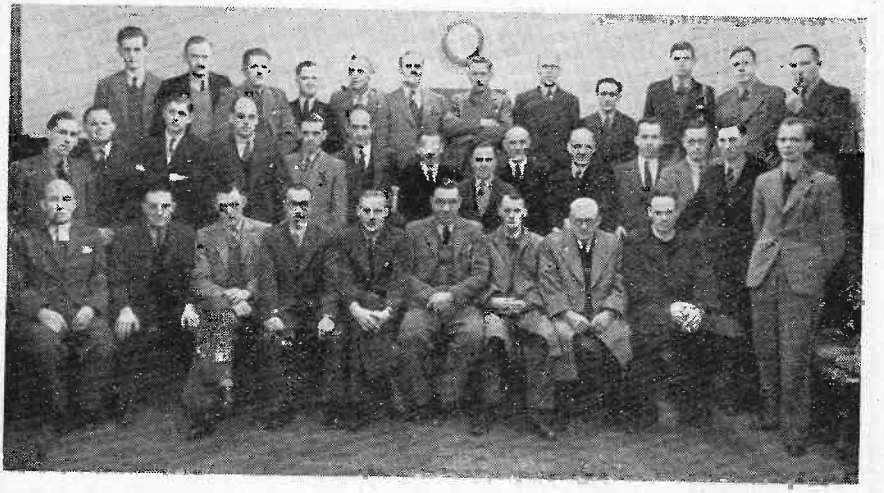
Membership group of the Leek & District Amateur Radio Society. The only callsigns named are in the back row G3FCF (extreme right); G3CUZ (3rd from right); and G2ATP (4th from left).

The GD Group (Isle of Man Amateur Radio Society) with GD6IA, president, seated centre. GD3ENK (left) is treasurer and GD3FBS, on GD6IA's right is the secretary.

Grafton Radio Society.—Three Clubs, Barnet, Harrow and Clifton, recently visited Grafton and all expressed the desire for a "repeat." NFD also kept many of the members quite busy. The Club closes for the entire month of August, but members can keep in touch with the Hon. Sec. by post for all the latest information.

North-West of Ireland Amateur Radio Society.—This Club now has eleven licensed members, and three more recently sat for the R.A.E. Recent lectures by members have included one on FM be GI3ECD. Others are being arranged for future meetings at the A.T.C. Headquarters, 11 Pump Street, Londonderry —every Saturday at 8 p.m.

West Somerset Radio Society.—An unofficial Field Day was



Photograph of the Bradford Amateur Radio Society, taken on October 19 last, after their usual fortnightly meeting.
Photo by Blakey, G3CUM, Baildon

held on the Quantock Hills on June 12. This event was attended by some fifty members and friends. G3SB/P was operating, and various discussion groups were formed and a useful exchange of ideas took place.

Medway Amateur Radio & Transmitting Society.—Meetings of the MARTS are still held every Monday evening at Luton Road, Chatham. Talks and demonstrations on UHF gear have recently been given, and the Club transmitter (1·7 to 28 mc) will be on the air by the time this appears. Plans for another exhibition are under way, and listeners' contests form yet another scheme which will be tried.

Chester & District Amateur Radio Society.—This Club now has a membership of 33 and recently welcomed G2YS, former Secretary of the Coventry Society. The search for permanent Club premises continues, but meetings are still held fortnightly at the United Services Club, Watergate Street. The next is on July 12. New faces will be welcomed at any meeting.

Thames Valley Amateur Transmitters' Society.—The June meeting was informal and mostly concerned the affairs of NFD. In future lectures will take place every other month, with the alternate months free for discussion among members. Plans are under way for a visit to a seaside town and also to places of interest to the Club in general.

West Bromwich & District Radio Society.—This Club has been reorganised, with its new Headquarters at the Lewisham Hotel, High Street, West Bromwich. Meetings will take place on the last Saturday in each month, and a full programme of talks has been arranged.

Romford & District Amateur Radio Society.—NFD was spent at Havering-atte-Bower on the 1·7 and 3·5 mc bands. Sleepless members went in for country walks and listened to the nightingale ! It was suggested, after this week-end, that more portable events should be arranged for Club members.

Wishaw & District Radio Club.—After many months this Club has acquired premises of its own at 8 Pather Street, Wishaw. Renovation is under way and the Club hopes to be on the air shortly with its call GM8JW/P. Meetings are held on Friday evenings at 7.30 p.m.

Coventry Amateur Radio Society.—The Club has been presented with a new Trophy by G2FDC—this will be awarded to the member producing the best piece of home-made equipment. Two stations were operated for NFD during the full twenty-four hours. Club meetings continue to be held at the BTH Social Club, Holyhead Road.

Cheltenham & District Amateur Radio Society.—Activity is on the upgrade, and a County Social was recently held at Berkeley. On July 17 there is a D/F Hunt, with the Gloucester and Stroud Clubs

NAMES AND ADDRESSES OF CLUB SECRETARIES:

BASINGSTOKE : L. S. Adams, 16 Bramblys Drive, Basingstoke.
BRIGHTON : L. Hobden, 17 Hartington Road, Brighton.
B.T.H. : Hon. Sec., Radio and TV Section, c/o Gen. Sec., BTH Recreation Club Office, Rugby.
CANNOCK CHASE : W. Whettall, 94 Cannock Road, Pye Green, Hednesford, Staffs.
CHESTER : H. Morris, G3ATZ, 24 Kingsley Road. Boughton Heath, Chester.
CHELTENHAM : S. Kelly, G3COZ, 10 London Road, Cheltenham.
COVENTRY : K. Lines, 70 Stepping Stones Road, Coventry.
CLIFTON (S.E. LONDON) : W. A. Martin, 21 Brixton Hill, London, S.W.2.
EDGWARE : R. H. Newland, G3VW, 3 Albany Court, Montrose Avenue, Edgware.
ENFIELD : F. Tickell, 10 Cowdrey Close, Enfield.
GILLINGHAM : R. A. Lucas, G2BJW, 97 Milton Road, Gillingham, Kent.
GRAFTON : W. H. C. Jennings, G2AHB, Grafton LCC School, Eburne Road, London, N.7.
GRAVESEND : R. E. Appleton, 23 Laurel Avenue, Gravesend.
HAYES, MIDDX : A. W. Watkins, G3CRK, 2 Cranleigh Gardens, Southall.
KINGSTON : R. Babbs, 28 Grove Lane, Kingston, Surrey.
ISLE OF MAN : H. Grist, GD3FBS, Broadway House, Broadway, Douglas.
LINCOLN : G. C. Newby, G3EBH, The Vicarage, Nettleham, Lincoln.
LONDON (SOUTH) : R. Lisney, G3FLI, 6a Ongar Road, London, S.W.6.
MEDWAY : R. Farrow, 55 Windmill Street, Frindsbury, Rochester.
NORTH-WEST IRELAND : C. Castles, GI3FKL, 9 Academy Road, Londonderry.
READING : F. Hill, G2FZI, 997 Oxford Road, Reading.
RHIGOS : F. Hamer, GW8BW, 7 Neath Road, Bungalows, Aberdare, Glam.
ROMFORD: D. L. K. Coppendale, G3BNI, 9 Morden Road, Chadwell Heath, Essex.
SOLIHULL : G. Haring, 121 Bradbury Road, Olton, Birmingham.
SOUTHPORT : F. H. P. Cawson, G2ART, 113 Waterloo Road, Southport.
SOUTH MANCHESTER : M. I. Wilks, 57 Longley Lane, Northenden, Manchester.
THAMES VALLEY : Maj. A. Eden, 31 Chatsworth Crescent, Hounslow.
WEST BROMWICH : G. Johnson, G2BJY, 22 Lynton Avenue, Hateley Heath, West Bromwich.
WEST SOMERSET : T. C. Bryant, G3SB, 16 The Parks, Minehead.
WIRRAL : R. A. Browning, 24 Norbury Avenue, Bebington, Cheshire.
WISHAW : A. R. T. Williamson, 14 Coronation Road, New Stevenston, Motherwell.

The combined stand of the four Societies at the Liverpool Amateur Radio Exhibition, which drew an attendance estimated at 7,000.

participating. On July 22 the subject of the meeting is Polar Diagrams, and practical plotting will be discussed. This is a follow-up on the theoretical talk on Aerials fixed for July 8.

Brighton & District Radio Club.—More interesting talks and demonstrations have been given during the last few weeks, with Valve Theory and Oscilloscope construction being the main attractions. Morse classes are held every Club night, and much time and labour were put into NFD.

"PSE QSL"

Those operators who may want SWL reports on their transmissions are invited to send us full details for appearance in the appropriate section of the *Short Wave Listener*. Give band, time, method, distance or direction from which reports are required, any points for special attention, and the QTH for reports. It is a condition of appearance in "Pse QSL" that all useful SWL reports received through it are acknowledged by QSL card.

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CONTRIBUTOR NOTE

Those who may be contemplating an article for the *Magazine* (or the *Short Wave Listener*) may have a copy of our "Notes on the Preparation of Articles" if they indicate the subject in mind for it. Writers who may already have contributed paid work to our publications will be sent a copy of these Notes on request. Since they contain a great deal of information which any intending contributor requires in his own interests, they should be on hand. Please apply "Attention of the Editor."

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MASON'S, Wivenhoe, nr. Colchester. The Denco DCR19 Communications receiver is now in production. We have full details. We can always supply the latest Denco and Eddystone goods. Send 9d. now for our 54-page illustrated catalogue.

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JACK PORTER, LTD., for reliable components at very keen prices, Boxed 12v Vibrators, 1/- ; 6H6 Valves, 1/- ; Relays, 9d. ; Sprague 15 mF, 750-v working Oil Block Condensers, 7/6 ; ·01 mF Dubilier Mica Condensers, 2/6 Dozen ; 6SN7 Valves (Twin Triodes), 4/- ; Moving Coil Headphones, with Transformer and MC Microphone, boxed complete, 10/- ; 6SH7 Valves, 2/-. Send for lists.—Jack Porter, Ltd., 30/31 College Street, Worcester.

RE Amateur Radio Service. *T. B. Wimbush, deceased.* The deceased, who traded as "Amateur Radio Service" (G6HP) from 27/29 Canning Street, Burnley, died on the 19th March, 1949. All persons having any claims of any description against the estate should communicate them forthwith to the undersigned, Solicitors for the Administrators of the estate. Robt. Kidd Whitaker & Pratt, Solicitors, 1 Queen Street, Accrington, Lancashire. (Dated this 12th day of May, 1949.)

QSL CARDS. Distinctive and attractive designs. Samples and prices from—G5KT, 35 Hillside Avenue, Kingswood, Bristol.

145 mc, or any other, amateur equipment designed or built to specification. Converters, Transmitters, Modulators, etc. Personal attention to all enquiries.—G2AJ, "Pine Crest," Biggin Hill, Kent.

THE SCHOOL OF ELECTRONICS, Principal M. J. Truscott, M.A., Ph.D., B.Sc., Correspondence Courses in Telecommunications, Radio and Mathematics. Special Course for Radio Amateur's Licence. Moderate fees.—Write Orthic Modern Institute, 72 St. Stephen's House, Westminster, S.W.1.

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WANTED. Six valves American Type 8020 High Voltage Vacuum Rectifier.—Box No. 562.

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AUTOMATIC CQ Sender. Built to June issue of *Short Wave Magazine*, £4 complete. State Call Sign.—"Amateur Exchange," 15 Bonaly Road, Edinburgh.

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BC221 AC Power Packs. To fit battery compartment, stabilised, 45/-. VR91 (EF50) boxed, 7/6. SP41, 1/6. 6SH7, 2/-.—M. A. Weston, Harman's Cross, Corfe Castle, Dorset.

WANTED: P.E.95 trailers with 5 kW or 10 kW power units. Previously used with American SCR.299.—Write to P.C.A. Radio, The Arches, Cambridge Grove, London, W.6. *Telephone: RIVerside* 3279.

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PT15 new, boxed, 12/6; 35T, 12/6; VT105 6/-; 6F6, 6/6; VR99, 6/6; CV63, 2/6.—Nevanas, 84 College Road, Great Crosby, Liverpool 23.

TX HF chokes, 250 mA spaced honeycomb wound, 1/3d. 4 mF 500-v paper condensers, 2/6d. 4 mF ditto, 1,000v working, 4/-. 0·1 mF can type condensers, 500v working, 9d. 0·01 mF mica condensers, 1,000v working, 6d. 9H. 100 mA chokes, 5/-. Telephone jack sockets, 6d. Postage extra.—COSMIC RADIO LTD., 129 Oxton Road, Birkenhead.

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BENDIX RA10DA Receiver, 8 valves, dynamotor 24v DC, good condition, £4. New metal cabinet, grey crackle, 12 in. wide, 7 in. high, 7 in deep, £1. 12v 75 ah battery, as new, £5. Tx valves, new, boxed, 1 of each TZ40 30/-, 35T 22/6, DA41 22/6, 2 6L6G 8/- each. Other items ; list sent.—G4QG, High View, Upperton, Petworth.

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R1116/3 £7. R1224, £4/10/-. B2 Tx complete with coils, £4. V55R modified for DC, £12. Army 17 set. Clean copies *Practical Wireless*, most '47-'48. Must sell so make your offer.—Box No. 557.

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SMALL ADVERTISEMENTS

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WELL-KNOWN amateur has for disposal surplus to requirements, one Hallicrafter S20R, £15, one HRO Senior complete with power pack and all coils, £40. Both these Rx's spotless condition. Absorption wavemeter, £3. Power pack 600v 200 mA, £5. Two-metre 4-element beam, £2. H.R. telephones, 10/- per pair.—Box No. 559.

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SMALL ADVERTISEMENTS

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BC348 as new—modified with power supply and built-in speaker, £18.—*Tel.: Hillside* 7010. 32 Cissbury Ring South, London, N.12.

TRANSMITTER 150-watt 'Phone/CW, rack built, crackle panels, metered throughout, bandswitched doublers, PA pp35T modulator, crystal mike, 5 power packs, separate VFO, reasonable offer.—Fairley, 19 Francis Avenue, Braunstone, Leicester.

R1116A 8-valve double superhet, battery communication receiver, 180 kc to 20 mc, £5. MCR1 5-valve miniature communication receiver, with power pack, 150 kc to 15 mc, battery or mains, £7/10/-.—Box No. 561.

MODERN Practical Radio and Television, 3 vols., £2. VCR97 tube with base and mask, £1. Oscilloscope, new ECR30 tube, Mu-metal screen, 3 VR91, 1 U22, 1·84v, £5.—170 Wilmot Road, Dartford, Kent.

HRO Receiver, Senior, 230v power pack, noise limiter, re-valved, re-aligned, new crystal, first £27/10/- secures.—Whitehouse, 69 Church Street, Cannock, Staffs.

AR88 as new, nearest offer £48. S-meter, spare valves and manual.—L. Neesom, High Street, Wooler, Northumberland.

VHF valves: 6C4, 5/-; 6AG5, 7/-; B7G valveholders with screen, 1/6. SN9/APA 5 —offers?—15 Westminster Road, Ellesmere Port, Wirral.

QRT, commercially built standard rack-mounting VFO 1·5-25·5 mc, 6J5-EF50-807, built-in 230v AC power pack, 5U4G-VR150/30, 100 per cent. T9 reports. Drift *nil*, almost brand new, £7.—G3EDX, 12 Conington Grove, Harborne, Birmingham.

50-WATT Vortexion amplifier and case, ideal modulator, £20. Phillips sound cell ET1013 microphone, table and floor stands, £9. RCA 18-watt amplifier, in case, £13. 58 MKI walkie-talkie, complete, £8/10/-. *Electronic Engineering* televisor, complete with tube, £23. Superb GEC console television cabinet, £8. Details S.A.E.—Austen, 28 Valebridge Road, Burgess Hill.

S640 purchased April 1949, with speaker, perfect, £25. T1154, brand new, unused, in box, £5. Tx, 25 watt, with power and key (see *Short Wave Magazine*, January, 1947) and new TU5B, £10.—Devaney, 12 Colville Street, Derby.

EXCHANGE for small car (no objection to minor repairs) or offers invited for following: Armour Wire Recorder, full spares, 5 reels wire. American TCS6 Tx with dual HT power pack. BC348 for AC, no cabinet. BC221 wavemeter. U.S. Army 1-222A Sig. Gen. with 5 mc xtal checks. German 3-in. scope with spare valve and CRT. All in good working order. —Box No. 564.

WANTED. Canadian transmitter/receiver Type 58 with accessories. Will buy or consider exchange for communication receiver coverage 1·7-16 mc. Inspection invited.—Box No. 563.

HAM clearance. ECO/PA, coils 160, 80, 40, 20, less power pack, £8. CO/PA 50 watts, coils 80, 40, 20, 10, power pack included, £12; Class AB-1 modulator P/P6L6's, 20 watts, power pack included, £10; HMV Electric Gram unit, £5. Further details S.A.E.—Gammons, 149 The Moors, Kidlington, Oxford.

TYPE 145 Oscillator, good condition, no power pack, £5/5/-. Carriage extra.—Wennell, 9 Gordon Road, Yiewsley, Middx.

955 and 9004 acorns, brand new, 3/6 each.—BRS16629, 29 Myrtle Terrace, Edinburgh, 11.

6J6's, 6AK5's, 6C4's, 6AG5's, 7/6; 832A's, 811's, 813's, 20/-. All new, boxed and guaranteed. Other 12v-6v American Valves, 5/-.—Box No. 566.

R208, 10-60 mc, AC mains or 6v, Speaker, S-meter, Noise Limiter, good condition, £7.—G3FMK, 47 Allen Street, Maidstone, Kent.

SMALL ADVERTISEMENTS

READERS'—*continued.*

WALKIE-TALKIES (2) American SCR536D complete, excellent working order. Handbook supplied. Needs only 1·5v fil., 100v HT to be on air. £12 the two, carriage paid.—G3FEN, 12 Bell Street, Shaftesbury, Dorset.

COMPLETE 100-watt Tx, bandswitched exciter, 4-6V6's, PA 2-807's, mod 2-6L6's, keying monitor and break-in muting panel, all-band coupler, power supplies, relay control, all on standard 19-in. panels. Offers? S.A.E. details or call G3VB, 15 West Avenue, Heath End, Farnham. (*Phone :* 6541.)

VHF valves : CV139 equivalent EC91 all-glass, B7G base, the earthed grid HF triode, slope 8·5, 10/-.—Luxmore, 14 Lake View, Wingate, Durham.

WILL anyone supply advertiser with BC221 frequency meter on hire purchase? If so, please forward particulars, terms.—Box No. 565.

WANTED.—Super-Pro BC794B, SX28A, Pan-adaptor, AR88 or Super-Pro cabinet. All must be reasonably cheap.—Fletcher, 6 Maple Avenue, Beeston, Notts.

SELLING UP.—B2 Tx/Rx, P/P ; Eddystone 640 ; BC221 P/P ; Q Fiver ; AVO 40 ; all new. Two 1,000v P/P 500 mA. Trans/Receiver. Frequency meter 22-80 mc, P/P. Parts for 'scope. 100 valves. Condensers, resistors, transformers, loads of magazines, many extras. Terrific bargain. £50 or exchange for motor cycle.—Puleston, 36 Langdale Terrace, Kirkstall Lane, Leeds 6.

CR100 RECEIVER, drive sticky, £14. Pair 813, practically unused, £3. Pair 35T, ditto, 35/-.—2 Parkhill Road, Chingford, E.4.

HRO and power pack, 6 coils, 1·7-30 mc, bandspread. Good condition, £30.—G3AMK, 32 Gloucester Avenue, Gorleston-on-Sea, Norfolk.

THREE T1131 chassis and panels in rack panel assembly complete. 19 in. wide by 2 ft. 10½ in. high. As new, £5.—119 Tollers Lane, Old Coulsdon, Surrey.

WANTED AR88, Super Pro or SX28A in excellent condition for cash. Will arrive and cross England ultimo July. Price and information to OZ7AT, H. Fredebo, Chr. Richardtsvej 8, Copenhagen N. Denmark.

HRO SENIOR, rack mounted, 10 coils, 50 kc-30 mc, 3 bandspread, monitor speaker, rack mounted coil container, power pack (needs attention), spare power pack, manual, £30. Eddystone 358X with power pack (broadcast coil only), £10. Collins TCS12 Tx complete with aerial loading coil, manual, £12. QRO power pack, 1,200v. 300 mA complete with 2GU50 valves and meters, £5. Coil deck EX5206 (HF) Tx, 10/-. Naval Tx/Rx Type 67, £1/10/-. Cossor oscilloscope, single beam £12. Eddystone 4-valve battery Rx, £4. TU5B, new, £1. RCA ribbon microphone, complete with two transformers, £3. Ditto with tablestand and press-to-talk switch, £4/10/-. All in tip-top condition. Official instruction manuals for ARI5206, £1 ; AR88LF, 15/- ; RAK6, 10/- ; RAL7, 10/- ; TBX4, 10/- ; TBY4, 10/- ; TBY8, 10/- ; Test kit Type 7, £1 ; SCR522, £1.—D. G. Lucas, G3AKH, 66 Whitley Road, Whitley Bay, Northumberland.

40/500 mc Fr. meter TS47/APR, AC Mains or battery operated, exchange for BC221.—Box. No. 567.

R44/ARR5 Receiver or similar wanted, must be in good condition.—L. Smith, 160 Butler Street, Manchester 4.

832A twin beam-power tetrodes, rating 22 watts phone to 200 mc. Boxed, new, 22/6, post free. Post orders only to Kean, 46 Castletown Road, W.14.

WANTED. HRO or AR88 receiver in good condition (used). Tx, phone, 10-80 metres, complete table model. Cheap, must be complete.—Box No. 568.

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