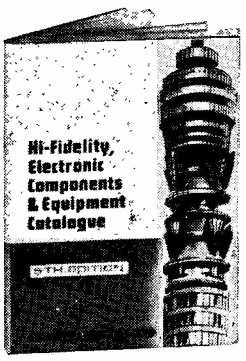
The SHORT WAVE Magazine

4/6
22½p

VOL. XXVIII FEBRUARY, 1971 NUMBER 12

WORLD WIDE COMMUNICATION



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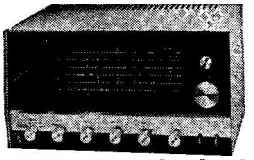

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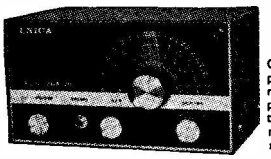

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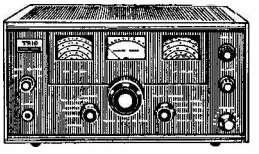

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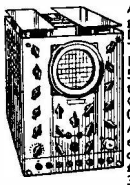

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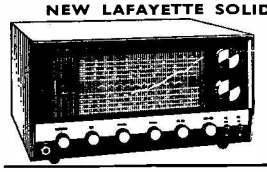

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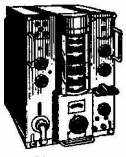

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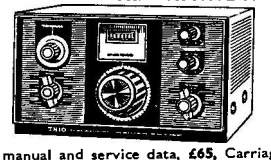

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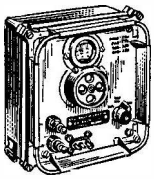

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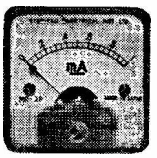

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(GB3SWM)

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CONTENTS

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT-WAVE Magazine

EDITORIAL

Disruption *At the moment of writing we do not know—because of the imminence of complete chaos in the postal system—when this will actually reach you. It could be so late that it will not be possible for readers to meet the various closing dates for the March feature articles—CDXN, Clubs and VHFB.*

Needless to say, the copy you now look at was ready to be sent out in good time to meet our publication date of January 29. After that, we were in the hands of the postal system.

Similarly, the March issue will be printed off and ready to go in ample time for appearance on February 26. But it is probable that because of the postal failure during the previous weeks, we shall not be able to include in March all that might otherwise have appeared.

Our advertisers are, of course, in exactly the same difficulty when it comes to dealing with orders—they will have lost their mail intake and the execution of orders will have been held up due to the general chaos in the delivery system.

We are all in our different ways and with our various responsibilities doing everything possible to maintain continuity "just as if nothing had happened." And this means not only by the expenditure of much extra time and effort, but also of money (for which there is no recompense).

The Postal System, for which as it is we are all paying more than adequately—whether in terms of a letter to granny, your sending us a report for CDXN, our posting to you an expensive book, or taking in the Small Adv. you urgently want to get into the next issue—is what is officially known and described as a Public Service.

It is for the Government to see to it that all public services are maintained and that we are not, any of us, blackmailed into paying more than is reasonable for a simple system of distribution, involving no problems for anybody except management in organising it efficiently and keeping it going.

Austin Forsyth, G6FO.

WORLD-WIDE COMMUNICATION

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

WHERE to make a start, with all the news there is? In the DX context on One-Sixty, there is the noticeable absence of W1BB, or W1BB/1, from the lists. A brief note from him announces that the allegedly "impossible path" from JA to Europe on 160m. has in fact been covered, by JA3AA and DL9KRA on January 3 at 2157z, the frequencies being 1904 at JA3AA and 1827 kHz at DL9KRA. Congratulations to both on a really resounding "First." A postscript to this same letter explains the absence of W1BB/1. It seems the gales attacked the feeder, which wrapped itself round a red warning light in such a manner that the aerial can't go up or down on its pulley, and to get at it needs someone to go to the top of the tower and be lowered down the side in a "bosun's chair."

G3JGR writes from Burgess Hill to say that 4S7GV has received permission to work Top Band. Look out for the 4S7's from 0030 to 0130z—they are looking for the U.K. every day.

Talking about transcontinental DX, one hopes that fearful boner G3KFE pulled last month didn't confuse too many people—of course we *should* have said the DX transmits in the area 1800-1810 kHz, and listens for G's and Europeans around 1825-1830 kHz. (How it slipped through, Lord only knows!)

QRT is the word as far as Top Band is concerned for G3DCS, he having sold his transmitter. QRT could pretty well be applied to your conductor also, as far as Top Band goes these days, although he does take the odd listen round now and then. On one such occasion G3YNC was heard calling "CQ VK," and we promptly searched to see if anything could be heard of VK—as much as anything because if one was even heard, it would make mincemeat of conventional propagation arguments. To his surprise, a VK came gently up out of the noise, calling G3YNC, but slid back into the depths before his VK call could be fully identified; it was believed to have been VK3NK.

G3OJV has an axe to grind, on the subject of the local natters on Top Band. His particular *bête noir* is the chap who is talking to a local, and sounds as though he is sawing up the rig. *Grunt—moan* . . . I feel ever so tired . . . What's the time? . . . Ah, yes, still an hour before bed-time . . . *more weird scraping noises* . . . I'm just clearing up the shack now . . . and so on *ad nauseam*. What a negation of good manners and what a test of good manners for the poor devil, due for the come-back, condemned by his luck to listen to it!

At G2HKU things have been fairly quiet. Ted had his usual contacts with PAØPN, and also found PAØRTR, DL5XF, GM3NVU, GM3YCB, all SSB, plus DL5XF, GM3IAA and PAØINA on the key.

Back to the transcontinental stuff. G3YMH hooked K1PBW and W1HGT, on the evening of Boxing Day, but the high-spot of the month was surely 9Y4NN in Trinidad on 23/12/70, who was first heard around 0020z; he worked EI9J and G3OLI as well. He came up again on the following night and appears to have raised GM3IAA up in Inverness, and G3TKN. Static at the 9Y4 end was up to S9 at times, but he seemed to be copying although dishing out 479 reports. KV4FZ, who was putting a similar signal in around the same time earlier in the month, was also complaining of heavy static. Gotaway of the month would seem to be OA8V, heard and called by GM3YCB, with no luck; however, KV4FZ raised him, which seems to suggest he is putting out a good signal.

GI3WSS (Holywood) has had a reasonable month, with the skip appearing to be very long in the first few days of January—for instance on January 5, only OK's could be heard.

G3YMP (Deal), amongst others, has a few words to say about that boob we mentioned a few paragraphs back. However, the main object of his letter was to report that he had heard from VK6NK, who, so far this season, has worked G3RPB, G3IGW, G3OLI, GM3YCB, DL9KRA, and EI9J! He is on 1803 kHz, and listens 1828-1835, *not* 1825, to avoid a local beacon. About 30 minutes before the peak for VK is the time to cast a careful ear around the low end of the band, as this is the time when VS6DO might be expected to show up. But it must be realised the opening is often only *five minutes* in duration which leaves no time for more than a swap of reports.

G3ZEM (Hartlepool) found things a bit iffy on the HF's, and so came down to 160m. for a spell and netted lots of DL/DK, OH's, PAØPN and OE5BBL.

It is not often that we talk of a DX-pedition of the Month in Top Band terms; but we understand that the founder of DOTM, W2GHK himself, will be on Top Band, looking for QSO's, and using a KW-2000 transceiver driving a modified inverted-Vee aerial. And we could remark that Stuart is no sludge at working the DX as well as looking after their cards—he won the North America section of the Bermuda Contest. Incidentally this seems a good time to remind everyone that the address for "DX-pedition of the Month" (DOTM) cards is Box 7388, Newark, New Jersey 07107.

We were a little off the beam in our note about GI6TK last time. Frank writes to put the record straight, and says that the lens of the left eye has been removed, and replaced by the lens of a pair of spectacles, which give him about 10% vision in that

eye, but it is still "tunnel vision" and he can see only a small area at a time, and this only when he can get into proper focus. Still, Frank is more than grateful even for this small amount of sight.

G3ZCC (Chingford) was yet another of the troops to miss out last time. Mick wrote in to say that he had a JR-500SE in the shack, plus an FL8 audio filter, which he was mighty pleased with; but his second letter indicated that a further improvement had been registered by the fitting of a Codar Q-Multiplier which now makes CW a pleasure. Talking of FL8 filters, these used to be quite common, but of late the supply of these most useful adjuncts to a SSB transceiver for CW operation seems to have totally dried up. Anyone any ideas?

G3TKN (Wirral) appears to have been pretty well QRT for a year but found time over the holiday to get on Top Band. Vincent adds a little to the 4S7 news earlier, by saying that he has a report from 4S7DA that the G3TKN signal was audible at RST 559 at 0045z. 4S7GV and 4S7WA are also in on the act and looking for G's. It is suggested that U.K. stations transmit on 1820 kHz as there is a BC station about 1825 to spoil things. Skeds can be set up by writing to Denver A.C.E. Wijesuriya, 4S7DA, A.M.Q. C85B, Royal Ceylon Air Force, Katunayake, Ceylon.

Top Band has been out for G3LXD (Church Crookham) for some time, but the fault was at last traced to a resistor in the oscillator circuit of the HRO, so that G3LXD is now back in operation again on CW and SSB.

An enormous list of 160-metre DX worked comes in from G3ORP (Maidstone); it covers sixteen W/K QSO's, including seven W1's, one W2 (who was all but lost under a 589 W8ANO!) two W3's, one W4 and five W8's. These were hooked with the help of three different aerial systems, which are of considerable interest in the DX context; this being the case, as we are pressed for both time and space this month—it's the postmen, now!—we will consider these interesting skywires in the next piece.

An interesting letter from G3ZGC next; he is training for seagoing operator service, and is on m.v. *Nova Scotia*, running to East Coast W and VE. In some places, around Newfoundland, Loran covers the whole of Top Band and more, accounting for poor readability in the signals heard. Around 2200z on November 29, OK1ATP, G3XXF, W1HGT, DL9KRA, HB9NL and OK1AMP were all audible at strengths from S6 to S9. December 29, 0112z, G3TKN was calling QRZ?, and G3ZRH a CQ, the latter at 349. That same evening, another listen at 2200z resulted in DL9KRA, G3OLI, G3OVX and G3LDM being logged. Sad to say, there were some more reports, but the piece of paper on which they were written landed in the Mersey as Joe was heading for dry land and home leave!

Here and There

So many newspaper reports of events connected with Amateur Radio are fatuous in the extreme, that it is a pleasure to mention one case where the facts *might* have been right at the time, but have very quickly been put out of date. In the *Daily Express* of November 17 last was a report that JY1 had

SIX-BAND DX TABLE

(All-Time Post War)

Station	Countries	28 MHz	21 MHz	14 MHz	7 MHz	3.5 MHz	1.8 MHz
G2DC	338	181	311	329	169	116	20
W6AM	349	149	161	349	145	119	7
G3KMA	262	208	202	192	142	61	11
G3IGW	212	129	153	169	136	107	47
G3DO	339	213	250	332	90	83	9
G3PQF	175	119	53	107	85	56	13
9H1BL	202	117	129	143	74	57	8
G3XBY	167	110	124	107	74	57	8
G3XAP	109	44	56	47	74	31	13
G3LZQ	265	140	156	215	72	38	8
G3WTV	196	125	124	157	70	74	—
G3VPS	147	58	54	122	61	40	14
G3RJB	177	80	58	164	60	37	8
G4RS	187	84	118	128	59	42	13
G3YDX	131	69	77	47	54	39	9
G3WPO	105	36	24	66	49	31	24
G3NOF	320	204	231	310	38	64	4
G3ZEM	88	—	—	86	28	31	13
G3IDG	131	77	97	55	27	18	12
G3DCS	126	15	80	66	19	20	6
G3ZCC	39	10	8	21	18	23	16
G3VLX	60	7	14	31	8	28	19

Note: Placings this month are based on the "7 MHz" Column. Claims must be made at least every three months to retain a place.

granted a licence to his wife, Princess Muna, adding that she "could not use it to talk to her husband as there is no reciprocal licensing between Jordan and U.K." Of course, most of the readership will know by now that in fact JY1 has been operating under his G5ATM reciprocal call from the London Clinic, and working quite effectively into W on Ten, as well as some G's. We also understand that when the King gets back to Jordan he will regularise his licence conditions and come up with the more appropriate callsign JY1KH.

G3PQF (Farnborough) comes back to life at this point, to add a little to the words of wisdom on QSL Bureaux—again from the point of view of one of the devoted few who help to keep the U.K. Bureau well ahead of all the others. Dave says he would appreciate *any* help he can get in "making the perishers send in some envelopes." He adds that about *4,000 cards a quarter go on his bonfire as uncollected,* and some of them are real goodies at that. In the present crop, as yet unburnt, are cards from BV2A, CR4, HM, KX6, VR2, VS5, VS6 and others of similar interest—yet they cannot be delivered to their addressees, because the latter have failed to lodge envelopes! This sort of thing disillusions the DX chaps, who then get managers and forget the whole business of QSL'ing—and who can blame them at that?

From G2HKU we hear of another addition to the ranks of the Silent Keys, Gaby Felix, ON4FG, on December 20. Gaby used to operate from OQ5 and various DX spots when he was filming for Belgian TV.

After all the complaints about dirty notes, G2DC had a nice surprise when he called LZ2KAD to tell that station he was 597 and carving up the whole band. The LZ came back "I apologise for my lid signal. Pse QRX." He then tuned up and returned with a near T9 note. A gentleman, and it is a pleasure to hear this.

Should you come across the call SMØDAM on the air, you will hear a nice signal, well driven. The operator is Mrs. Birgitta Granvik-Nilsson, and she is one of the few YL's who are fully-qualified as a radio officer in the Swedish Merchant Navy, or, indeed in the merchant navies of the Western world.

It is quite a while since last we heard from 9M2DQ; he writes to say that for the first time in 20 years he has landed in hospital and been very ill indeed. However, as a result, James has given up rubber-planting for the time being, and settled in a bungalow on Penang Island, where he at least has the advantage of a reliable 24-hours daily mains supply to offset against the fact that high towers and rhombics are not now possible. All his U.K. friends will wish him a speedy recovery and full health to get back at the DX.

An interesting one for the prefix-hunter types to keep an ear open for is PE2EVO, at Eindhoven, a special prefix issued for the permanent scientific exhibition which has been there since 1966.

From DL1CU we hear that HV3SJ will be going on the air on CW mainly, between March 16-24, with DL1CU himself, plus ex-OK1KD and ex-OK1AJX; the intention is not just to let the 40 w.p.m. merchants in, but to look out for the slower lads as well. All contacts can be QSL'ed *via* the Bureau, or if preferred direct to DL1CU with s.a.e. and one IRC. Call him 5 kHz up or down, and any clot who causes QRM goes on the black-list.

The vile weather we have been having of late has fouled up more than just the shack temperature. The freezing fog brought the G3KFE "invisible" wire into unwanted prominence, while G8HX and G6FO can now state with certainty that if the centre insulator looks like a ball of cotton-wool, the VSWR rockets up to well above normal; in G8HX's case, extra effects included S9+ side-tone in the receiver, the field-strength meter beside the rig reading four times higher than it did, and the transmitter not wanting to load. So, as Frank says before reaching for the spanner and testmeter, just take a peek outside *first!*

With the achievement of his 5BDXCC, W6AM seems to have gone back to his first love and 14 MHz, but one notices that although Don is now 73 years of age and does not spend much time attending Amateur Radio affairs, there is one he never misses, which starts at the time this piece lands on the doormat. This is the joint NCDXC and SCDXC members' meeting each year, with the current one running at Fresno the last weekend in January. One notices in the programme a technical talk by W3EB/6, Ozzie Jaeger of Jennings Industries, discussing the using of solid-state rectifiers in the rig; the DX-peditioner main speaker is VKØWR; the Andorra effort taking the stand, C31CK, C31CL, HBØXVU all being W7GVA in disguise; a look at the Big Shots on slides; W6YY discussing DX-ing behind the Iron Curtain; and finally W2GHK talking, and showing slides of, DX-peditions of

TOP BAND COUNTIES LADDER

Station	Confirmed	Worked
	Phone and CW	
G2NJ	98	98
G2HKU	98	98
GI3WSS	97	98
G3ADH	97	97
G3XTJ	96	98
G3VLX	95	98
G3WPO	95	98
G3XDY	88	96
G8HX	86	89
G3YMH	67	92
G3LXD	64	83
G3KFE	61	85
G3XIV	?	63
	Phone only	
G2NJ	98	98
G3PQF	98	98
G3WPO	91	98
G3VGB	91	97
G3XTJ	81	94
G3XDY	72	89
GI3WSS	67	83

(Failure to report for three months entails deletion from this Table. Claims may be made at any time. Six months of "Nil" reports will also result in deletion.)

the Month. The redoubtable W4BPD, Gus Browning, is reported to have entered hospital—Room 233W, Orangeburg Regional Hospital, Orangeburg, South Carolina, 29115.

Forty Metres

Is a band where anything can happen—and frequently does, at that. Oddly, one of the rewarding times to look it over is in the evenings, when TV blights the country and puts most of us off all bands except this one and Top Band. On some such an evening, you may take a listen in the lower ten kHz of the CW segment, and find it absolutely crawling with, admittedly, fairly run-of-the-mill DX, such as ZS, VK, JA and so on. On another night a first look may reveal nothing more inspiring than a couple of LZ's billing and cooing to each other, or even a general-coverage-type electronic banyan tree shading everything. *But*—if you can work 'em on this band, there is just no QRM which can demoralise you *anywhere!*

For W6AM an interesting CW QSO was with W6BXL/M, who had just finished with F7NB and CT3AS; other CW contacts with Europe included DL1DQ, around 0200z.

G3DCS, with his Joystick system on CW, pulled out of the murk Europeans plus an assortment of W1, W2, W3, W4 and W8, just to seee what he could make of it. Turning from a Joystick to a beam—the one at 7 MHz specialist GM3JDR, we find that Don hears and works stuff on his "Bobtail curtain" which is utterly inaudible on a dipole. Incidentally, the top of the Bobtail is at forty feet, laid out to fire East-West. To give the two lists Don sent in, in full, would all but fill the rest of the space, but a selection shows all W call areas, with W6-7 types at about 1400-1600z, the other call areas being available in the mornings till the W6's appear and again in the evenings from 2000, with JA's in evidence from 0800 to 2000z, over both paths. Around 1215 JD1YAA and JD1ABO peak to S7 but persisted in working W's. Another gotaway was KR6AY, who came back with a QRZ JDR?—but promptly sank without trace under a wall of W's. The score in six months of 40-metre operating from the present Wick QTH is now up to 120 countries, and 43 States, the Dakotas, Wyoming, Montana, Nevada and KL7 being still outstanding in that direction.

Over to G3OJV, who seems to have been mainly on CW, to raise PY2AXZ, W's, VP2MR, 9H1CB, AX/VK's, VE1APE, FPØCA, PZ9AB, not to mention letting 4S7PB off the hook. The sole SSB QSO was to EA8HA.

Some experiments involving an inverted-vee with the apex at about 40ft. led G3YMH into an assortment of contacts, most notably with lots of W's, *ditto* EU's, of course, and 9H1BB.

As for G2DC, Jack found the morning periods particularly good on Forty, apart from clottish operating by F stations. One of these bounders called G2DC no less than five times with an S8 signal each time Jack called EA9EA, who would have given G2DC WAC in six QSO's in one morning on the band, the others being PY2EXX, ZL2OD, UA1WS, WA3COJ and JA1ZHV. It takes a lot to get G2DC's dander up, after 47 years of Amateur Radio, but this F station made him feel like wondering whether the time had not come for QRT finally—but we hope it will not come to such desperate measures.

The HF Bands

Space is fast running out on us; but although the three HF bands have, to some extent, been going through seasonal doldrums, they are never bad enough to neglect completely. Taking *Twenty* first, we can note that this is the first time in memory that the W6AM report had made no mention of a 40m. QSO. However, Don has a tailpiece to put in on 5BDXCC; as far as was known at his time of writing, W6AM was the only member of North California DX Club to have arrived—but the South Californian gang are cock-a-hoop, with no less than six members having made 5BDXCC already! That must be something of a record.

G2DC thought so little of them that he lumped 14 and 21 MHz

G2ACD is Arthur C. Dunn, of 408 Scalby Road, Newby, Scarborough, Yorkshire, who held an early AA (non-transmitting) licence pre-Hitler's War. He is an Ex-Mayor of Bridlington and nowadays is active on all bands, running a KW-2000A barefoot into a simple long-wire aerial.

together; all continents have been workable but the snag has been that when the DX has started really to come in the EU QRM has also chosen the same time to peak.

For G3DCS the score continued to rise, CW giving W's, WX3MAS, HC1CS, ZS1EI, ZS2HU, ZS5UT/MM, CE2RF, FG7XF, VO1BS, 3Y3CC and VP2AAC, plus SSB with HV3SJ, 4X4UL, ZL1AH, 9H1M and OH5PK.

G3OJV mentioned JA1ZKZ as the only one of interest in his earlier letter, and none in the second, as the band opened after leaving to go to work, and closed before Peter could get in the shack in the evenings; and that about sums it up for G3KFE, too.

Around 0800 has been "opening time" says G3NOF, who found the JA's first in as a rule, followed by ZL till about 1000z, but a dearth of VK for some reason. A gotaway was FK8AC heard at 1958z, along with KC4USN, VR2EK, 5H3LV, 5H3MV, 9Q5MG; but sorrow was turned to the other thing by success in raising A2CAH, AX's, EA6BM, EA6BU, FB8XX, HL9TZ, JA's, PJ7JC, ZL's including ZL4LZ/M, VP8LH, VS6CO, ZS's, ZS2MI on Marion Is., 3B8CR, 5VZJS, 5Z4DW, 9E3USA, 9J2PV and 9G1GT.

It is galling enough to have TR8VW as a gotaway, says G3ZAY, but it adds insult to injury when the DX comes back to you with a report of RS21 and insists on calling you G9ZA!! However, ZE6JP, ZD7SD, assorted W6's and 7's and CR3KD came across with reports just a wee bit better.

It may be recalled that a couple of months back G3DNF recounted impressions on returning to the game and finding SSB a frost, with CW far better. Since then Gordon has stuck to the key for most of the time, and has been making strenuous efforts to improve the All-Band All-Time Countries Score, purely as G3DNF, and omitting all previous GM3DNF or GW3DNF credits. The result is 35 new countries booked in, mostly DX, in about ten weeks. This still does not satisfy him that they are good enough for the Table—yet! The 100th country came up on New Year's Eve, but oddly enough nary a new one was found in the succeeding nine days to the time of writing. That long-awaited first VK was booked in, by way of AX8HA, after all these years, and on *Twenty*, others of interest included 8R1J and ZS5UT/MM.

G3ZEM has rude words to say of *Twenty*, and retired to Top Band in high dudgeon—whatever that is—but not before making his number, as the Navy says, with VP9BY, YB5AAQ, AX's, YA1AB, MP4BBA, VU's, 3B8CR, VS6DO, JA's, XW8DO, EL2FT, ZE1DL, ZS4AU, ZL1AH, TA1TS, ZS2A, 9H1BG, OX3KD and, nearly, with 9K2BJ.

The long silence from Four Oaks does not mean G3DO has not been on the DX bands—far from it, as Doug spends most of his spare time these days on 14336 kHz, where the County-Hunters Net is to be found, looking for more American counties — of which he has now accumulated 2100 *confirmed!*

Ten and Fifteen

And of course all we need to say here is that if Twenty got the thumbs-down signal, these two were in no better shape at the times when we ordinary mortals, excluding the Sleepless Wonders and the No-Work types, can get on.

Some pertinent comments on TVI come from G8HX, who corrects our statement last time that he had no help from the GPO; the people who are *not* being helpful are the TV firm. It seems the GPO can do nothing about QRM to TV sets on the relay system by AT-stations working in or near the relay pass-band, provided the QRM is from a fundamental signal and not a harmonic. Frank reckons about fifty subscribers are losing their picture when he operates, which *should* satisfy *them* that he is not at fault, as he surely would have been "in jug" ere now, else—because this has been going on since last May!

Ten proved to be of interest to G3PQF, who popped thirteen new ones into his little black bag during the last two major contests.

Trying to decipher his handwriting is the key to reading the report from G3ZCC, who used SSB for UR5QAO, WA3NRV, W2GHK/P4, KR6II, CT2AP and SMØCUD, with an inverted-vee dipole at the enormous height of eight feet, which ought to encourage some of the others.

For W6AM a useful ten-metre contact was with W1AW, who was able to advise Don of the safe receipt of his 5BDXCC claim; another one of interest was ZS6OS, who intimated he was going to be in W6-land in August, so no doubt there is one QSO which will end with a meeting of the parties.

G2DC found Ten quite interesting but was amused by the habit of the RA, RB type stations of never finishing a QSO. The reason in at least one case was just that the chap shot 20kHz up the band between overs—most distressing case of drift! CW completed contacts with AX2BPN, FR7ZW, FR7FM, FR7IZ, MP4TDS, UL7XL, UL7GM, ZS6BDO, ZS6QS and 5U7AR.

The 21 MHz for G3DCS was not very productive, yielding only SVØWO on CW and 9G1DY with SSB, but *Ten* was a different story altogether, with loads of Europeans, UAØAAD, MP4TDK, AX2BPN, VE2BBP, UH8CJ, UW3XX, all by CW.

G3OJV shows CW with VS6BL, and SSB with ZL3FK, 9G1BF, and 9F3USA on *Fifteen*, although nothing on Ten.

TVI is still a plague on the 21 MHz activities of G3NOF, the more so now that the morning programmes have started again at weekends. This prevented contacts with KR6JU and VU2JM, but Don did ring the bell with VK5NB and SVØWT for Crete. Ten was generally pretty poor when Don checked it; some VK and Asia openings over the short path were noted, with W's in the afternoon. Gotaways on Ten were HS1ABC, MP4TDT, UAØYF in

Under canvas, ZE1GDS was the Gwelo, Rhodesia, station for the recent J-O-T-A occasion, when they had 240 contacts in 40 countries. Operation was by ZE's 1AQ, 1BL, 6JC, 6JL and 8JY. The audience suggests that they had a few SWL's in the making!

Zone 23, 7P8AZ and 8R1U. Contacts were completed with AX5DN, AX6AI, JX8IL, KR6IL, MP4BIM, RAØACE, ST2SA, VP8KD, VU2KX, XE1FC, WX3MAS, 5VZPS and 9J2VX.

The SSB stuff is spreading its tentacles everywhere, as G3ZAY amply showed from his hideaway in Petts Wood. Martin found KR6's, KG6, KC4, VS6's, FH8CG, ZS1ANT, ZE2JA, 8P6BQ, PY7JC, 9Y4CR, 9K2AL, EA9EA, IX1LIO, KR8HU, VU2JM, VK's, YBØAAO, ZS2MI, HC8FN and several VP8's. Among the got-aways one notes ST2SA, 5R8AP and U5ARTEK. All these were on *Fifteen*.

Not so G3DNF, who looked everywhere but still found the pickings a little meagre. *Ten* yielded that first VK already mentioned, plus ZS3AW, KV4CI and UM8IE. *Fifteen* offered OA9QZ, ZP9BG, 4Z94GG and HK3AVK.

Let the final word lie with G3DO, who, in between his county-chasing activities, found time to look for new countries; *Ten* stumped up with JW8IL as a new one for the band, and in addition ST2SA and 3B8CV were notable QSO's. *Fifteen* gave a new country to add to the band total, in KJ6CF.

Contests

March 13-14, 1500z and 1700z respectively, are the start and finish of the "Helvetia 22 Contest." Three points a time for HB contacts, any band from Top to Ten. The HB will give the usual RS(T) plus serial number and in addition a two-letter code representing the Canton in which he is located. For each canton worked there is a multiplier. Thus the score for each band is the QSO points times the mutliplier. Certificates to the highest scorer in each country. Logs to HB9AAA, Box 17, 2500 Bienne 4, Switzerland. There is also an award available for working the 22 cantons. For this one, send the cards, one for each of the 22 cantons, to HB9RK, Box 384, 1701 Fribourg, Switzerland.

There are plenty of contests but only a few really matter, and one of these is the *CQ WW* WPX SSB Contest, the rules for which are the same as last year. The date is from 0001 GMT March 27 to 2359 on March 28, but you can only operate 30 of the 48 hours. The rest periods can be up to five in number to total eighteen hours, any time during the Contest period. The full rules will appear in the March issue of *CQ Magazine*.

Another important one is the ARRL affair. Here the dates are February 6-7 and March 6-7 for *Phone*, then February 20-21 and March 20-21 for *CW*. All the details on the ARRL Contests are of course obtainable out of *QST* or through the ARRL Communications Department, 225 Main Street, Newington, Conn., U.S.A., 06111.

Worry!

This piece had to go to press just as the postal black-out became imminent, with no certainty one way or the other. If the stoppage did happen, there is no knowing when you might be reading this—and it could be that the closing date for March CDXN, **February 8,** has already been overrun. Though, as for this month, the March issue will be produced ready for despatch on time, it may be that report-letters will not have reached us soon enough to be taken in. Those that are late will be covered at the earliest opportunity.

For the next few months, the deadline dates for CDXN are **March 8** (April issue); **April 8** (May); **May 10** (June); and **June 7** (for July). Please note these dates. They are firm deadlines for the receipt of correspondence for this feature, which should be addressed to: "CDXN," SHORT WAVE MAGAZINE, BUCKINGHAM, England.

VHF BANDS

A. H. DORMER, G3DAH

WITH the exception of the lifts around December 9 and 19, there is little comment one can make about propagation during the concluding weeks of 1970. The opening on December 9 seems to have been missed by many, as activity was comparatively low, although the indications of good DX were there if one took the trouble to look at the pressure patterns in the daily papers, and to monitor the various two-metre beacons. Both GB3DM and GB3ANG were good signals in the South for several days prior to the opening. Best DX was over the East/West path, with DL3XE in EI74j a very good SSB signal for some hours. Although not heard in Herne Bay, DL8OQA must have been putting in a signal to Weston-super-Mare on the 10th, since Bill Scarr, G2WS, was heard calling him at around 1800z (or perhaps this was just on sked?).

The opening on the 19th was fairly widespread, but again probably best along the East/West axis, with PAØ and DL very strong, and some F's. OZ and SM were also there, but not easy to contact from the South.

Generally speaking, the conditions on the VHF bands were as poor as the weather conditions.

January has shown few signs of promise as yet, which is hardly to be expected with pressures and temperatures as they are, but the 10th saw some reasonable two-metre GDX and also a bit of a lift on 70 cm. G8BGQ in Watford, with others, made it with GC2FZC in Guernsey for example, and several French stations were workable up to the South Midlands. Four metres seems to have been uniformly dull.

Annual VHF Tables Results

The final placings in the 1970 Three-Band Annual VHF Tables are as shown, with congratulations to Roger Hargreaves, G3OHH, of Mow Cop, Staffordshire, the overall winner His total score of 163 points exceeds that of last year's winner, G3DAH, by no less than 24 points, and this margin not only reflects his improved performance on four metres, but also his advent on the 70 cm and two-metre scenes. It looks also as if he will be coming up on 23 cm very shortly with a pair of 2C39A's and a good dish (no offence, Pat!). Runner-up was yours truly, who just made it over G2AXI (Basingstoke, Hants), who had advanced from 10th place last year to third this time.

The break-down by bands shows G3OHH repeating his performance of 1969, leading on four metres by a comfortable 12 points over G2AXI. Mike Crowther-Watson, G3IAR, of Sevenoaks, Kent, makes it into third place. The two-metre table is once again headed by G3DAH (Herne Bay, Kent) with G3JXN (London) moving into second place, followed by G3COJ (High Wycombe, Bucks). G8AUE of Pentrick, Derbyshire, one of the most consistent signals on the band, repeats his success of last year by heading the 70 cm Table. If there were a Table for 23 cm, he would get the lead there also with his 19 counties and 4 countries. G8ATK just takes second place over G8ATS (Bury St. Edmunds, Suffolk), who was runner-up on 70 cm last year. Special mention must be made of G8ATK. who appears as the leading G8/3 in the overall results, and who figures within the first four in the two Tables in which his licence entitled him to operate. Well done indeed, Mike!

It is noted with regret that fewer stations appeared in the Tables this year compared with last year, 25 as opposed to 33, possibly due to the poor conditions experienced at the start of the year, which led to a number of regular entrants delaying sending in their scores straight away. This meant, of course, that come March and April there was quite a lot of logbook to wade through in order to extract the relevant data, and this in turn may have seemed too much of a chore—so there is another good reason for getting entries in right away for the new Tables, which start w.e.f. January 1. (To start the ball rolling, G3DAH has 1+1 on Four, 25+4 on Two and 10+1 on 70 cm=42 points.)

It is worth while sending in scores even though there seems little chance of becoming the winner, since it is always interesting when one can compare results with other operators in the area, or with those who use similar equipment. So, thanks to all readers who have supported this feature throughout the year, and keep the claims coming in to SHORT WAVE MAGAZINE, BUCKINGHAM, as before for the period January to December 1971.

VHFCC Awards

Certificate No. 85 goes to G3XKT, Tony Beardsley, of Sandiacre, Nottingham, for contacts on two metres. Operation commenced in March 1969 with a QQV03-20A, an input of 24 watts, and a pair of EL84's as modulators. The antenna is an 8-ele Yagi at 30ft. and the QTH is 220ft. a.s.l. in *Derbyshire*, though the postal address is *Nottingham*. The take-off is good in all directions except North-West. For reception, Tony uses an AF139 RF stage and AFZ12 mixer to produce an IF of 28-30 MHz for a transistor superhet, the design of which is based upon commercial modules. The QSL return rate works out at about 35 per cent. Activity is confined to two metres (and Top Band) at the present time, but plans are in hand for 70 cm transmission and reception during 1971.

VHFCC Certificates have also been gained by G3ZIG (No. 86), GC3YIZ (No. 87), G8BJS (No. 88),

GM8BZX (No. 89), G8DJQ (No. 90) and G8BHD (No. 91). Details have had to be held over this time due to lack of space, but they will be covered at the first opportunity.

VHF RTTY

The admission in last month's "VHF Bands" that we were surprised at the number of stations active on two-metre RTTY has resulted in a spate of letters deriding our ignorance. *Mea culpa* gentlemen—you seem to hide your lights under bushels, since the only stations *regularly* heard in Herne Bay on the allotted frequencies are G3FRV and G6CW.

"The allotted frequencies" seem to be a bit of a sore point with some operators, who complain of persistent AM QRM, particularly on 144·6 MHz, the RTTY channel for the South of England. All right, so the Band Plan isn't mandatory, but the excuse proffered that "this has always been my channel" really *is* anti-social when it means interference with another, quite lawful, activity. What is wrong with 5s. worth (or 25p, should it be) of new xtal from one of the well-known *emporia*, or with pulling the existing rock sufficiently to clear the channel? Come to that, what about going VFO? Channels on VHF *belong* to no one individual or net, although certain of them may be allocated, by agreement, for specific purposes, but certain nets and individuals have, quite unjustifiably, laid claim to particular frequencies to the detriment of other users.

G8AEL (Kempston, Beds) draws attention to the deliberations of the recent BARTG committee meeting at which it was stated that there are more thany twenty stations active on VHF/RTTY in the London area alone, and that there is a move afoot to make Friday the RTTY activity night. It appears that the same sort of number can be credited to the Midlands. One cannot help wondering why it is that London stations should be using 50 bauds and the Midlands, and PAØ, should have adopted the slower speed of 45·5 bauds. Dave urges those who have not tried this mode of transmission before to have a go at it, as it will get through where AM will not and, provided one is prepared to bear with the "pages of garble and Serbo-Croat from the exile in Outer Mongolia who will dominate the traffic before the gear is set up correctly," a lot of fun can be had with RTTY.

Brian Hodgson, G3YKB (Ealing, London), lists the following stations known to be active in this mode, as *additions* to those mentioned on p.675 last month: G8DDW, G3IIR, G3FRV, G3ODR, G3EFP, G3BPT, G3XSO, G3AOK, G3DJF, G8WDM, G8CKT, G8AGM, G3MMJ, G3TDM, G6CW and 8BNG. Of these stations, ten are on the allotted frequencies, and efforts are being made to encourage the others to follow suit. Currently, it appears that there is always activity in the London area on Thursday night, although one imagines that this will be transferred to Friday night when the new activity plan gets under way. G3YKB is interested in working RTTY on four metres as well as on Two—look for him on 70·56 MHz.

The indefatigable Ted Double, G8CDW, the contests and awards manager for BARTG, is in for a busy time with two annual contests, The Quarter Century Award, and the administration of the "World Championship of RTTY Award," for which the British are responsible this year, although the event is organised by

THREE BAND ANNUAL VHF TABLE

January to December, 1970

FINAL PLACINGS

Station	FOUR METRES Counties	FOUR METRES Countries	TWO METRES Counties	TWO METRES Countries	70 CENTIMETRES Counties	70 CENTIMETRES Countries	TOTAL pts.
G3OHH	57	8	54	11	29	4	163
G3DAH	24	3	67	15	16	6	141
G3AXI	47	6	51	12	30	3	139
G3COJ	11	1	55	16	29	8	120
G8ATK	—	—	53	17	37	8	115
G3JXN	35	3	61	14	—	—	113
G8ATS	—	—	55	12	36	8	111
EI6AS	21	8	59	11	2	2	103
G2JF	—	—	53	11	29	8	101
G8BCA	—	—	46	8	30	8	92
G8APZ	—	—	46	9	31	4	90
GD2HDZ	1	1	51	9	20	3	85
G3EKP	23	6	35	8	6	4	82
G8BKR	—	—	56	10	11	2	79
G3IAR	35	4	30	7	—	—	76
G8CVD	—	—	48	11	2	1	62
G8BWW	—	—	45	7	5	3	60
G3FIJ	5	1	39	5	1	1	52
G3BHD	—	—	42	9	—	—	51
G8AUE	—	—	—	—	42	7	49
G8AUN	—	—	35	8	2	2	47
G3ZIG	—	—	37	7	1	1	44
G8CCH	—	—	33	7	—	—	40
G8DWV	—	—	24	5	—	—	29
G3OJY	—	—	21	5	—	—	26

This is the final Table for 1970. The new listing starts from Janaury 1st, 1971. Readers are reminded that their claims should be sent to "VHF Bands," SHORT WAVE MAGAZINE, BUCKINGHAM.

the Italian magazine *CQ Elettronica*—and all this single-handed! Write to him, *QTHR*, for details of these.

There is quite a bit of RTTY activity in GM also, with some eight stations involved in the Edinburgh area alone. The Edinburgh-Glasgow link on 145·4 MHz is open every Sunday afternoon from about 2.30 p.m. One wonders why they don't use 145·3 MHz, the U.K. North allotted frequency, but perhaps there is a QRM problem there. Those interested should contact GM8CWH, *QTHR*, for skeds and general information.

Contests

The two-metre SSB Contest on the night of January 11 engendered much activity, but propagation conditions were such that little extended-tropo. DX was possible. Conditions looked propitious when, for example, early on the Monday morning, G8BBB near Cambridge was receiving 500 μV of signal from GB3VHF and 75 μV from GB3DM, and this during dense fog—but Murphy's Law struck in no uncertain fashion when, 20 minutes after the start of the contest at 8 p.m., the PAØ's which, half-an-hour earlier had been coming through at RS-59 dropped down to the RS-54 mark, which made it pretty difficult for the Midlands operators. Best Continental DX heard in Herne Bay was DC6BB, who was just audible above noise. Nothing was heard here of GM8AGU who was QRV in Kincardine, although G3BA, G6CW and G3CCH were among those known to have raised him. It is reported that 'AGU had had sixteen QSO's by 2130 hrs, including one OZ. EI6AS, who was heard at RS-33 working G6CW, had apparently made some six contacts by half way through the contest. GW3UCB/P at RS-58 on peaks from near Llangollen was a good signal at times, but the QSB was very pronounced, and several stations were having great trouble in completing the QSO with him. Geoff Stone, G3FZL, was on from Forest Hill with his new *Heathkit* transceiver, putting out a nice clean signal to good effect, and G3HBW, Arnold Mynett in Chesham, Bucks, was not doing too badly with his 0·7 watt p.e.p. rig, with which he worked, *inter alia*, GW3UCB/P! On the whole, operating was good with but few grotty signals in evidence. The activity justified, once again, the three-hour duration of the event, as contacts were still being made right at the end of the period. While numerical scores, without knowing ranges, do not convey the whole picture, it may be of interest to note the following, by no means exhaustive, list: G3OXD/A, 57; G3FZL, 49; G8BBB, 61 (this was his final score and the best heard by G3DAH); G3RQA/P, 46; G3BA, 51; and G8DDC/A, the Dunstable Downs Club, 42. These figures were all being passed towards the end of the contest and, therefore, may be slightly lower than those in the final analysis.

Comparison with the report on the corresponding event last year supports the conclusion that conditions were better, activity higher and the likelihood of G8BBB winning again with 61 QSO's this time against 39 last year better than evens. A very enjoyable event.

The results of the G8APZ /G8AWS 432 MHz marathon, which closed on December 31, are not yet ready for publication, as at the moment of writing all logs had not been received and a fair amount of analysis remained to be done. It is hoped that the final scores can be published next time out.

The 432 MHz Cumulative Contest season opened on January 15, with subsequent sessions planned for January 28, February 10 and 23, and March 1. Times are 1900z to 2100z, and only three of the five possible logs will count towards the final score. However, logs for all periods should be sent in for checking purposes. To be eligible for an award, an entrant must take part in a minimum of *three* activity periods.

The GM Scene

GM3YMX and GM8CWH of Edinburgh come up with news of amateur interest in that great City. GM8BJF, whom your conductor remembers as being a very keen and active operator, has been livening up Two with his ¼-watt SSB rig, and has a big linear on the way to go with it. Brian's avowed intent is to work for some of the elusive GDX, and he can be sure that some of that same elusive GDX will be going for *him* when he becomes active with the higher power. Many new GM3Z--stations are now active in the area, and it is with great pleasure that one gathers that Jack Wilson, GM6XI, has been heard back on the two-metre air after a severe illness.

Harry Mackie, GM3FYB (in Dunfermline) had a good DX contact with Portsmouth during the recent lift using his 60-watt AM rig, and has been inspired to press on with 1296 MHz again. One wonders if he has plans for rejuvenating the Moonbounce ploy?

GM3ZBE (*ex*-GM8BYG) in Aberdeen, is looking for skeds with G stations on Two, and suggests 145.41 MHz SSB, or CW on a pre-arranged frequency. The sked, for any night at 2245z, may be set up by letter, *QTHR*, or by contact on 3.5 MHz. He has been having difficulty in finding G stations in spite of the fact that he monitors the band regularly, and is in the habit of transmitting to the South when the interpretation of his pen-recorder indications and observation of propagation conditions warrant it. He has been heard by G3AAV (Leeds), G6CW (Nottingham, G3CIW (Cheltenham) and G3LTF (Essex), although no contact has resulted—and this is not because he doesn't listen on his own channel, he does! Furthermore, he always announces his tuning intentions, *i.e.*, QLH or QHL, etc. The fact that he can hear the Wrotham beacon is evidence enough that the receiving set-up is OK, and he wonders if another of those curious cases of one-way propagation is involved here. Well, there you are—a GM looking South late evenings on the SSB channel or on CW, so what about it?

GM2DRD (Forfar, Angus) sends details of auroral manifestations observed by him during December, from which it appears that December 28 was particularly good on two metres in the North, although little seems to have been

seen of it in the South. One cannot help feeling just a little envious when Jim casually says "... but not a great deal to report this month"—and then one finds from his log that he worked two LA and two SM stations and heard another dozen or so *Ar* signals, all within the space of about two hours! His contact with LA4WF in Oslo looks very nice indeed. The Aurora was causing some interference with Ch. IV TV at the time, but was not prominent visually. 'DRD says that activity has been generally low during the month, although the regulars have always been there, and he mentions the following as being particularly reliable: GM3JFG, GM8AGU, GM3GUI, GM8BZX, GM3ZOO, GM3FGJ, GM3UM, GM3VZB and GM3EOJ.

Gordon Hunter, GM3ULP/GM6ADR/T in Motherwell, has been having a go at his local M.P. to enlist his support in repelling any invasion by commercial mobile radio interests of the 70 cm amateur band. He pointed out that his TV equipment was valued at over £1,000, including the £200 camera, and suggested that it would be "extremely regrettable" if all this became redundant due to a reallocation of frequencies. He can say that again! The answer from the Ministry was illuminating, to say the least. It emphasised that the Minister's plans for introducing Commercial Radio did not envisage the use of frequencies allocated to amateurs. Ah, well, it's comforting to know that!

Here Is The News

G3JHM has reported, and many four-metre operators will have noted already, the increase in signal strength of the Sussex beacon GB3SX. This is due to the installation of a high-gain (four-element) beam radiating Northwards. Incidentally, 'JHM can now be heard on SSB on Two as well as on Four. ZB2BO is still interested in four-metre operation —he has a converter and a 4-ele beam, and it is hoped that the ZB2 beacon will be operating again this summer. TF3EA, currently on Two and Four, is planning to come up on 70 cm also.

GD2HDZ (Laxey, I.O.M.) is now on Four, as can be seen from the Annual VHF Tables, and at the time of writing had one QSO in the log. The dreaded Tennessee Valley chaps are at in the Island, and operation is restricted, therefore, to late nights and Sunday mornings, but the 40 watts input to the QQV03-20A and a 4-element Yagi should make Arthur good copy over quite an area. The frequency is 70·59 MHz, and GD on Four is always welcome. GD2HDZ is also on 70 cm each evening, but with an average of less than two contacts per day, it's pretty tough going! G8CUE of Rotherham is the great standby; they have had 43 QSO's since October 15!

Two Metres

G8ELL (Stevenage, Herts.) and G8EEX (Crowborough) are by no means newcomers to Amateur Radio in spite of their callsigns. G8ELL was G3BWC in the early '50's and G8EEX held a licence in *1923!* He now operates from a hill in Sussex (650ft. a.s.l.) with a five-element beam and, in spite of a feeder run of nearly 200ft., puts out a potent signal.

Not many operators keep such a careful record of contacts made on the VHF bands over the years as does G2JF. The following is a breakdown of his two-metre QSO's for the 17+ years that Jim has been active on the band. G, 2419; F, 936; PAØ, 703; DL, 665; ON, 274; OZ, 132; GW, 83; SM, 50; OK, 27; GM, 21; GC, 16; HB, 14; DM, 13; LA, 11; LX, 10; GI, 9; GD, 6; EI, 5; SP, 4; EA, 3; OE, two; and one each PX, HG and YU, plus 9 Maritime Mobile —a total of 5415 different calls, all worked on tropo, except the HG and YU which were Sporadic-E. Of course, many of these stations have been contacted more than once. Well, what are you waiting for? You've a long way to catch up! Incidentally, Jim reports that his contact with SM7BYU in QRA GP15h during the opening of December 19 was interesting in that the SM was running a few watts only to a halo!

G8BII and G3BHW, both well known on the band, share a common interest in radio and astronomy. . . . G3OIZ, late of Littlestone in Kent, is now QRV from a hotel bedroom in Westgate-on-Sea, having moved over from the airport at Lydd to that of Southend, where he is a Flight Captain.

Although propagation to and from the Continent has been pretty poor of late, some operators may have been on during the recent German SSB contest and heard a strange callsign, DBØAFZ. This identification is allocated to a special amateur station in QRA Locator DL45d, near Bochum in

ANNUAL TABLE — BAND SUMMARY
January to December — 1970

FOUR METRES

Station	Counties	Countries	Total
G3OHH	57	8	65
G2AXI	47	6	53
G3IAR	35	4	39
G3JXN	35	3	38
G3EKP	23	6	29
EI6AS	21	8	29
G3DAH	24	3	27
G3COJ	11	1	12
G3FIJ	5	1	6
GD2HDZ	1	1	2

SEVENTY CENTIMETRES

Station	Counties	Countries	Total
G8AUE	42	7	49
G8ATK	37	8	45
G8ATS	36	8	44
G8BCA	30	8	38
G2JF	29	8	37
G3COJ	29	8	37
G8APZ	31	4	45
G2AXI	30	3	33
G3OHH	29	4	33
GD2HDZ	20	3	23
G3DAH	16	6	22
G8BKR	11	2	13
G3EKP	6	4	10
G8BWW	5	3	8
G8AUN	2	2	4
EI6AS	2	2	4
G8CVD	2	1	3
G3FIJ	1	1	2
G3ZIG	1	1	2

TWO METRES

Station	Counties	Countries	Total
G3DAH	67	15	82
G3JXN	61	14	75
G3COJ	55	16	71
G8ATK	53	17	70
EI6AS	59	11	70
G8ATS	55	12	67
G3BKR	56	10	66
G3OHH	54	11	65
G2JF	53	11	67
G2AXI	51	12	63
GD2HDZ	51	9	60
G8CVD	48	11	59
G8APZ	46	9	55
G8BCA	46	8	54
G8BWW	45	7	52
G3BHD	42	9	51
G3ZIG	47	7	44
G3FIJ	39	5	44
G3EKP	35	8	43
G8AUN	35	8	43
G8CCH	33	7	40
G3IAR	30	7	37
G8BWV	24	5	29
G3OJY	21	5	26

the Ruhr, which has been established on much the same lines as the Dutch station PE2EVO. It is associated with the new Hq. which is being set-up by the German Amateur Radio Society, DARC. (Presumably the AFZ in the callsign is for Amateur Funk Zentrum.) Special QSL cards are being issued against receipt of 10 IRC's (*sic*)—which makes it a pretty expensive contact to confirm!

It has now been established that PAØPKN is operating an intermittent beacon service, in that he keeps a transmitter going on 145·955 MHz from time to time when it is not required for communication use. The QRA Locator is CM62b and the transmission is beamed East with an RF output of five watts, but he has been received in this country. "Checkpoint Charlie," the German VOR beacon on 143·968 MHz, has been received well of late in this country, and is proving to be a reliable indicator of East/West propagation. He can be heard more frequently than either DLØER, who seems to have lost much of his former punch, or DLØPR. Look for his 800 Hz modulated carrier on the frequency given above, but please note that he does not radiate a callsign, hence the convenient, if inaccurate, appellation bestowed upon him.

G6CW (Nottingham) had an unusual QSO, or should it be series of QSO's, in the early morning of December 9 during the opening to the East. He was in contact with DLØER and two PAØ stations when they were joined by OE3LFA and OE3WSB and, subsequently, by HG2KRD! One hastens to add that John was not hearing the OE's or the HG, and nor were they hearing him, but several messages were passed up and down the line between all parties, and the whole incident turned out to be very interesting, not to say unusual! One recalls this sort of party developing on Top Band many years ago, and G3DAH would be pleased to hear from a station in the Midlands, one in North Yorkshire, and a couple in GM who would be prepared to co-operate in organising such a venture on two-metre SSB on some convenient occasion. (*GM3ZBE please note.*)

Seventy Cms

Dave Sellars, G3PBV (Newton Abbot, Devon) is now on 70 cm with a QQV02-6, NBFM and a 10-ele Yagi which has recently been raised from 36ft. to 45ft. GB3GEC is a consistent signal with him, and GB3SC is heard fairly often, particularly now that the antenna is up another ten feet. Parenthetically, GB3VHF is usually just below noise level, but was a good signal on December 9 and 19, when the two-metre lift was on. The only signals heard on 70 cm on the 9th were those of G8ARV, but, on the 10th, Peter Blair, G3LTF, was heard working OE2OML, the Austrian then being at 3 dB above noise level, although he was S9+ on two metres. As the distance works out at 780 miles (or 1,240 Km.) this was a very nice piece of hrd-DX. Dave has also done a few sums, and on the grounds that a 42-ele *Parabeam* instead of the 10-ele Yagi would yield another 7 dB, a 3 kHz bandwidth instead of the 5 kHz of the R.1475 would give another 3 dB, and a pre-amp at the masthead 3 dB more, he reckons he could have worked him at S5—so he is now pressing on mightily with sundry modifications, including an SSB project for Two and Seventy.

G8AUN is in favour of a calling/listening period of say 10-15 minutes every hour on the hour on 70 cm. This seems a good idea to make GSO's more likely. . . . No more video from Nigel Walker, G8AYC of Gillingham, Kent, for the time being. He has joined the BBC and is away on a course for the present. Even the antennae are down! . . . DLØER, the Essen Club station well known also as a beacon callsign on 145·981 MHz, is now QRV with ten watts of video on 435 MHz. The accompanying audio is on 144·95 MHz. He has already put pictures into this country.

Twenty-Three Centimetres

There is an increase in 23 cm activity in Normandy, with F3LP, F9XG and F1RJ all on the band. More activity from this country also, in the shape of G8BYV and G3XPT in Norfolk. 'BYV uses a BAY96 tripler with an input of ten watts to a 4ft. dish. The converter is a G8AEJ type. G3XPT has the smaller BAY66 tripler, a 3ft. dish, and a converter of his own design.

While on the subject of 23 cm, the publication of a separate Annual Table for that band, as for the other VHF/UHF bands, is still on, provided that we get entries for it. Several operators have requested such a Table, and it is considered that it could be of general interest, but as it stood all the last year with only G8AUE putting in a claim, the interest is, perhaps, a bit restricted. We'll do it if you will supply the basic information.

Listening This Channel

For some time now, it has been apparent that the idea of listening on one's own channel before tuning a designated portion of the band can, and indeed frequently does, pay off. On phone, the announcement of this intention is easy, but is a lengthy process if sent in clear on CW. One hears often enough the Q Code signals QLH, QHF, etc., which give an indication of where to call in reply to a CQ, and one has even heard "QRV QRG" to imply that the sender is looking on his own frequency for replies. Why not use QSU, which is already allocated in the official list of Q-Code for this purpose—or nearly enough for this purpose. Certainly, it would be as comprehensible as some of the Q-Code signals now generally (mis)used. It seems logical to employ QSU for CW, as its exact official meaning is "Send or reply on this frequency (or on — MHz, with class — emission)."

Deadline

Deadline for the next issue is **February 6,** and the address for news, views and comments is as usual, "VHF Bands," SHORT WAVE MAGAZINE, BUCKINGHAM. With thanks to all those who passed on good wishes for 1971, cheers for now and *73 de G3DAH.*

(The deadline following will be **March 6** for April.)

SATELLITE RECEPTION MADE EASY

GENERAL PRINCIPLES AND AERIALS TO USE

Part I

J. M. OSBORNE, M.A. (G3HMO)

The author will be well remembered as having made a number of original contributions in the context of Amateur Radio. He was first to show how transistors could be home-made for experimental purposes, and proceeded from this to prove that amateur-band communication was possible over useful local distances with these transistors, powered only by a few photo-electric cells activated by the sun. He did a great deal of original practical work on the design of Top Band aerials for mobile operation—still the standard treatment on that subject. He was probably the first amateur to build an effective radio telescope—which came to be known as the Stowe Radio Telescope—for observation of the sun and the nearer noise sources, using simple equipment. Readers who have been with us over the years will remember his articles on all these subjects in SHORT WAVE MAGAZINE. *Since then, G3HMO—as head of the Science Dept. at Westminster School, London—has turned his attention to Satellite Reception and the methods whereby the most can be got out of the information they radiate. Following now is Part I of an article that will go into this subject in some detail—and it should be noted that, as always, his treatment is essentially practical and well within the scope of any radio amateur looking for something out of the ordinary.*—Editor.

IN the past the reception of satellites has been considered a field for experts using complex aerial systems and specialised receivers. This is not so now and as the sky is full of orbiting electronics, there is plenty of scope for the amateur. For example, at the present time there are three weather satellites continuously broadcasting cloud cover pictures from a thousand kilometres up by automatic picture transmission (APT). The reception of APT was first described in SHORT WAVE MAGAZINE for April, May, June and October 1959. More recently I have been developing my own gear for APT and have felt that many readers could enjoy a project of this sort once they have found that they could receive satellites easily and reliably. The object of this article is to describe how these signals can be received, with the minimum of expense and time. Once the amateur has got the hang of reception with these easy techniques and simple gear, he can decide whether to develop more specialised apparatus to his own design.

The subject divides into two parts: The receiving gear and its operation; secondly, satellite orbits and how to aim the aerial. I will deal with the reception side first. This can be subdivided into *(a)* choice of frequency, *(b)* construction of the aerial, *(c)* suitable receiving gear, and *(d)* recognition of satellite signals. Logically, one should deal with the orbits first but as it takes time to organise the gear I decided to reverse this order.

Although Russian and Chinese satellites can be heard (at the right time) around 20 MHz and while direct up/down links with satellites use GHz bands, the most active band on which to listen is undoubtedly 136 MHz. It is very likely that an amateur with good receiving gear who can accurately set the receiving frequency will pick up either *Essa 8* on 137·62 MHz or *ITOS 1* on 137·5 MHz if he monitors

Not actually a one-man juggling act—but G3HMO on the roof of the Science Lab. at Westminster School, in the shadow of the Houses of Parliament, checking a crossing of the weather satellite "Essa 8". He is reading off the predictions, aiming the aerial accordingly, feeling for the optimum plane of polarisation by manipulation of the beam, and watching what happens on the large-scale S-meter at lower right. The whole process has to be gone through in a few minutes—"Essa 8" makes a fairly rapid pass—during which time he also has to make notes (and breathe!). What this picture shows is that even in the heart of London good, strong and usable satellite signals can be easily received on simple equipment.

Yagi Data for Satellite Reception

Over 136 MHz Band

	DIRECTORS 1 2 3 4	DIPOLE	REFLECTOR
Element Lengths	36 37 38 39	41½	44
Spacing Between Elements	13 13 13 13	21½	

All dimensions are in inches. Length of tube for folded dipole element should be 85in.; after folding to 41½in., there should be a ½in. gap at centre, for coax connection—see Fig. 3. For the main structure, materials required are one 8ft. length of Marley 2½in. plastic rainwater pipe (local D-I-Y stores) and to make the elements, two 13ft. lengths of ½in. o.d. hard-drawn aluminium tube (through D-I-Y- stores, or from Blackburns, Ltd., Drayton House, Gordon Street, London, W.C.1). Total cost of materials about £3.

these frequencies from 1000 to 1200 GMT any day. The signals are audible for 10 to 15 minutes on each transit. This procedure is accordingly recommended to those who have no access to official predicts. (For aerial details. read on.)

A satellite's attitude in space is continually changing and likewise the plane of polarisation of its aerials. Without going into details, it is obvious that with respect to a fixed point on the ground, a moving satellite could not maintain a fixed plane. Receiving aerials are, in consequence, either crossed Yagis or helicals. Correctly designed, such aerials give constant output irrespective of the plane of the incoming signals and will even accept circular polarisation if it is in the right sense.

However, these aerials have a lower gain than a similar, single plane, Yagi. One can imagine the loss resulting in connecting in parallel with a correctly plane-polarised Yagi a second Yagi in a plane at right angles to the first. The second Yagi will contribute no signal but will load the first Yagi.

Some months ago I decided to look into the necessity for special aerials for satellite reception. Such aerials are highly desirable if the object is to receive and reproduce weather pictures. But the signal level from weather satellites is in fact so high that it seemed something much simpler would do

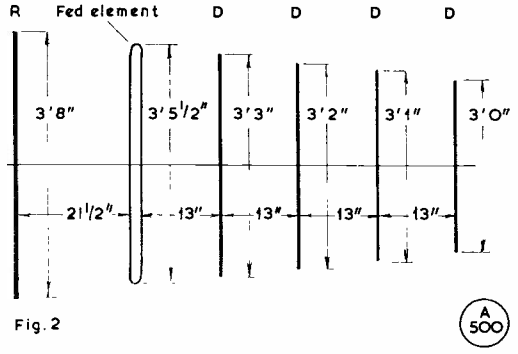


Fig. 2. Dimensions of a Yagi for work in the 136 MHz Satellite Band.

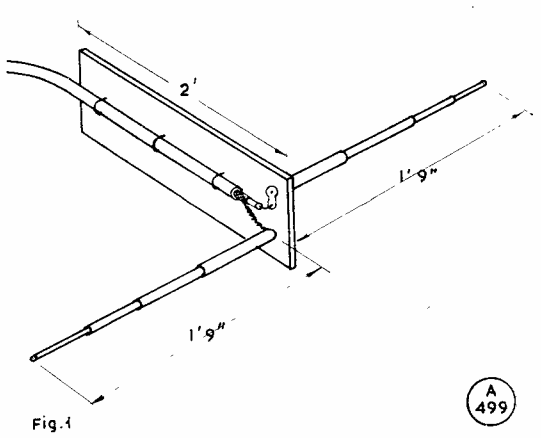
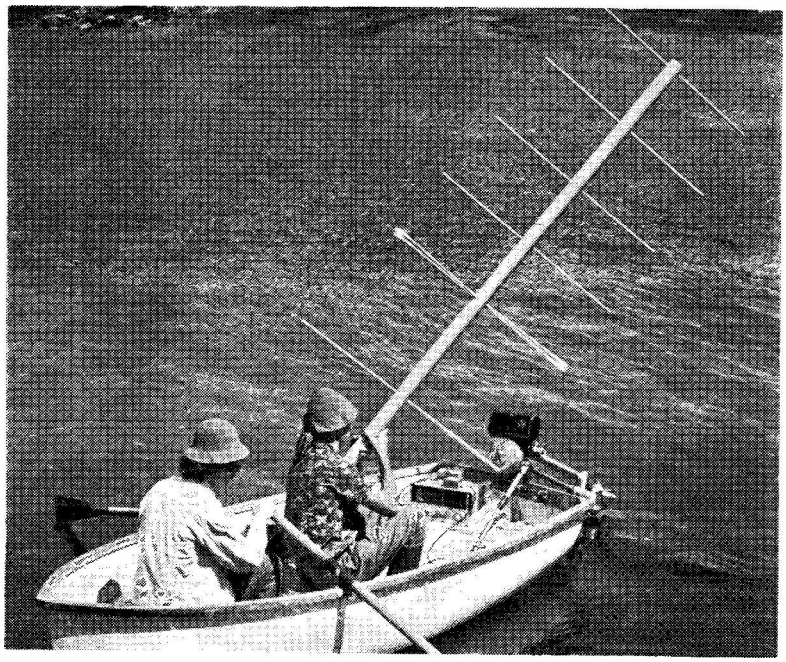


Fig. 1. Simple hand-held dipole for experiments in satellite reception.

just for identifying the signal. This proved to be the case and *ITOS 1* has been easily received mobile using only a 3ft. whip on the roof rack. To extend the investigation a simple dipole was constructed from two short telescopic aerials (transistor radio type. out to 2ft. when extended) fixed to a piece of hardboard about 30in. for a handle, as shown in the diagram, Fig. 1. This showed clearly that while aiming the handle at the satellite's approximate position gave the best results, *rotating* the handle to get the right plane was far more important. The signal. not unexpectedly, virtually disappeared when the handle was at right angles to the best position. The other important observation was that the plane of polarisation only rotated slowly, typically once in five minutes. (This finding, as far as I know, has not been published anywhere before. It is of no interest to commercial users.) However, this gave me the idea for a very simple Yagi which I have used to track satellites with signals only a little inferior to those obtained with a *J-Beam* crossed Yagi (*see* picture on p.235. June 1969 issue of the *Magazine*). It must be emphasised that for serious work and as a permanent installation the *J-Beam* crossed Yagi shown there is ideal.

A Simple Yagi—and its Advantages

The /P type discussed here is light enough to be held and aimed by the operator. A large-scale indicating meter wired in series with the receiver S-meter is conveniently placed for the operator to observe. He then steers the hand-held aerial and *rotates it about the long axis* to maintain maximum S-meter readings. With practice and experience the operator's performance can be made to equal that of any lock-on-and-follow auto-track aerial system. If the No. 1 operator delegates this job to his No. 2, he has at his command a servo-mechanism second to none in its versatility. This leaves him free to tune the receiver, note transit data and if desired make tape recordings.



G3HMO is nothing if not thorough in proving the practicalities of Satellite Reception on the 137 MHz band. While son Nicholas rows out a mile or so from their holiday cottage on the South Devon coast, G3HMO aims the aerial to read signals, good and strong, from satellite ATS-3. The Rx gear consists of a Solid State Modules converter, lined up for the band, into an Eddystone EC-10 Mk. II as main receiver. The Wx satellites mentioned in his article can be picked up easily in such conditions—even under power with the ignition lead of the Seagull outboard motor only a few inches from the gear. (Of course, for an experiment of this particular sort, you need a fine, calm day, as G3HMO points out in his notes for this picture!)

Constructional Details

The Yagi dimensions for 136 MHz are shown in Fig. 2. The elements are of thin-walled ½in. o.d. aluminium tube. The support is an 8ft. length of 2½in. o.d. Marley lightweight plastic water drainpipe. as Fig. 3(A). Holes just under half-inch are drilled in the pipe so that when the elements are forced in no further fixing is needed. The folded dipole is made by first hammering flat the part of the tube to be bent, and then bending to the dimension given in the diagram. The coax lead is brought up inside the plastic pipe and joined to the ends of the folded dipole where it projects into the pipe (Fig. 3(C). This is done as follows: The ends of the aluminium tube are dented with a hammer; next, holes are drilled in the dents to take small self-tapping screws; the screws are used to retain 6 BA solder tags Fig. 3(B); then the coax is fed through the pipe from the reflector end and the inner conductor brought out through one hole and soldered to a tag; this end of the folded dipole is then forced into the hole until it is almost coming out the other hole; at this point the outer braid of the coax is fished out through this hole and soldered to the other tag; this end of the dipole is now forced into the hole in the plastic pipe while easing the other end back so that both ends of the dipole are now about half-inch apart, inside the plastic pipe with the coax securely fixed. The junction of the dipole to the coax is proof against the weather and the coax runs out at the hand held end.

The weight of the finished Yagi is only 1·7 kg (about 4lb.) and can be manoeuvred without fatigue

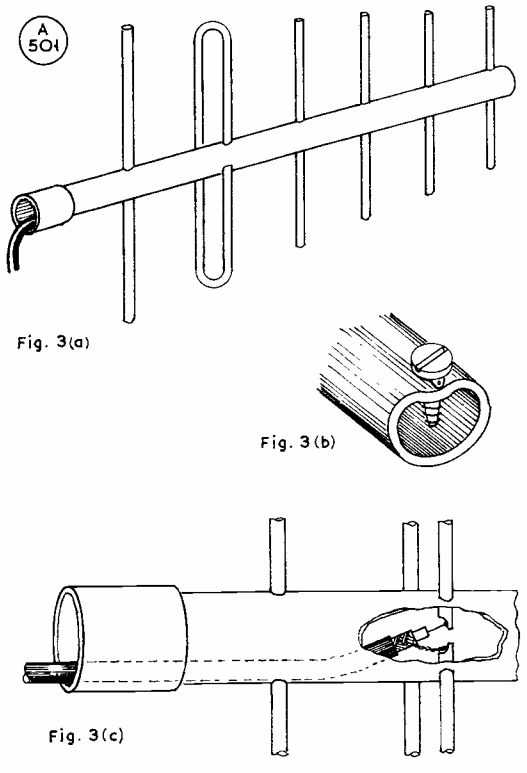


Fig. 3. (A) Light-weight Yagi designed to be hand-held and steered for satellite reception. (B) Detail showing how the end of the folded dipole is fabricated to take a solder tag without having to increase diameter; made in this way the tube can be forced into the plastic pipe to make a weather-proof junction for the coax. (C) Cut-away to show how the folded dipole element is connected to the coax.

for 20 minutes or so, except in high winds. The proof of the pudding is in the eating—this aerial not only gives good results on APT satellites; it also picks up signals from satellite ATS-3 parked some 22.000 miles up over South America.

The simplest way of receiving signals is to use a good two-metre converter with its front-end peaked on 137 MHz instead of 145 MHz. The IF is fed into a reasonable communications receiver, the IF being 8 MHz lower than for the 2m. band. (I use a converter by *Solid State Modules* as advertised in the *Magazine*.) The manufacturer will align the converter for the satellite band on request. With the crystal provided the 2m. IF is from 28-30 MHz. Then *Nimbus 3* comes up on 20·95 MHz and *ITOS 1* on 21·75 MHz on the *Eddystone* EC-10 Mk. II which follows the converter. Any similar set up should work as well.

Finding The Picture

The APT satellites use FM and the receiver should have a 50 kHz bandwidth and an FM discriminator fully to resolve the modulation. In practice, it is easy to identify the signals on a selective AM receiver by detuning slightly. A characteristic audio signal can be recognised on either side of the peak indicated by the S-meter.

It is difficult to describe this audio of an APT signal. The carrier is frequency modulated at 2·4 kHz. The amplitude of this note is modulated by the picture signal. The picture consists of 800 lines sent at 4 lines per second. There is a white bar at the edge of the picture. The signal sounds therefore as a 2·4 kHz note of fluctuating strength but with a very pronounced 4-cycle per second bleep. The beginning of the picture has a 600 kHz start tone and on the *ESSA* satelites there is an interval of uniform modulation between pictures. Alternatively, the satellite may use an infra-red radiometer scanning at 48 r.p.m. This has a complex line structure with a weird musical "Dr. Who" type sound with a 48 r.p.m. beat. Of course, one only gets full value when using an FM receiver.

For resolving APT pictures I have a standard VHF FM chassis, available until recently for about £6. I trimmed the RF and oscillator coils until the unit tuned the 136 MHz band. For adequate gain and signal-to-noise ratio, two FET preamplifiers are connected between the aerial and the FM receiver. The signals are recorded on tape and subsequently played back to make cloud cover pictures. But all that is another story. First we must return to the subject of satellite orbits and how to use the aerial.

(To be continued)

The firm of Solid State Modules was represented at last year's Amateur Radio exhibition, and here we see Paul Crapper, G3MXG (and XYL) with one of their latest pieces of equipment—a complete solid-state Tx for two metres. Also on display were the Solid State Modules Mosfet converters for VHF.

" . . . auto-keyer here is a bit unusual . . . "

A 70-CENTIMETRE TRIPLER

THE HIP-TRIP FOR HIGH POWER ON 432 MHz

DESIGN AND CONSTRUCTION

A. H. DORMER, C.Eng., F.I.E.R.E. (G3DAH)

THIS article describes the design and construction of a resonant line cavity for the 70 cm. band. Choice of an appropriate grid circuit permits operation as either a 144/432 MHz tripler, or as a PA capable of an output in Class-C of 100 watts of plate-and-screen modulated AM. Selection of the relevant parameters for Class-AB1 operation will permit the transmission of video and SSB. In the tripler configuration (which is the only one which will be described here in detail) an output of some 40 watts at 432 MHz can readily be achieved. It is planned to describe operation in other modes in due course.

Basic Design

By virtue of its geometry, an external anode valve of the 4CX250B type lends itself admirably to the construction of a coaxial cavity, the inner of which can be a tube fitting over the valve anode and forming, with the associated valve and tuning capacities, a quarter-wave resonant line at the operating frequency. Such a tube can be constructed from readily available 1½in. i.d. copper stock, and this measurement determines the value of the other dimensions. A characteristic impedance of 50 ohms was selected as appropriate to the sockets, cables and coaxial relays in use at this station. From the formula:

$$Z_O = 138 \log_{10} \frac{D1}{D2}, \text{ where}$$

Z_O is the characteristic impedance,
D1 is the i.d. of the outer conductor.
D2 is the o.d. of the inner conductor.

rearrangement gives:

$$D1 = D2 \times \text{antilog} \frac{Z_O}{138} = 3{\cdot}5\text{in. approx.}$$

To calculate the length of the inner line, the associated capacity must be determined. This consists of the valve output capacitance of 4·5 pF plus the tuning capacitor and circuit strays, and a total of 7 pF is assumed for the purpose of the calculation.

At resonance, the inductive and capacitative reactances of the line must be equal in value. We can write, therefore,

$$X_L = X_C = \frac{10^6}{2\pi fC},$$

and where $f = 433$ MHz and $C = 7$ pF, the inductive reactance of the line can be determined as near-enough 52 ohms.

X_L may also be expressed as equal to:

$$Z_O \bullet \tan \frac{2\pi l}{\lambda}.$$

transposing.

$$l = \frac{\lambda}{2\pi} \bullet \tan^{-1} \frac{X_L}{Z_O}$$

$$= \frac{27{\cdot}1}{6{\cdot}28} \bullet \tan^{-1} \frac{52}{50}$$

= 3·4in. approximately, where
l is the required length of line,
λ is the wavelength in inches.
$\tan^{-1}$ is the angle measured in radians tangent of which is $\frac{X_L}{Z_O}$.

In the event, the inner cylinder had to be reduced slightly in length, indicating that the assumed figure of 7 pF for the total capacity was a little on the low side. The dimensions in the drawings should be used—*see* Figs. 1 and 2, pp.734-735.

To accommodate an inner cylinder of this dimension the outer cylinder must be of the length indicated in Fig. 1 or Fig. 2, because account must be taken of the thickness of the top capacitor plate and the extent to which it and the valve and holder project into the cavity.

From the standard formula for the calculation of the capacitance between two parallel plates of known area and spacing, the dimensions of the disc tuning capacitor can be determined, and it is found that with a diameter of 1½in. a spacing of ·375in. gives the desired result. If it is intended to use the cavity for the transmission of video signals at frequencies above 435 MHz, it may be necessary to reduce either the diameter of the discs or the length of the line, and therefore the height of the outer cylinder.

Construction

Two methods of construction are illustrated. *Method 1* calls for nothing more than the ability to use simple tools and a soldering iron, while *Method 2* requires access to machine-shop facilities. Electrically, the performance of the two versions is very similar, but the refinements introduced in the second method will lead to a superior appearance of the finished article, as the photographs show.

Method 1 *(overleaf)*

The drawings in Fig. 1 show the simple mechanics and dimensions for the components of the cavity. Brass or copper tube can be used for both line and cavity. For the inner line the author used the standard "Yorkshire" copper tubing, since this is readily obtainable from builders' merchants and, for the outer line and plates, brass, obtainable from *J. Smith & Sons (Clerkenwell) Ltd., 42-54 St. John's Square, London, E.C.1.*

Constructors will have their own ideas of the

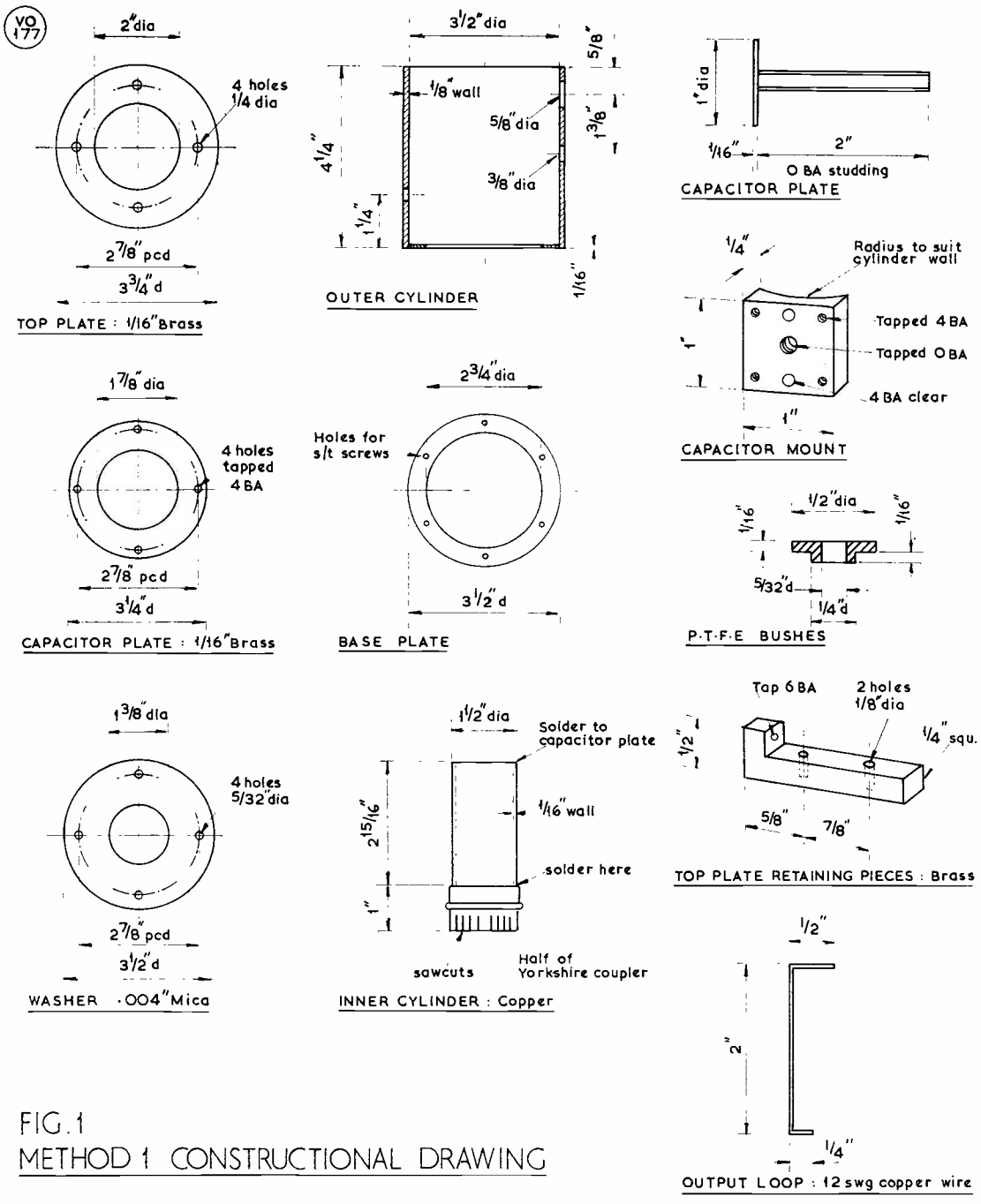


FIG. 1
METHOD 1 CONSTRUCTIONAL DRAWING

Fig. 1. The "Method 1" arrangement discussed in the text — full constructional drawing.

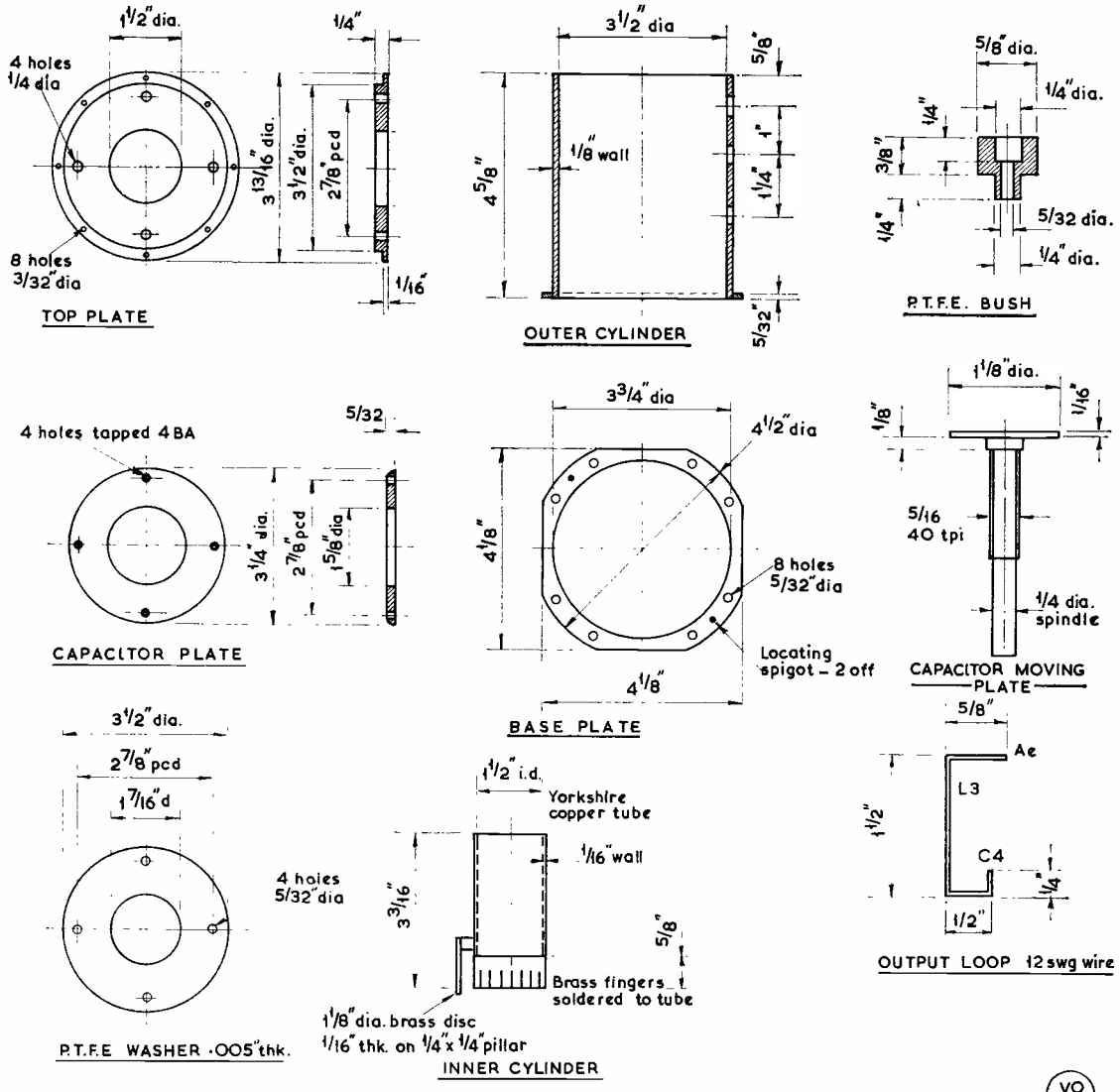


FIG. 2. METHOD 2 CONSTRUCTIONAL DRAWING

Fig. 2. The more refined "Method 2" constructional arrangement — see text.

sequence to be followed in the fabrication of the cavity. Suffice it to say that accuracy is of prime importance. and that the following points should be observed:

(a) All metallic surfaces must be truly flat so that good electrical contact is made between them. Heavy RF currents flow across certain of these surfaces, and failure to ensure an RF-tight junction will result in overheating and poor performance.

(b) The valveholder is mounted in the copper chassis and soldered into place from the underside. The outer cylinder with the base plate soldered in position is then prepared, as shown in the drawings. The inner cylinder is made slightly longer than indicated, and the top plate slightly larger. The top plate and the capacitor plate are bolted together and drop over the inner tube, which is in position over the valve. Lightly tack the inner and the capacitor plate together with solder. *From the underside,* ease the valve and complete assembly out, and solder the inner to the underside of the capacitor plate, taking extreme care not to move them out of position with

respect to one another. Remove the excess length of the inner cylinder and then replace the whole assembly into position with the valve in the holder. True up the edges of the top plate to match the outer cylinder wall, prepare and insert the mica washer and the insulating bushes, and complete the assembly.

(c) Since the full HT appears across the tuning capacitor, the moving plate should be covered with insulating material.

(d) Although the standard 1½in. i.d. copper tube specified for the inner conductor may be skimmed out, slotted and spread to give a tight, push fit over the valve anode, the thermal contact conduction is then poor, and a standard "Yorkshire" coupling piece, cut and slotted as shown, is superior in this respect.

(e) Mica is specified as the dielectric between the top plate and the fixed capacitor plate, but p.t.f.e. sheet could be substituted, and should be ·005in. thick for an anode potential of up to 1500v. DC.

(f) There must be a good electrical contact between the moving plate of the tuning capacitor and the cavity wall. Some form of tensioning or locking device *must* be used—in this case an OBA hex. nut.

(g) The top retaining pieces are secured into tapped 6BA holes drilled in the cavity wall, and the 6BA set screws locate into dimples drilled into the top plate.

Method 2

The essential differences between this method of construction and that of *Method 1* are apparent from Fig. 2, and may be summarised as follows:

(a) The outer cylinder is 4⅛in. long, with both ends machined flat and parallel. The increase in length is necessary to accommodate the heavier capacitor plate.

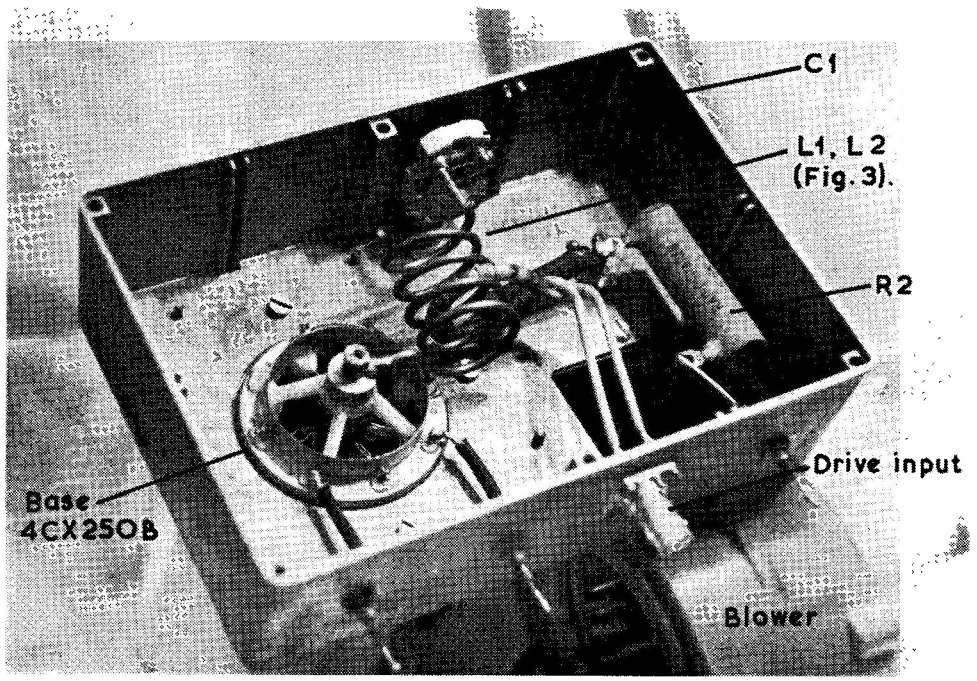
(b) A flat is endmilled on the outer surface to provide a seating for the output socket.

(c) The top plate is secured to the outer cylinder by eight 8BA set screws which enter holes drilled and tapped in the cylinder wall at equal intervals. Pop marks indicate correct orientation of the plate.

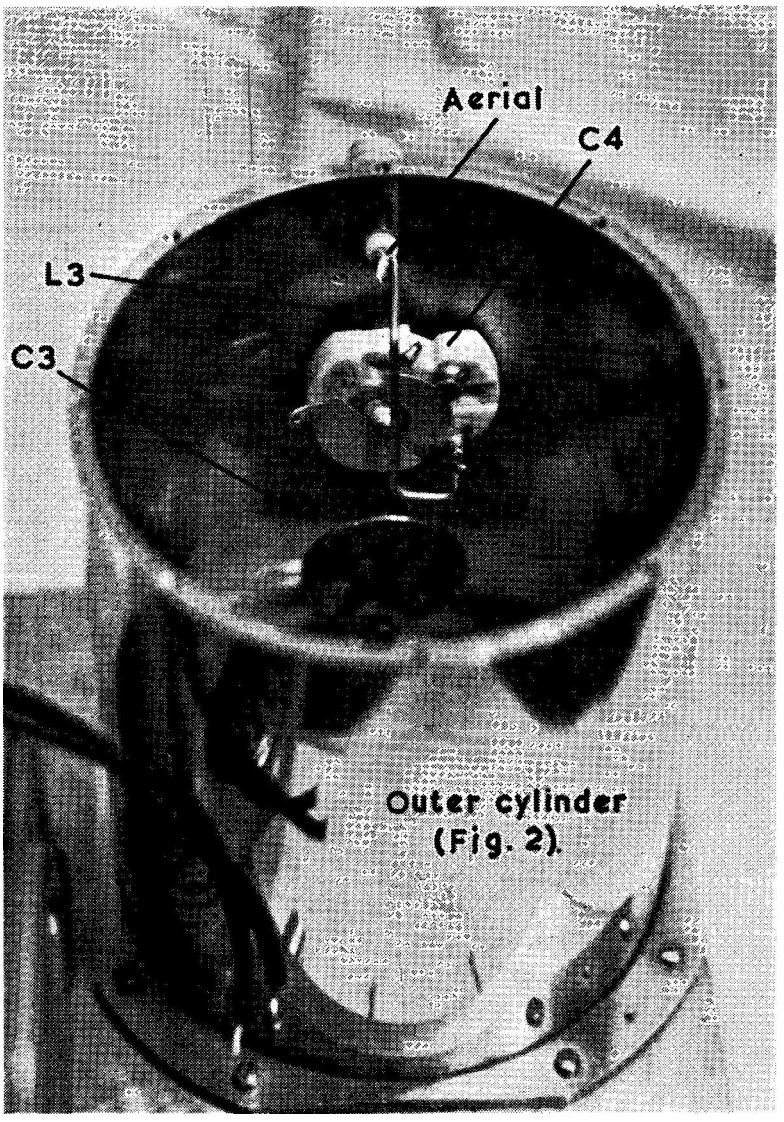
(d) The diameter of the top plate is made 1/16in. greater than the o.d. of the outer conductor to provide a small lip, which not only makes it easier to remove the assembly when required, but also effectively conceals any slight eccentricity in the cylinder itself.

(e) A more substantial (5/32in.) capacitor plate is used with p.t.f.e. sheet as the dielectric. The brass remaining after the plate has been cut is further machined out and the corners rounded off to provide the base plate into which the outer cylinder is soldered. Small locating pegs are fitted as shown before bolting down to the machined surface of the chassis.

(f) The tuning capacitor shaft, which is made from 5/16in. steel rod threaded 40 t.p.i., passes through a brass, split, collet bush which is internally threaded 40 t.p.i. to carry the capacitor spindle, and externally threaded 32 t.p.i. to take a locking nut. The collet is soldered into the cylinder wall with



Under-chassis view of the completed Seventycem Tripler showing the 144 MHz grid coil—L1, L2 of Fig. 3—and the single-plate grid tuning capacitor C1, constructed by modifying a Jackson C802 to give one fixed and one moving plate.



The output loop L3 and loading capacitor C4 for the "Method 2" cavity. The capacitor is a Jackson C802 reduced to one fixed and one moving plate. The disc below is the moving plate of the tuning capacitor C3. Compare this photograph with the drawings at Fig. 2, p.735. The completed job should look just like this, which is very nearly scale size.

the spigot protruding $\frac{1}{8}$in. into the interior to prevent the moving plate from being drawn out so far that it touches the outer wall. It also prevents the disc from being inadvertently distorted at maximum spacing.

(g) The insulating bushes are turned up from $\frac{5}{8}$in. p.t.f.e. rod, and are fitted with caps of the same material to prevent accidental contact with the high voltage supplies.

(h) In place of the "Yorkshire" coupling piece specified for the *Method 1* cavity, a piece of thin springy brass (or phosphor bronze) is silver-soldered to the end of the inner line, slotted at quarter-inch intervals by equidistant, thin saw cuts, and adjusted to give a firm grip of the valve anode.

(i) The fixed plate of the tuning capacitor must be mounted as shown to avoid fouling the valve anode and to give maximum capacitance change for a given movement of the other plate.

It is recommended that manufacture proceeds in the following sequence:

(1) Face off one end of the outer cylinder and

turn a small spigot of ·010in. on the other end,

(2) Make up the base plate,

(3) Sweat baseplate in position over spigot and skim off to true length. Drill holes in cylinder as indicated. (This is best done on the lathe.),

(4) Machine inner tube to length and sweat into capacitor plate. Skim the plate true.

(5) Sweat finger stock on to tube,

(6) Machine surface of chassis flat,

(7) Prepare ancillary items, capacitor plate, etc.,

(8) Take time for a cup of coffee, and prayer,

(9) Complete assembly.

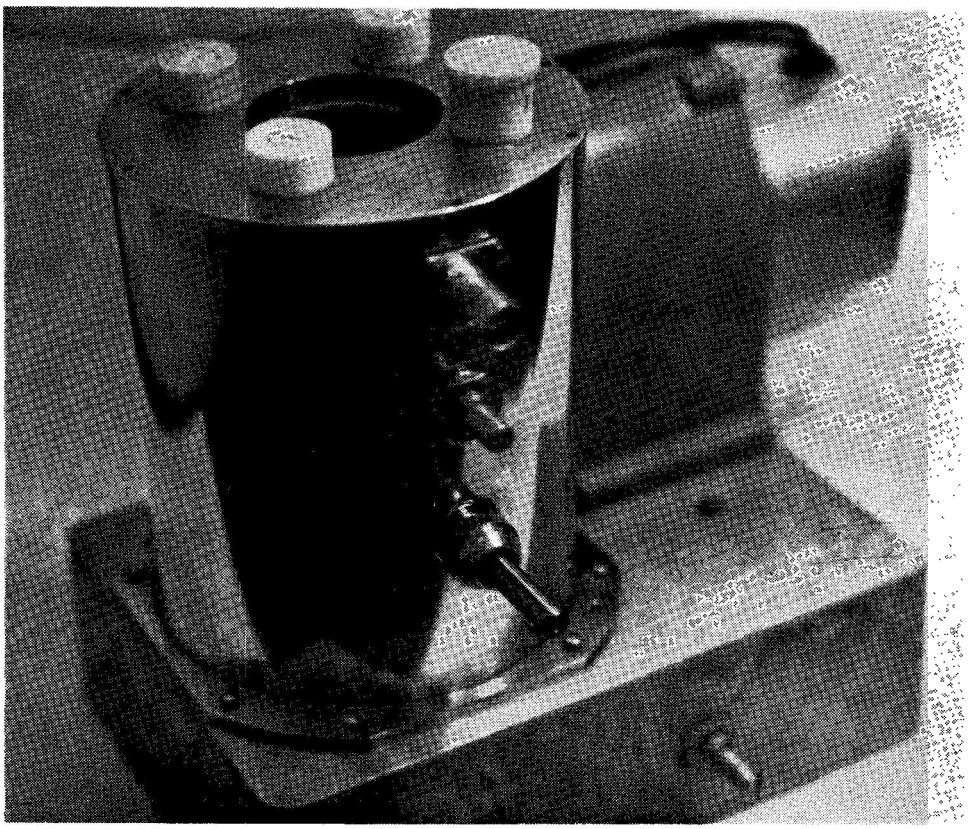
Circuit

The circuit shown in Fig. 3 is quite straightforward, and requires little explanation, except perhaps to say that the cathode follower arrangement provides a convenient way of obtaining a variable supply for the screen of the 4CX250B and, therefore, a smooth control of output. A separate unearthed heater supply should be provided for the valve.

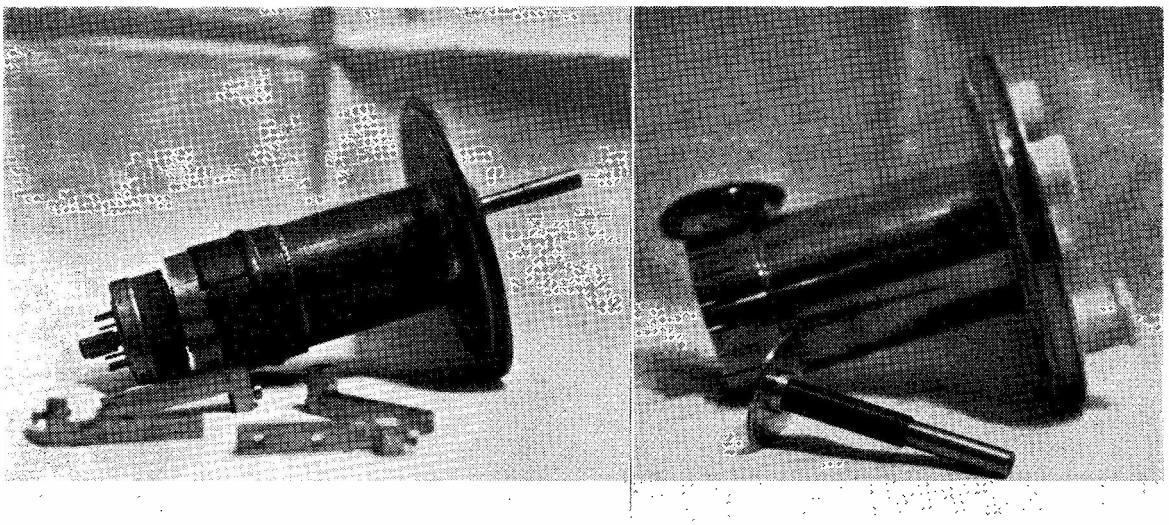
Operation

Never operate the tripler without the blower on.
Never apply screen voltage without plate voltage.
Always run the Unit into an RF Load.

With construction complete, GDO the grid circuit to ensure that it is resonant at 144MHz. Secure the chassis base plate, switch on the blower and check for air leaks. Seal with tape where necessary. Switch on the heater current, and note here that the heater volts must not exceed 6·0v. AC (5·5v. AC when operating as a straight-through amplifier at 432 MHz). Apply drive at 144 MHz and resonate the grid circuit. The amount of drive, and hence the grid current, will depend upon the output required from the tripler. As a guide, with I_g = 10 mA and 1000v. HT supply, the output is 12 watts when E_s = 140v., and double that when the screen is raised to 200v. Increasing the drive to just under 20 mA and raising the anode volts to 1500v., the maximum permitted at this frequency, will produce more than 40w. RF out. To operate efficiently as a tripler, the grid should be at least 150v. negative, and this figure is achieved by providing fixed protective bias of 75 volts and a drive-derived bias of the same value (11 mA through 5·6K). Under these circumstances the screen current will be 4 or 5 mA, well within the maximum dissipation rating.



A general view of the completed "Method 2" cavity showing, in particular, the p.t.f.e. bushes with the protective caps in place, and the method of locking the tuning capacitor spindle by split collect and nut—see drawings.



The "Method 1" (left) and "Method 2" (right) inner cylinders, showing the differing construction. The latter method involves some close work with lathe and metal tools and gives a more elegant result than that of "Method 1"—but either will give good results electrically. The small objects in the foreground of the left-hand picture are the top-plate retaining pieces.

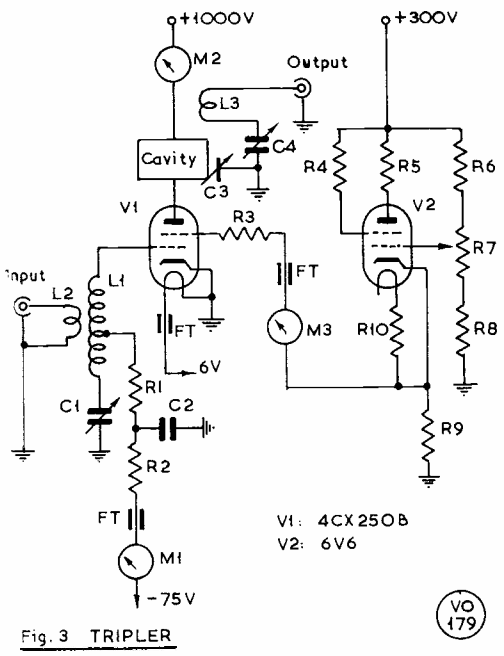


Fig. 3. Circuit of the Seventycem Tripler — see text and photographs.

With reduced voltage on the anode and screen and the output coupled into a load, the cavity may now be resonated and the loading adjusted to give maximum output. These controls are interdependent. Full operating potentials may now be applied for required output. Note that, as a safety precaution, the DC supply voltage for the screen cathode follower is derived from the same transformer as the main HT supply, and separately fused.

Power Supplies

The circuit of a suitable PSU will be given next month and requires no particular comment.

The air cooling requirements for a single 4CX250B at an anode dissipation of 250 watts is 5·6 cu. ft./min. at a water gauge pressure of 0·6in. The blower specified yields just under 0·4 w.g. at this volume, but as the tripler is run at considerably below 250 watts anode dissipation, the air output is adequate.

Table of Values

Fig. 3. Circuit of the 70-Centimetre Tripler

C1	= 6 $\mu\mu$F	R10	= 100K, 1w.
C2	= 1000 $\mu\mu$F	M1	= 0-20 mA
C3	= *see text*	M2	= 0-200 mA
C4	= 6 $\mu\mu$F	M3	= 0-10 mA
FT	= 1000 $\mu\mu$F feed-through	V1	= 4CX250B (or 4X150A)
R1	= 47K, 1w.	V2	6V6
R2	= 5·6K, 5w.	L1	= 4½T, 1in. i.d., 1½in. long, 12g.
R3	= 100 ohms, ½w.	L2	= One turn, 1in. i.d. at centre of L1, 14g.
R4, R5	= 47 ohms, ½w.	L3	*See* Fig. 1 and 2
R6	= 39K, 2w.		
R7	= 20K variable		
R8	= 10K, 2w.		
R9	= 68K, 2w.		

COMPACT VERTICAL AERIALS FOR THE LF BANDS

DESIGN CONSIDERATIONS BASED ON AN EXPERIMENTAL INVESTIGATION—PRACTICAL POINTS CONCERNING INSTALLATION, AND THE GROUND SYSTEM

R. L. GLAISHER (G6LX)

ONE of the penalties of living in a suburban environment is shortage of space to erect efficient aerials for the lower frequency bands. At G6LX, the only run available is between a mast and the house, a total length of some 90ft. In addition to the lack of space, height is also a problem as the house is of the chalet type and the mast is only 46ft. high. Being a confirmed user of the 160- and 80-metre bands for winter DX working, a serious attempt was made with various kinds of shortened and loaded aerials which would fit within the space available. While satisfactory results were obtained on Eighty with these short horizontal aerials, Top Band performance was well below that required for consistent DX working.

At a previous (overseas) location, the writer had the chance to use a full-sized quarter-wave wire vertical for 160 metres. The performance of this aerial was very impressive and it was felt that some tests should be made to see how a shortened vertical would operate from this QTH, and whether it would be any more effective than the horizontal types previously tested. One thing leads to another, and this test was no exception, as what started as a simple check on "L" and "T" aerials, ended up as a full-scale project which has taken five years! This article summarises the results and gives details of short folded aerials which are capable of good low-angle radiation on the lower-frequency bands.

General Points

The aerials tested were constructed from 14g. copper wire and were suspended from the 46ft. wood mast, or from a rope triatic strung between the mast and the house. In order to provide a standard of comparison, each aerial was cut for use on the 7 MHz band and compared with a permanently installed Ground-Plane mounted on the house 90ft. away from the test site. The test equipment available included a General-Radio RF Bridge and Generator, Antennascope, Collins directional wattmeter and SWR meter. In common with most short verticals, the aerials tested were unbalanced devices which are operated against ground. It was therefore most important to use a *low-resistance ground* or counterpoise system, in order to avoid losses and to ensure consistent performance and repeatability during the test programme. Further information about ground systems and details of the arrangements used at G6LX are given later in this article.

Loaded Aerials

The input resistance of a simple quarter-wave vertical working against ground was found to be about 40 ohms with negligible reactance. This approximates to the figures usually quoted in the text books and was accepted as a standard for further tests. On reducing the element length to 0·2 wavelength (26ft. for 7 MHz), the input resistance dropped to 25 ohms and the reactance increased to —200 ohms. At a length of 20ft. (0·1 wavelength) the resistance was 17 ohms with a reactive component of —500 ohms; at 13ft. (0·1 wavelength) the figures were 12 ohms resistive and —620 ohms reactive.

To overcome the problems of low-resistance and high reactance, many authorities recommend the use of top or bottom loading to increase the electrical length of the aerial. Bottom loading (Fig. 1), usually takes the form of inserting a rotary or tapped coil between the aerial and the feed-line and adjusting the inductance to null out the capacitive reactance to give a match to the feeder. Unfortunately, coils, even the best, are loss making devices and unless the inductance can be kept quite small, an aerial of this type is relatively inefficient. Comparison tests made with various lengths of bottom-loaded elements showed that the maximum shortening which is acceptable is about 25 to 30% reduction in electrical length. Above this, losses are quite serious and there is a noticeable degrading of performance. Thus, to be efficient a bottom loaded vertical for Top Band has to be 90ft. high!

Top loaded verticals frequently use the "L" or "T" configurations to provide the required electrical length (Fig. 2). Tests with these types showed that they were more useful than the bottom loaded units and that reductions of up to 50% could be made before losses were significant. Even so, this still

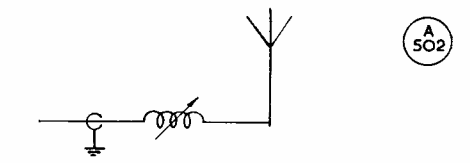


Fig.1. Base loading

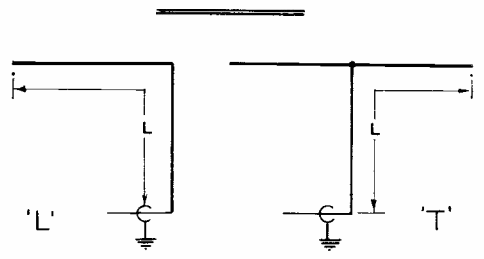


Fig 2 Top loading

suggested that to be efficient, a 160-metre "T" would require a height of 65ft. To cross-check the 7 MHz results, a "T" was made up with a 40ft. vertical section loaded by two cross-arms each 85ft. long. Although the test coincided with a spell of good 160-metre conditions, the results were very disappointing. A similar test with a half-sized version on 3·5 MHz confirmed the mediocre results obtained on 1·8 MHz.

Folded Aerials

As it was now obvious that simple loaded aerials would not provide the performance required in relation to the height limitation, thought was given to the possibility of using a folded element similar to half that of a folded dipole, but mounted vertically and fed against ground (Fig. 3). Starting with a length (H) of 33ft. (quarter-wave at 7 MHz), plus of input resistance and reactance were taken for various lengths of element down to 0·05 wavelength (13ft.). The results of this test are shown in Table I. It will be seen that as the length is reduced to 0·2 wavelength, a good match is possible to a 50-ohm feed-line, as the input is almost completely resistive at this length. As the length is further reduced, the resistance and reactance rise quite sharply, reaching a peak at 0·1 wavelength. As the element is shortened below 0·1 wavelength, the resistance again passes through the 50-ohm point at 0·075 wavelength, and then drops very sharply to the 10-ohm point at ·05 wavelength. The 0·075 wavelength 50-ohm point includes positive reactance (inductive) of 200 ohms, and this can be nulled out by a series condenser connected at the feed point. As a condenser has much less resistance loss than a coil, such an arrangement looked very promising for 160-metre operation. A new element was constructed with a length (H) of 40ft. and measurements taken at 1800, 1825 and 1850 kHz. At 1825 kHz, the Bridge gave readings of 63 ohms resistive and +230 ohms reactive. A 150 $\mu\mu$F variable condenser was connected at the feed point and tuned to give minimum SWR. Further checks showed that the aerial had a bandwidth of about 35 kHz at a single setting of the condenser. It was found that the aerial could be set for minimum SWR at any desired frequency between 1800 and 1900 kHz by adjustment of the series condenser.

This aerial was used for a whole winter season at G6LX and was subsequently passed on to another local amateur. At both locations, it has proved itself to be a good low-angle radiator capable of putting up a competitive performance under DX conditions.

Having sorted out the Top Band problem, the next project was to find a way of using the aerial for two-band operation. Earlier tests with the 7 MHz element had suggested that it might be possible to arrive at a compromise length which would operate as a near-0·075 wavelength element on 160m., and as an 0·2 wavelength unit on 80 metres. Checks made with the 160-metre 40ft. element at 3500 and 3800 kHz showed that a considerable amount of inductance would have to be added in order to null

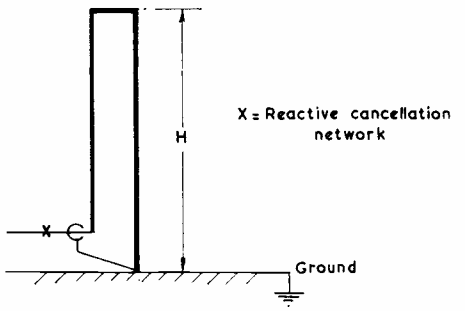


Fig. 3. Folded Element

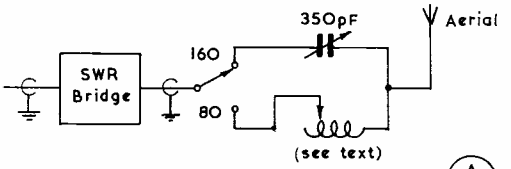


Fig. 4. Tuning network

A 503

out the negative (capacity) reactance introduced by the shorter length. As the inductance would introduce losses, some arrangement had to be found to limit the amount of reactance cancellation needed for 80-metre operation. A new half-sized element (26ft. long) was tested on 7 and 3·5 MHz. The length was gradually reduced and resistance and reactance plotted. The best compromise length was found to be 22½ feet and this was used as the basis for two-band operation.

Following extensive air testing on Forty and Eighty, a 45ft. version was constructed and checked

LENGTH (wavelength)	INPUT RESISTANCE (ohms)	INPUT IMPEDANCE (ohms)
0·25	146	0
0·2	53	— 10
0·15	65	—200
0·1	1000	—600
0·075	55	+200
0·05	10	+270

Table I. Input impedance of a folded element—see text.

BAND MHz	H 0·2 w/l	H 0·075 w/l	H 0·2/0·075 w/l
1·8/1·9	98 feet	40 feet	—
1·8/3·5			45 feet
3·5	50 feet	20 feet	—
3·5/7·0			22·5 feet
7·0	25 feet	10 feet	—
7·0/14·0			12·25 feet

Table II. Suggested dimensions for various bands —see text.

out on 1·8 and 3·5 MHz. Only a small amount of inductance was needed to null out the reactive component on 3·5 MHz, while a 350 $\mu\mu$F variable condenser performs the same function for 160-metre operation. The coil used consists of 12 turns of 10g. copper wire wound on a 3in. diameter mandrel and then air-spaced. Taps are provided as required and the feed-line is connected *via* a heavy duty battery clip. About 10 turns are needed for operation at 3·5 MHz and 6 turns at 3·8 MHz. The condenser and coil are adjusted to give minimum SWR readings at the required operating frequencies. The feeder is switched to either the coil or condenser, depending on the band in use. A relay is used for the switching function and is remotely controlled from the shack. (Fig. 4.) The coil, condenser, relay and an SWR meter are housed in a weatherproof doghouse mounted at the base of the aerial. The SWR meter is included as it is often useful to be able to make a quick check on SWR without having to return to the shack. The bandwidth on 160 metres is similar to the single-band unit, about 35 kHz. Nearly 100 kHz can be covered on 80 metres without adjustment of the coil tapping. The limited frequency coverage is rather a nuisance—however, the walk to the bottom of the garden to re-trim the networks following a major in-band change of frequency does help to keep one awake during the early-morning DX sessions!

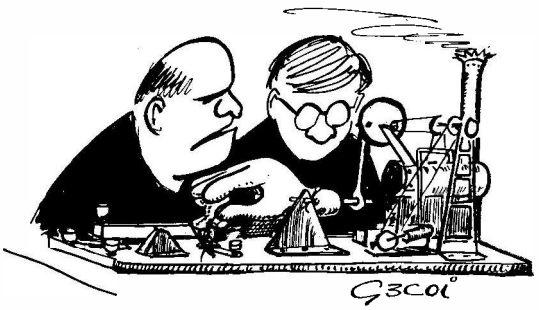
Ground Systems

Power fed to a grounded vertical aerial is shared between the aerial and the earth system. RF power flowing through the ground is dissipated in direct proportion to the ground resistance. If the ground resistance is high in relation to the input resistance of the aerial, then considerable power is lost simply in heating up the ground system. For example, a typical copper-plated ground rod in average soil will have a contact resistance of about 250 ohms. If used with the 50-ohm folded aerial only one fifth of the available transmitter power will reach the aerial. Assuming that the average 10-watt Top Band transmitter has a power output of 7 watts, this means only 1·4 watts is available as actual radiated power! As aerials are reciprocal devices, a similar loss will occur on received signals. A simple single-wire counterpoise has an even higher resistance and should *never* be used, except in conjunction with other earthing elements. For greatest efficiency a buried radial earth system is ideal but very few of us have the facilities for such a luxury. The only thing that can be done is to make the earthing arrangements as comprehensive as possible within the limits imposed by the individual QTH.

At G6LX, the vertical is located at the extreme North-West corner of the garden. Although space is available within the garden to bury radial earth wires in the 90° sector to the South and East of the aerial, the remaining 270° is in neighbours' gardens and consequently out-of-bounds. This limitation does not seem to have had any deleterious effect on the omni-directional performance of the aerials. The earth used consists of five earth rods spaced round the bottom of the pole and connected together with 10-gauge wire. Four wires of between 60 to 80ft. long are connected to the rods and run out in the sector of the garden bounded by the fences to the North and West. The wires are buried to a depth of 6 inches and additional earth rods are used to terminate the far ends. In addition to the buried wires, a number of insulated wires are used as a counterpoise. These consist of old lengths of coax, perished lighting cable, garden wire, in fact anything that will conduct. Some of the counterpoise wires are tacked to fences, others run under a crazy paving path, under a rockery and even through a tool shed. The counterpoise wires are connected to the earth system at the base of the aerial.

Poor performance of a vertical aerial can usually be traced to high resistance joints, incorrect feeding, interference from nearby objects or a poor earth system. Care should be taken to ensure that all joints, including earth connections, are properly soldered. To avoid detuning effects, the aerial should not be located close to trees, metal objects (including a metal pole) or similar structures. If a metal pole *has* to be used, the aerial should be hung from a triatic strung between the pole and another support. The triatic should be made of rope and the aerial located as far as possible from the pole.

The spacing between the parallel vertical wires of the folded units appears important. Experience has shown that a minimum distance of 12ins. must be used, otherwise peculiar things happen which affect the bandwidth and tuning of the system. If the wires are kept under tension, there is no need for spacers. A suitable insulated cross-arm at the top and strain insulators at the bottom will usually suffice to keep the wires parallel.



" . . . having a bit of trouble getting the dot-dash ratio right . . . "

TTx FOR TOP BAND

USING AN IC UNIT AS MODULATOR

R. ROBERTS (G3TAR)

THIS transmitter is a straight-forward circuit to build with an unconventional method of modulation, which is quite efficient and fully modulates the ten watts produced.

A home built power supply (variable) is used and somewhere between 20 and 24 volts at 10 watts is achieved. The circuit does not require a lot of explanation or indeed a lot of construction so it would suit the Top Band enthusiast without much experience in transistors. The Tx is very efficient and some very good contacts have been made with it. The pot core for LI was not critical and a junk box one of ½in. diameter was used, so the oscillator was no problem. There are some good circuits for VFO's nowadays and these could be built and tried afterwards.

Some Details

The modulator transformer T1 was from an old push-pull transistor radio audio circuit. Both the driver and output were tried and worked well. The IC-10 (Sinclair) was coupled to the 3-ohm side in the case of the output transformer. The RFC is a piece of ferrite rod about 3in. long, wound full of 22g. wire, although a commercial one very similar was also tried.

C8 can be made variable if preferred though a fixed capacitor was used in this case. Also, a conventional *pi*-network coil could be fitted, *e.g.*, 66 turns tapped at 52t. on a 1½in. former, but the one specified was found to be neater and more efficient.

R6 is carefully adjusted for increment ("upward") modulation on an RF meter, or the receiver S-meter, and there will be an upward movement of about 200mA on the transmitter current meter on speech peaks, when properly adjusted. It was found that the most efficient method of loading was for maximum reading on an aerial current meter or field strength meter, rather than the conventional dip method used with a valve-type rig.

Editorial Note: The Sinclair IC-10 mentioned here is a fully integrated-circuit transistorised amplifier, constructed as a small single unit, capable of up to 10w. audio output and requiring only a PSU (8-18v.), load coupling transformer, gain control and crystal microphone to make it a complete modulator for a low-power Tx. The Sinclair IC-10 is available from Sinclair Radionics, Ltd., 22 Newmarket Road, Cambridge.

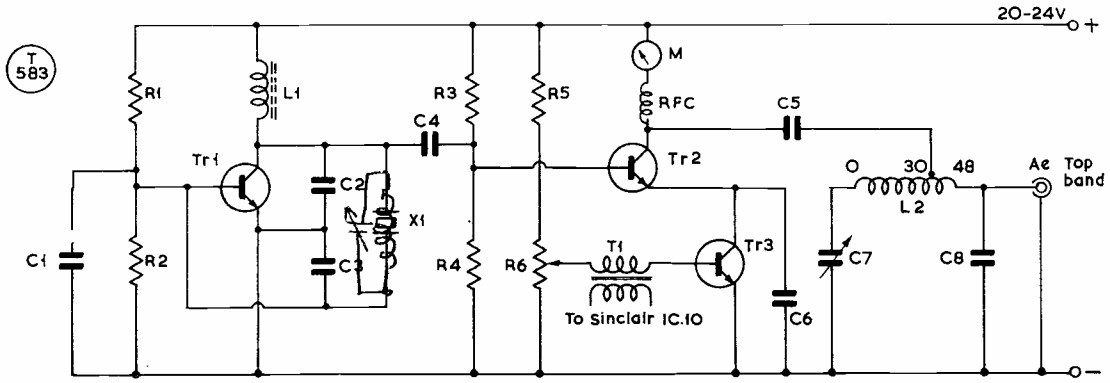
Construction was on a standard aluminium chassis. with the oscillator transistor using the chassis as a heat sink and a separate finned type mounted on top for the PA. An 85-ohm wirewound resistor was placed in the feed to the IC-10 to keep the voltage to a minimum of 18 volts when the transmitter was run with 24 volts.

TR3 was mounted underneath the PA transistor heat sink. The Tx was used with a selection of top band crystals from 1880 kHz to 1926 kHz with no trouble. Various types of transistors have been tried, *e.g.*, BD116, 2SO34, 2SO24 and 2009, also audio types for TR3. All have worked. Results were compared against the Codar A.T.5, itself an efficient transmitter,

Table of Values

The Top Band Tx Circuit

C1, C2, C3 = ·001 μF, mica
C4 = ·002 μF, mica
C5 = ·0022 μF, mica
C6 = 0·1 μF
C7 = 300 μμF, var.
C8 = ·0011 μF, mica
R1 = 6,800 ohms
R2 = 12,000 ohms
R3 = 1,000 ohms
R4 = 200 ohms
R5 = 100 ohms, 5w. wire-wound
R6 = 20-ohm potentiometer
T1 = Transistor o/p xformer
RFC = *see text*
X1 = Xtal for any Top Band freq.
Tr1, Tr2 = BD123 (and *see text*)
Tr3 = BD131
L1 = 6 turns 22g. on ¼in. pot core
L2 = 48 turns 22g. on 1in. former, tapped at 30th turn



and were equally as good. Collector modulation with the IC-10 was tried but only 70% modulation was achieved, as against the 95% obtained by the series emitter method. It may be of some help to mention that the IC-10 was wired up as per the instruction manual with the unit. A crystal mike was used and across tags 5 and 6 a 330K was wired, also an 0·02 μF condenser was placed across pins 5 and 3.

The power supply was unconventional, as this was constructed with a mains-type Variac transformer feeding the primary of a 24-volt transformer, a bridge rectifier and about 2000 μF of smoothing.

THE OTHER MAN'S STATION

G3XOK

G3XOK, licensed in 1968, is owned and operated by 18-year old Bob Kearney at 134 Larkshall Road, Chingford, London, E.4. His interest was first aroused at age 11 when he discovered the relics of his father's gear, dating back to the latter's service with the Royal Signals. The impression must have been deep, as Bob won a school trophy for an essay on Electronics at that tender age.

With the exception of a modified R.1155, still giving yeoman service, all remaining gear is home-constructed, including transmitter, el-bug, crystal calibrator and a two-metre converter. Operation is chiefly on Top Band, the converter being the first step towards getting going on VHF.

Bob is working at the Post Office Dollis Hill Research Station, and is awaiting his ONC results. Studies which may reward him with a University place naturally curtail activities.

His interests are varied, as he is a member of the Inland Waterways Association and is actively concerned with gliding. Former Scouting experience and these varied hobbies have contributed to his being chosen for an Outward-Bound Course.

On the debit side Bob has fallen a victim to the planning spectre, which may mean the loss of a major part of the garden which at the moment includes his shack.

Being literally a stone's-throw from the railway, his 'phone transmissions are frequently punctuated by the roar of passing trains. Perhaps that is why he has come to be known as "the station on the station!"

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for March issue: February 5)

(Please address all reports for this feature to "Club Secretary," SHORT WAVE MAGAZINE, **Buckingham.)**

BEFORE making a start on this, the first edition of "Clubs" to be written in 1971, it is perhaps right that we should mention a letter your scribe has received which annoyed him somewhat. It came from a regular correspondent to this piece and complained about the power of "several hundred watts" which we would be "naive to deny" the top stations were using during MCC. Now, it so happens that we know the rigs of the stations named, having spent a few happy operating hours on them. Neither of them is capable of putting out power such as is envisaged—unless there is something new in the way of techniques to obtain hundreds of watts out of a TT11 PA on the one hand, or a PA tank coil on the other which starts to smell at twelve watts input! Let it be clearly understood by all that the term "invigilation" used in this MCC context does *not* just imply sitting down and writing a check log out with a few notes. A station visit is quite on the cards, and in an unexpected area of the country at that, by someone who will *not* necessarily announce himself as an invigilator!

The Reports

And what a clip there is this month. After 24 years of January MCC reports in this space and several warning notices during the last few months, there were *still* a number of Club Secretaries who sent in data for the January issue (*grrr*!) and so find themselves included in the February pile.

It is also quite surprising how the "Wales and The West" area clip has grown over the past few years, until today it comes up to be one of the bigger ones.

Basingstoke first; they get together at Chineham House, Shakespeare Road, Popley, on the first and third Saturday evenings in each month. February 6 is down as an informal, for constructional work and Morse, but on the 20th G2CPM will talk on the Design, Operation and Application of the Oscilloscope. Visitors are always welcome here, and should contact the hon. sec.—*see* the Address Panel, p.747.

Over the water now, to **Bangor, Co. Down.** February 5 is the date, and the venue the Silverstream Hall, Belfast Road. As for the subject, that is by Stew Perry, W1BB (on tape and by slide), who will be describing the art of effective Top Band communication.

On to **Bristol,** where the secretary is now G3RKH —*see* Panel. They have Hq. at 41 Ducie Road, Barton Hill, where they assemble every Tuesday and Thursday. Highlights in February include the business meeting on the 4th, and skittles—against the Bath club—at the Wingrove in Keynsham. February 16 is down for a visit to Distillers Co. (Yeast) Ltd., and on the 25th they return to Amateur Radio as G3PTO opens up on the dark secrets about successful VHF operation.

Just up the road is the **Shirehampton** group, who have snapped up the displaced Bristol hon. secretary for themselves. Here the story is one of regular Friday evenings, at Twyford House, Shirehampton, where G3YOH is looking after R.A.E. tuition; there are also lectures, a transmitter and receiver, and of course Morse as well.

After months of hard searching, the **Haverfordwest** chaps have at last found a new Hq., in Rosemary Lane, Haverfordwest, in which they have an SSB rig, using GW3XOT as the call. In addition there are facilities for Morse if required—drop in any Tuesday evening at Hq.

A new one—to this piece at least—is **Minehead,** who have been running just a year, but could do with some more members. Again it is Tuesday evenings, this time at the Old Police Station, Dunster—details from G8BGG at the address in the Panel, p.747.

Barry College of Further Education run a newsletter, called *Jungle Drum* which comes to hand at intervals; from it we notice that this group does a lot to ensure close liaison with the other local organisations, which must be beneficial to all concerned. A full programme of talks, film-shows, and so on is being fixed up.

At **Saltash,** it is pleasant to see the revival of their newsletter, *Pegasus.* It notes the February programme, at Burraton Toc H, Waraton Road, February 5 being a Junk Sale and February 19 an Audio Evening.

Sad news from **Cornish** of late—they have lost two members, G3OFN and G3FHC, to the ranks of the Silent Keys. The main meeting seems to take place on the first Thursday in each month at the SWEB Clubroom, Pool, Camborne, and there are sub-groups at Newquay and elsewhere who get together between the main meetings. All the details

can be obtained from G3UCQ—*see* Panel.

The dates for **Reading** meetings in February fall on the 2nd and 16th; however, as they recently had an AGM, the details for these two dates are not settled at the time of writing. Doubtless when this reaches the readers, the hon. sec.—address as in the Panel—will be only too pleased to fill out the gaps.

At **Chippenham** the lads foregather every Tuesday at the Boys High School, Hardenhuish Lane, Chippenham. For the latest details, contact the hon. sec. —*see* Panel.

Exeter, despite what we said last time, have their main meeting on the first Tuesday in the month, and a fortnight later open up their Hq., at the Community Centre, 17 St. Davids Hill, to go on the air with the Club station.

Plymouth nearly missed the boat this month with the news of 3YDU's slide show on 2nd; the other meeting on the calendar is February 16 and at the time of writing was still open. The routine with these lads is to head for the Virginia House, Bretonside, on the first and third Tuesdays in each month.

At **Torbay** the headquarters are in Bath Lane, at the rear of 94 Belgrave Road, Torquay; take your cash with you on February 27, as they are having a Junk Sale.

National and International

A.R.M.S. are top of the pile; they look after the interest of the /M types, both in U.K. and elsewhere, and also issue some awards of special interest to the mobile fraternity. The hon. Secretary, G3FPK, explains that their January issue is a bit slim because of important copy lost in the mail—but it has a good article on the Sommerkamp FT-150 as an SSB transceiver for mobile working.

The latest issue of the **Nigerian A.R.S.** News is much taken up with farewells to members returning home this month on one hand, and with the future on the other, particularly in the matter of the granting of new amateur radio licences.

The **Radio Society of East Africa** is at the moment rather pre-occupied with their new Hq. at Nairobi, a stone house in Newberry Road with a good piece of ground. About half the cost was available in funds, the rest having been loaned by one of the members. However, they naturally wish to repay, and at the moment are appealing for gifts to help liquidate the debt and to finish off the detailed work. However, after reading the list of helpers to this project among the members out there your conductor would like to rub it in to most of the U.K. club-members that their effort is an example of co-operation and getting things done.

A brief note from G3KGM records the demise of the **Civil Service Radio Club,** by vote of the members —partly because the prospects of improved accommodation for the shack and aerials seemed to be further off than ever, and also—as so often is the case—due to apathy on the part of the body of the membership. Sad indeed.

The **R.A.I.B.C.** *Radial* is always looked forward to here each month, as it certainly is by the blind and invalid radio amateurs and SWLs who make up the membership. A special appeal this time is for a helper for a new member who lives in Girvan, Ayrshire. Any offers direct to G3LWY, at the address in the Panel.

British Rail's *Newsletter* for December has some very interesting notes from G3HQU on his activities in the field of diving and archaeology, and in particular of the raising of the *Ullswater.*

Probably the best of the newsletters put out by the extra-territorial groups is that from **BARTG,** who look after the RTTY interest in this country, and December's issue is no exception. One would feel membership is an essential for anyone who contemplates any form of RTTY or FAX operation, closed-circuit or on-the-air.

A brief note from G3DOT indicates that he is now the publicity king for the **Royal Navy** group. They have a newsletter which seems to appear every other month, together with nets on Eighty on Wednesday evenings and Sunday mornings, the QRQ runs on the first Tuesday in the month for the chaps who aspire to be "dab-hands" at reading Morse, and of course the HF-band nets during 1100-1300z each day, the G3BZU lunch-break period.

The **Ex-G** club members keep in touch with each other through their Sunday evening nets on Twenty—1900 GMT start, on 14347 kHz approximately, and G stations welcomed. In addition there is the quarterly *Bulletin,* which this time carries a very funny piece by G4JZ discussing the erection of his Quad.

Scotland and the North

The **University of Manchester** Institute of Science and Technology gang seem to have lots of facilities in their shack on the 12th floor of the building. For details, contact the hon. Secretary at the address in the Panel, opposite.

If you are in the Glasgow area, on a Friday evening, you would be well-advised to drop in to 21 Jardine Street, Glasgow, N.W., and meet the **West of Scotland** chaps. We understand that parking facilities are very good, and the Hq. is conveniently placed for the local transport services.

Sliding gently Southwards over the Border, we come first into contact with **Lincoln,** on Tuesday evenings at No. 2 Guardroom, Sobraon Barracks, Breedon Drive, off Burton Road, Lincoln; the programme shows February 2 as a talk on STD by G8DTU, followed by a Colour TV demonstration on the 9th. Films are shown on the 16th, and the 23rd is an Open Night.

"Oscilloscopes and How to Train Them," by G3RXS, is the fare at **Bradford** on February 2, with Films on the 16th, at 10 Southbrook Terrace, Great Horton Road, where the lads have their Hq.

Another Junk Sale for **Peterborough,** on February 5, will please those members who go to the clubroom in the Rose and Crown, opposite the City police station.

The four dates to reserve for **Hull** meetings are

February 5, 12, 19 and 26. For the first one there is a discussion of plans for the coming year and for the second a construction session. A junk sale fills in the third date nicely, and for the last one G3SSA and G8EAH will combine forces to cover Basic Meters.

A rather good idea crops up in the **Mid-Cheshire** programme, in the way of a talk—the first of a series—on What's New in Amateur Radio or Electronics. One gets the impression from the latest *Newsletter* that the intent in the next year is really to make things hum with activities of one sort and another. Look for them any Wednesday evening at Winsford Verdin Comprehensive School, Technical Activities Centre, Grange Lane, High Street, Winsford.

The **South Manchester** chaps have a place at the Conservative Divisional Office, 449 Palatine Road, Northenden, every Friday evening. On February 5, they have the tape-and-slide lecture on "The History of Radio" while on the 12th the theme is Experiments with Transistor PA Stages, for which G3VIW and G3WFT join forces. G3HWR takes over the stand on the 19th for his talk on 13 Centimetres. Finally, for the 26th, G3HZM will hold interest with a lecture on D/F receivers.

It is rather interesting to note that **Wirral,** having moved back into their old home at Harding House, Park Road West, Birkenhead, found an immediate

Names and Addresses of Club Secretaries reporting in this issue:

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EX-G: F. W. Fletcher, G2FUX, 53 St. Ives Park, Ringwood (*3561*), Hants.
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NUNEATON: D. W. Smith, 2 Niton Road, Weddington, Nuneaton, Warks.
PETERBOROUGH: D. Byrne, G3KPO, Jersey House, Eye (*351*), Peterborough.
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PURLEY: A. Frost, G3FTQ, 62 Gonville Road, Thornton Heath, Surrey, CR4-6DB.
R.A.I.B.C.: Mrs. F. Woolley, G3LWY, 331 Wigan Lane, Wigan, Lancs.
R.S.E.A.: P.O. Box 5681, Nairobi, Kenya, East Africa.
READING: P. J. Bendall, G3NBU, 89 Hexham Road, Reading.
REDDITCH: R. J. Mutton G3EVT, Summerhayes, Mill Lane, Oversley Green, Alcester (*2041*), Warks.
ROYAL NAVY: C/RS M. Matthews, G3JFF, H.M.S. *Mercury*, Leydene, Petersfield, Hants.
SALTASH: J. A. Ennis, G3XWA, 19 Coombe Road, Saltash, Cornwall, PL12-4ER.
SHEFFIELD: G. Neale, 84 Marlcliffe Road, Sheffield, S6-4AG.
SHEFFORD: C. W. Stedman, G3XWS, 10 Wychwood Avenue, Luton.
SILVERTHORN: A. Mitchell, G3YJZ, 6 South Road, Edmonton, N9-7JH (*01-804 8074*).
SOLIHULL: J. Burnie, G8BYM, 12 Buryfield Road, Solihull, Warks. (*021-705 4565*).
SOUTHGATE: A. F. Hydes, G3XSV, 6 Glenbrook North, Enfield. (*01-353 8747*).
SOUTH MANCHESTER: D. Holland, G3WFT, 7 Alcester Road, Sale, M33-3GW.
SURREY: S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon, CR2-8PB (*01-657 3258*).
TORBAY: Mrs. G. L. Western, G3NQD, 110 Truro Avenue, Hele, Torquay.
UNIVERSITY OF MANCHESTER (Inst. of Science and Technology): P. Wilby, G3YRU, Students Radio Society, P.O. Box 88, Sackville Street, Manchester, M60-1QD.
VERULAM: H. Young, G3YHY, 93 Leaford Crescent, Watford, Herts., WD2-5JQ.
WESSEX: G. A. Moore, G8BBN, 15 Stanfield Road, Winton, Bournemouth, Hants.
WEST OF SCOTLAND: K. McDermott, GM3SSB, 22 Fettercairn Avenue, Glasgow, W.5.
WIRRAL: A. Fisher, G3WSD, 34 Glenmore Road, Oxton, Birkenhead, Cheshire (*652-5078*).
WOLVERHAMPTON: J. P. H. Burden, G3UBX, 28 Coalway Road, Wolverhampton, WV3-7LX.
WORCESTER: B. N. R. Magill, 123 Kilbury Drive, Worcester.

improvement in attendances on the first and third Wednesday in each month; it looks rather as if the first date in any month is set aside for a lecture or similar activity.

A change of address and date was notified by the **Sheffield** Secretary last time, but, unfortunately, we cannot be sure whether this is a permanent or temporary change. The remedy, for anyone who wishes to meet the gang, is of course to contact the Secretary—*see* Panel.

Talking of moves, the **North Leeds** chaps are on the trot again—this time to a better place from the operating point of view, as they are hoping to make Club entries in many of the contests this year. They are still with the same landlord, who applies a "no-advertising condition" to the new place as he did with the old. This means we must direct you to G3MZF (*see* Panel) for the initial contact.

Mansfield have a room at the New Inn on the first Friday in each month, for a natter and a noggin. However, on March 1, this will take second place to the essential AGM, however thirsty they are!

Edinburgh is served by the **Lothians** Club, with a pattern of fortnightly meetings. February 11 is to be a review of NFD past and present, with the basic points for 1971 to be finalised. On February 25 GM3OWI is the man of the moment, and his theme will be Lasers.

If we let it, the **Derby** programme would fill most of the space available for this piece! They have certainly got a crowded programme, which is filled even more by the events connected with their Diamond Jubilee this year. Thus, we see a surplus auction on the 3rd; a discussion and demonstration of SSB Power Measurement on the 10th; and on Saturday, the 13th, the Diamond Jubilee dinner and dance at the Derbyshire Yeoman, Kingsway. February 17 is a general discussion on Aerials; the 24th a Film Show; and the 26th a talk by G6FK on VHF Propagation. As if all this were not enough, Monday evenings are being occupied in renovating antique apparatus in anticipation of their Diamond Jubilee exhibition at the Museum and Art Gallery on April 3.

The Midlands

Our first correspondent here is the Secretary of the old **East Worcs** group who advises us they have made a change of title, and now are styled **Redditch** Radio Club. Their Annual Dinner is on February 11, at the Montville Hotel, Mount Pleasant. Normal programme dates are the second and fourth Thursdays in each month at the Old People's Centre, Park Road.

Now **Coventry,** where the hon. Secretary retains a sense of humour about his job, advising us that the Junk Sale on February 12 will include "left-overs from Christmas." February 5 and 19 are both "Nights on the Air" with the Club rig, leaving us only the 26th to mention, this date being provisionally set down for G3RMB to talk on VHF Transmitters.

Melton Mowbray have regular meetings and a Sunday morning net as well, plus sundry outside activities as may be seasonable. We have no up-to-date information, for which we would refer you to G3NVK—*see* panel—but we can say from a glance at the previous programmes that there always seems to be something cooking.

Not far off, at **Leicester,** the form is a weekly meeting. Morse tuition every week for a set period, alternate weeks aimed directly at the chap going for R.A.E., and other activities. The shape of things seems to touch the spot all right, as they have 56 members of whom 25 are licensed.

Hereford have an AGM in February, on the 5th, so we have no information on the programme for the weekly meetings beyond that date. They radiate a useful and fully detailed *Newsletter* from which we are able to say that the group have a place at the County Control, Civil Defence Headquarters, Gaol Street, which is the envy of many another club.

Cannock have booked the tape lecture on VHF Propagation for their February 4 date, to be followed up on March 4 by G3EEZ "live" talking about VHF and UHF. Later on it is understood there are hopes of getting G3POA along to give them the gen, on Skydiving, as a change from Amateur Radio matters.

Solihull have a new Secretary, G8BYM, whose address duly finds its way into the Panel; he advises that on February 2 there is an informal in the "Malt Shovel" next door to the Hq. at Old Manor House, High Street, where on February 16 all the local Top Band addicts will have ears keenly cocked for the W1BB tape-and-slide lecture.

Another change of Secretary for our long-suffering clerical assistant to record is at **Midland,** where G8BHE takes over. The members have all their meetings, unless otherwise stated, at the Birmingham and Midland Institute in Margaret Street, Birmingham. Here on February 9, G3XGP will be discussing toys containing electronic novelties. Their main activity, of course, will be the local Boat Show, at Bingley Hall once again, this being February 13-27.

Wolverhampton have lashed out the funds on a duplicator which they hope to put to good use in several ways besides just improving the *Newsletter.* Weekly meetings at Neachells Cottage, Stockwell End, Tettenhall, are the form but unfortunately our copy of the *Newsletter* stops at February 1, so we refer you to G3UBX, as Panel, for the latest information.

The re-formation of the **Nuneaton** Club was carried out successfully on December 11, and it is understood that normally meetings will be on the first Friday in each month, at Caldecote Grange, plus any extra sessions for "away" activities. Anyone in the area interested in becoming a member or visiting would be well advised to contact the Secretary—*see* Panel.

Worcester have given up their Perdiswell Park Hq., and to make things even more difficult the Secretary and treasurer have both found it necessary to resign for reasons connected with changes of employment —so now all we can do to put you in touch is to put their *Newsletter* compiler temporarily into the "hot seat" in the Address Panel.

A wedding occasion, of course—but not at all usual, because here we see a GD and ex-GD gathering for the marriage of the daughter of GD3FOC. The men are, left to right, GD2HDZ, ex-GD3DRB, GD3FOC himself, ex-GD3IWP, GD3FBS and GI3AGC, with their ladies. It must have been a very interesting get-together for them all!

London and the South

Here we start with **Purley** who are at the Railwaymen's Hall on the first and third Friday in each month, the first date being a natter-nite and the second a lecture. Thus, we have February 5 for the Natter Night, and the 19th for G3SJX to talk about SSB Equipment.

Welwyn Civic Centre is the home of the **Mid-Herts** crowd, where they forgather on February 11 for G8BGM to talk about Linear Integrated Circuits for the Radio Amateur.

North Bucks seem to have a pretty full programme if the period before the end of last year is anything to judge from; however, we have not any details of the February events, nor the venue, for which we have to refer you to G3ZNY—*see* Panel.

No end of confusion for your scribe results from the hon. sec. of Clacton and the Secretary for Colchester both having Clacton addresses; but we sorted them out in the end. **Clacton** group are convened on the second and fourth Tuesday in each month at the Martello Tower, Marine Parade West, Clacton-on-Sea.

Colchester are in Room 40 of North-East Essex Technical College on February 17. They will be addressed by Mr. R. Freeman, author of "The Glorious Eighth" which tells the story of the U.S. 8th Air Force. Mr. Freeman will be talking about the background to his book, and illustrating his chat with slides and a film which should make some of the younger generation think a little! As so many of the events discussed took place in parts of East Anglia, the lads are throwing the Club open to welcome anyone who can attend from the surrounding area.

At **Verulam** the AGM has been passed, with the election of a new Secretary (details as Panel). February 17 sees the lads heading for the Council Chamber at the Town Hall to hear G3JGO (of TVI Clinic fame) talking about Frequency Generation. All members are requested to note the new time for starting—7.30 for 7.45 sharp will enable them to finish just a little earlier.

Silverthorn have their Hq. in a "Stately Home," namely Friday Hill House, Simmons Lane, Chingford, where they can put G3SRA and G8CSA on the air, as desired. These chaps rarely send in a detailed programme but at the same time the grapevine tells us there is usually something buzzing. Details can be obtained from G3YJZ, at the address given in the Panel. Incidentally, these chaps feel a bit aggrieved at the reference, in the **MCC** report last month, to their time keeping. They say it was not G3SRA but could have been somebody else—all right, let it go at that!

The February get-together of the **Crawley** lads is down for February 24 at Trinity Congregational Church Hall, Ifield, when G3GRO is to talk about VHF Techniques. At the last AGM we note that G3TR, after years of service as chairman, has "gone upstairs" to be life president, while G3FRV (who was for long Secretary), is now chairman, and G3YVR the hon. sec. again. However, these chaps do not believe in allowing hon. life presidents to think they have a sinecure—he has to do the monthly *Newsletter*, which is probably the hardest chore of all!

Acton, Brentford and Chiswick are among our

DEADLINE DATES FORWARD

For the issues mentioned, these must be, after February 5 for the next one, March 5 (April); April 8 (May); May 7 (June); and June 4 (July). These are closing dates, by which reports must be received, addressed Club Secretary, Short Wave Magazine, Buckingham. We guarantee appearance if reports are in on time—but not otherwise.

faithful regulars and advise us that on February 16, at the Chiswick Trades and Social Club, 66 High Road, the chaps will be hearing G3CCD describing and showing how he has modified his transceiver for Top Band.

On to **Echelford,** where the Christmas edition of the *Newsletter* is very well produced and full of interesting items as well. As for the meetings, at the time of writing both February 8 and 25 are still "open," but doubtless attenders at the Hall, St. Martins Court, Kingston Crescent, Ashford, Middlesex, will find something has been organised for their entertainment.

The **George Kent** group held their inaugural meeting last November, and followed it up with a meeting the month after at the Works. For details of the more recent activities, reference should be made to G3DOT, as Panel.

Nice to hear from the **Medway** crew again after a longish absence from this piece. Nowadays they get together every Friday evening at the Aurora Hotel, Gillingham, which will probably be well remembered, by ex-Service types who served in the Medway area, as the old NAAFI club. As to the programme content, we are told that something in the way of a talk, a film-show, an outside visit, or whatever is provided most times.

Southgate have a monthly meeting at the Civil Defence Hut, Bowes Road, opposite the Arnos Grove tube station, but unfortunately it is not possible to give a date at the time of writing—no doubt the hon. Secretary would be only too pleased to remedy this if you contact him at the address shown in our Panel.

Compass Points is the title of the newsletter of the **Dartford Heath D/F Club,** of which the last issue to hand is for December, listing events in January and March but nothing for February. The first evening D/F Hunt of the season is down for March 5, details to be announced, which suggests that if you are keen on D/F and are within striking distance of Dartford, you should get in touch with G3XVC, as Panel, p.747.

At **Kingston** they book the second Wednesday of each month at the Penguin Lounge, 37 Brighton Road. This gives February 10 for G3IEE to talk about Grid Dip Oscillators and their Uses.

For the latest details of the **Guildford** lads it is necessary to refer you to the Secretary, at the address in the Panel, as the last information we have is the October 1970 copy of the *Newsletter*. The hon. sec. would be pleased to bring you up to date if you care to get in touch.

A somewhat similar situation pertains at **Surrey,** where they are deliberating over a change of venue, so here again we suggest you write or ring G3FWR for the last-minute state—*see* Panel.

No misfires at **Dorking**—they are too happy with their Hq. to want to move and their publicity chaps never miss a trick. The informal is on February 9 at the Wheatsheaf when they will be discussing SSB. At the formal meeting on the 23rd, there will be a review and construction of tackle to be used for VHF Field Day.

There are two dates ringed in the **North Kent** calendar for February—the 11th for a talk on SSB by G3FRB, and the 25th, on a topic which had not been finalised at the time of writing. Details on this one and on the meeting-place can be obtained by contacting G3WRP, as in Panel.

Next-door neighbours to North Kent are **Cray Valley,** who have Hq. at the Congregational Church Hall, Court Road, Eltham, London S.E.9. Here they will be gathered on February 4 for a talk on the PLA Port Communications and Radar, by G3BPT. February 18 is the "second meeting" date.

Looking at the **Shefford** reports over the years, one is moved to wonder just how it is they manage to keep it up. This month sees February 4 down for G2DPQ to talk about NFD operating and logging procedures, and on the 11th G3TDW on Probing of the Mysterious layers. R.A.E. Division under G3VMI comes on the 18th, and a Quiz and Surplus Sale for the 25th. All these events are taken "At Home," in this case the Hq. at the Church Hall, Ampthill Road, Shefford.

Although the **Maidstone YMCA** crowd get together every Friday evening at the Y Sportscentre in Melrose Close, certain evenings are marked up for "specials." Both the VHF and the LF stations will be activated on February 12, while on the 19th G3REM will be doing his stuff on "Knots and Splices." Otherwise, there is quite a lot for the lads to do on the carpentering and painting of their new *second* shack.

Conclusion

And that's the lot for another month. Reports for next time should contain details of your March meetings, plus a note of the Hq. address, with the name, callsign (if any), address and telephone number of the hon. Secretary. As the latter is the QTH to which we would refer any enquiries, it is a good thing to check the Panel and make quite sure it is up-to-date, with post-codes if applicable added.

The deadline for next time is a bit tight at **February 5** latest, addressed to "Club Secretary," SHORT WAVE MAGAZINE, BUCKINGHAM.

" . . . one of the interests here is VHF/P . . . "

LOOKING INTO THE R.A.E.

QUESTIONS AND ANSWERS

The next City & Guilds Examination for radio amateurs—Subject No. 55 in the C. & G. examination syllabus—comes up in May. Here we deal with last year's question paper, suggesting answers that should have satisfied the Examiner on all counts (except perhaps as regards the handwriting in the original draft!). Though in fa t there is a choice of questions in Part II, all have been dealt with here, by way of example. An attempt has been made to cover the ground in the same manner and in the same sort of time as would a well-prepared entrant. Candidates for this year's R.A.E. can take it that the questions will be based on the same syllabus as last year (which will also be that for 1972) and that the paper will take the same general form. The two (compulsory) questions in Part I should be regarded in the sense of a gift, because essentially they depend upon reading, understanding and memorising the general licence conditions. Long and detailed explanatory answers are not usually required —what is expected of candidates is that they should show by their answers that they understand the questions and could deal with them in detail if a practical case required it. The R.A.E. is a pass-or-fail examination, and failure in either part means failure in the Exam. as a whole. The pass standards are "distinction." "credit" and just "pass" or "fail." These are divided into eight grades— Grade 1 is the best you could do, and Grade 8 the worst. A certificate is awarded to all successful candidates. Possession of this certificate is an essential prerequisite for an AT-station licence in the U.K.—Editor.

AUTHOR'S PRELIMINARY COMMENT

THE following paragraphs constitute a set of "model answers" for the May 1970 R.A.E., but before looking at them more closely a few comments are in order.

First, it is widely felt among those who teach for R.A.E. courses that this paper slipped a little from the unexceptionable standards of past years. Knowing which Act of Parliament the licence is granted under is hardly appropriate to the object of the Examination, which is to ensure that a new licensee knows enough about the art to conduct himself properly when on the air—for which he must have a certain reasonable degree of competence —and to avoid interference. The question about a vertical and a horizontal polar diagram for the same aerial—and a directional one at that—is felt to be at too high a standard for this course. A complete heterodyne wavemeter circuit would take so long to draw that not enough time would be left adequately to explain its operation! Here, our "model answer" suggests a compromise which could be done in the time without skimping the important parts of the written section of the question.

Turning to a consideration of the Exam. itself, most readers will be aware that it is a three-hour paper. timed for 6.30 till 9.30 on the same date throughout the country. For the 1970 paper ten questions were set, and the candidate was required to answer *both* questions in Part I, and any six of the remaining eight questions. A book of Logarithm Tables is provided for the candidate's use, but a slide-rule is permissible if you have one and are adept at using it.

Part I

Answer both questions in this part.

Q. (1). What are the limitations imposed by the Amateur (Sound) Licence on the use of the station as regards the following:

(a) Use on waterways or moving vehicles
(b) Classes of emission to be used
(c) Persons who may operate the station
(d) Sending messages to other amateur stations
(e) Transmissions by radioteleprinter
(f) Content of messages?

Which Act of Parliament empowers the Minister of Posts and Telecommunications (formerly Postmaster-General) to grant licences? (15 marks)

Answer (1)

(a) Not allowable with the Amateur Sound A or B licences as such. There are, however, provisions for such operation by additions and variations to the main licence and constituted in the Mobile licence.

(b) Classes of emissions are set out in a Schedule embodied in the Licence. In general, AM/CW/SSB operation plus FM is allowed on all amateur bands (A1, A2, A3, A3a, A3h, A3j, F1, F2, and F3), but RTTY if any sort is barred on 1·8-2·0 MHz.

Once on the 2300 MHz band and above, pulse modulation becomes permissible, with a 50 MHz guard at each end; *e.g.*, on 2300 MHz, pulse is not permissible below 2350 MHz. The forms of pulse modulation allowed are P1D, P2D, P2E, P3D and P3E. All these symbols have meanings allocated to them in accordance with international practice, as follows: A1 is CW on-off keying, A2 tone CW, A3 amplitude modulation, A3A SSB with reduced carrier, A3H SSB full carrier, A3J SSB suppressed carrier, F1 carrier frequency-shift keying, F2 keying a frequency-modulating tone, or on-off keying a frequency modulated carrier, F3 telephony. P1D, on-off keying of a pulsed carrier, with no modulating audio frequency; P2D telegraphy by on-off keying an audio tone or by on-off keying a modulated pulsed carrier, the AF modulating and ampiltude of the

pulses' P2E, on-off keying of an audio tone or on-off keying a modulated pulsed carrier, the modulation to vary the width (or duration) of the pulses; P3D, telephony by pulse-amplitude modulation; P3E telephony by pulse-width modulation.

(c) The licensee himself. No unauthorised person to have access to or to operate the station. The authorised operators shall be holders of a valid U.K. transmitting licence, in the presence of and under the direct supervision of the licensee.

(d) Messages shall not be broadcast to groups of other amateur stations, but shall be sent, (1) to amateur stations with whom contact is established, separately and singly, (2) groups of amateur stations provided that communication is established separately and singly with each station in the group.

(e) Transmission by radio teleprinter is not allowed on 1·8-2·0 MHz; when it is used on other bands it shall be with the International Telegraph Code No. 2, (5-unit start-stop) at a speed of 45·5 or 50 bauds.

(f) Messages are to be remarks of a personal nature about matters which the licensee or the station he is working are or have been directly involved; procedural signals relating to such messages. Third-party traffic is forbidden except under the limited conditions of a disaster relief operation or an exercise in that context, at the request of the St. John Ambulance Brigade, the Red Cross, or the police.

The Act of Parliament authorising the Minister to grant licences is the Wireless Telegraphy Act of 1949.

Q. (2). Define
(a) harmonic radiation
(b) parasitic oscillations.
State the precautions which can be taken to prevent a radio-frequency power amplifier stage from producing parasitic oscillations. Describe the action of the device or devices used. *(15 marks)*

Answer (2)

Harmonic radiation may be defined as the radiation of signals at multiples of the final output frequency proper, or at multiples of frequencies used to general the final frequency.

Parasitic oscillations are defined as unwanted spurious radiation not under the control of the designer, or those controls of the transmitter which should determine the output frequency.

Parasitic oscillations usually fall into one or the other of two pretty clearly defined categories. The first group are LF parasitics, which may occur at anything from high audio up to the IF range of frequencies, and usually appear as rough spurious carriers up and down the band, spaced apart from the main carrier by the frequency of the parasitic oscillation. The usual way of curing these is by improving layout and earthing in the modulator stage or, if it is the PA proper at fault, by so arranging matters that any similar-value RF chokes fitted in the grid and anode circuits are of different makes or ratings or both, even though they have the same nominal inductance. The point here is that the stage is oscillating at a frequency determined by the inductance of the choke and the stray C, and the feedback is accentuated by the anode being at very nearly the same frequency; the PA thus turns into a TATG oscillator. The cure has been given.

The other class of parasitic is at VHF or UHF. It arises as a result of the stray capacitances in the stage resonating with the inductance of the leads, the intended PA tuned circuit components merely acting as bypasses or RF chokes at the parasitic frequency. The cure here is to put in "stoppers" in series with the grid and anode leads *right at the pin* of the valve-holder. The stopper may be merely a low value resistor in the range, usually, of 10-100 ohms, or in a bad case it may need a coil of a few turns wound on to the resistor stopper on grid and/or anode and wired in parallel with the stopper resistor. Once the parasitic has been eliminated by the detuning action of the stoppers, or the damping of the resistors, or both, it is as well to check that the stopper is not soaking up too much power at the highest *proper* frequency, and adjusting the resistor rating if needed. Neutralisation is not theoretically relevant in these cases, but it is often found that a mild parasitic will only appear in an unneutralised stage.

Part II

Answer six *questions in this Part.*

Q. (3). What is meant by capacitance?
Describe how a store of energy builds up in a capacitor when it is connected to a source of DC through a resistor.
How much energy is stored up in a capacitor of 10 μF when it is connected to a 500 volt DC supply?
What safety precautions are necessary when handling high-voltage capacitors? *(10 marks)*

Answer (3)

Capacitance is the effect of an electrostatic field between two wires, or the plates of a *Capacitor.* When such a capacitor ("condenser") is connected to a DC supply through a resistor—see Fig. 1—electrons will flow from one pole of the supply to one plate of the capacitor, and to balance the situation a similar number of electrons will leave the other plate of the capacitor and head for the opposite terminal of the battery, till a state of balance occurs. In a perfect capacitor with no series resistor this would happen instantaneously, but with the resistor in the circuit clearly the rush of electrons means a volt-drop across the resistance and, at first, none across the capacitor plate. Gradually the electrons get through the resistor and reach the plate of the capacitor, which charges up, and eventually, when a state of equilibrium is reached all the volts are across the capacitor and none across the resistor. At any moment in between the sum of the drop across the resistor and the capacitor equals the terminal voltage of the supply. A plot of volts across the capacitor with time is an exponential form,

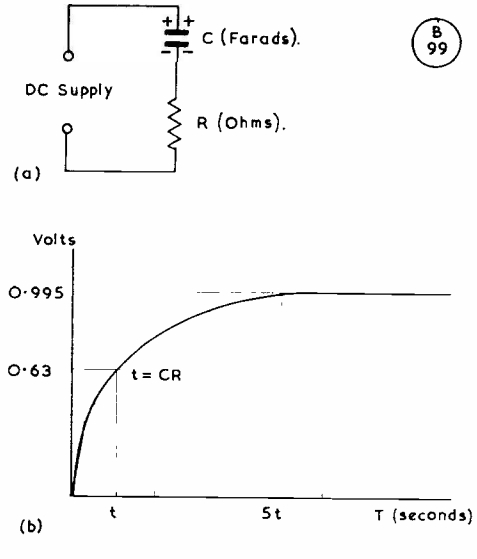

Fig. 1 (a) Capacitor charging (b) Time constant

Fig. 1. (To answer Q.3). A, resistance and capacitance in series across a DC supply. B, charge of capacitor through resistor in circuit of (A). Note that "t" is numerically equal to CR when R is in ohms and C in farads. At a time "5t" charging is 99.5% complete. The "t" factor is known as the time constant.

as shrown in Fig. 1. It is found that when the volts reach 63% of the final value, the time so far from start, *t*, is numerically equal to C in farads x R in ohms. At 5t, charging is 99·5% complete.

The energy stored in a capacitor is $\frac{1}{2}CV^2$ joules. Taking in the values we have:

Energy stored $\frac{1}{2}CV^2 = 0{\cdot}5 \times 10 \times 10^{-6} \times 500 \times 500$ joules = 1·25 joules.

High-voltage capacitors should always be discharged before handling, because when in good condition they can retain a substantial amount of energy for some considerable time. In circuits they should always be fitted with shunt resistors of a high value which will discharge them in a reasonable time from switch-off—but the precaution of shorting them nonetheless is still vital.

Q. (4) What is meant by
(a) resistance
(b) reactance
(c) impedance?

State the formulae for calculating the reactance and impedance of a series AC circuit containing inductance, capacitance and resistance.

What is the dynamic resistance of a parallel resonant circuit consisting of an inductor of 100 μH inductance and 1 ohm resistance, and a capacitor of 500 pF? *(10 marks)*

Answer (4)

Resistance is the measure of opposition to flow of current in a DC circuit.

Reactance is a measure of the opposition to flow of AC in a circuit due to either capacitance or inductance.

Impedance is the measure of opposition to the flow of current in an AC circuit containing a combination of reactances and resistance.

Inductive Reactance $X_L = 2\pi FL$

Capacitive Reactance $X_c = 1/2\pi fC$

Impedance $Z = \sqrt{R^2 + (X_L - X_c)^2}$

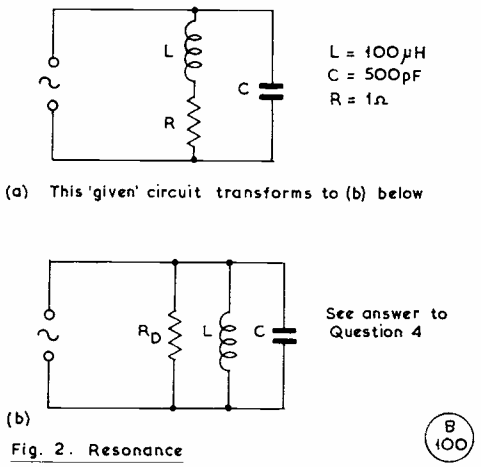

Fig. 2. Resonance

Fig. 2. (To answer Q.4). A, the circuit posed in the question, which can be transformed into (B) lumped tuned circuit losses, as Rd, the dynamic resistance at resonance. Values for Rd are solved in the text.

Consider Fig. 2. At *(a)* we have the circuit given in the question, and at *(b)* is the circuit as transformed to show R_d, the Dynamic Resistance.

Now, R_d equals L/Cr.

Putting in values, we get

$R_d = 100 \times 10^{-6}/500 \times 10^{-12} \times 1$

Which simplifies to

R_d = 200,000 ohms.

Q. (5). With the aid of a circuit diagram describe the construction of a variable frequency oscillator suitable for use in an HF transmitter.

Describe how oscillations are set up and maintained. *(10 marks)*

Answer (5)

Virtually any oscillator circuit can be persuaded to perform satisfactorily in this service, *provided the mechanical construction is right.* The circuit of one of the best ones electrically, the Clapp-Gouriet, is given in triode form at Fig. 3. Wiring should be good, and solid. Components should be rigidly mounted but not in any way stressed mechanically. The coil should be wound with hot wire tightly on a ceramic former, the remaining components being chosen with a careful eye on their suitability, feedback should be as slight as possible to sustain

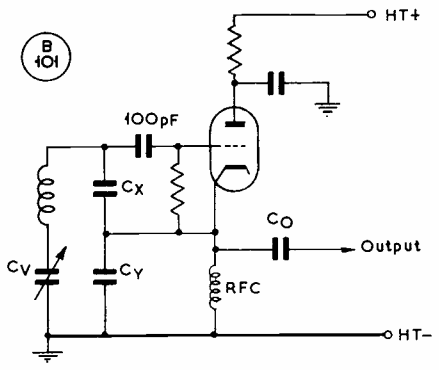

Fig. 3. Clapp Oscillator

Fig. 3. Answering Q.5, a Clapp oscillator in its basic form. Cv can be about 50 pF; Cx, Cy, .0022 μF; and the valve any high-slope triode. Co should be as small as may be, while exciting the next stage adequately.

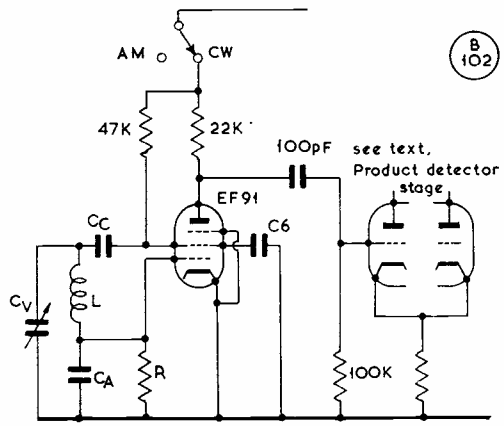

Fig. 4. Typical BFO Circuit

Fig. 4. (To answer Q.6). Typical BFO circuit, used with an IF of 85 kHz. Ca, Cb and Cc are .0011 μF, silver mica. L is 10 mH, R 100K, and all contained in one screening can. Cv can be a 50 pF variable capacitor.

oscillation, and loading kept constant, with HT and heaters both fully stabilised. The environment of the VFO should be, as far as possible, stabilised against temperature and humidity changes.

Consider Fig. 3. Oscillation is set up due to the positive feedback from cathode to grid through C_x and C_y. The cathode is lifted from earth to AC for this purpose by the RF choke. The amount of feedback is dependent on the relative capacitances of C_v, C_x, and C_y which will inevitably change as the variable capacitor is tuned; thus the range is limited, and the output falls as we tune to the HF end of the range, until eventually it stops altogether. Thus a practical circuit would divide C_v into a fixed and a variable capacitor in parallel to avoid the variable stopping the oscillator. In some cases this is carried even further by dividing the fixed portion of C_v into two, one large, and one small, having a negative temperature coefficient.

Q. (6). Why is a beat frequency oscillator necessary for the audio reception of continuous wave telegraphy?

Describe a typical BFO and show how this is coupled to the receiver circuitry. *(10 marks)*

Answer (6)

When a CW signal is demodulated in a detector there is nothing left but a DC level, which goes up and down in sympathy with the received marks or spaces. To make it audible what is required is an oscillation on a frequency near to that of the wanted signal, so that the demodulated signal is brought out to the AF stage as an audio tone of frequency equal to the *difference* between the local oscillation and the signal frequencies. Such a local oscillator is called a "beat-frequency oscillator" (BFO) and may be used at any point in the receiver before the detector, although other considerations tend to make it appear at the last IF stage, coupled to a diode or product detector.

Fig. 4 shows the circuitry of a typical BFO—the values are for an 85 kHz nominal centre frequency, for use with an IF of the same nominal figure. The BFO in fact tunes, at C_v, from, say 83-87 kHz, so that with the signal "centred" in the IF pass-band, the BFO may be tuned to give the preferred beat-note in the speaker, and to best separate the wanted signal from any others. Any oscillator circuit will do; the present trend is to use crystal control. The circuit shown is from a standard receiver design, and is used at 85 kHz. For connection to a product detector—part of which is shown in skeleton—the value of the coupling from the BFO anode will be, as shown, around 100 pF. For use with the simple diode detector, coupling could be through about 2-22 pF to taste, through the capacitor, to some point on the last IF anode wiring. The coupling can then be adjusted for good detector operation without "pulling" of the BFO.

Q. (7). With the aid of circuit diagrams describe a system of amplitude modulation and explain its action.

How can the depth of modulation be controlled as a protection against over-modulation? *(10 marks)*

Answer (7)

Consider Fig. 5. The AF amplifier valve is coupled by T1 to the anode circuitry of the PA stage. Imagine for a moment that the signal voltage developed on the PA side of T1 by the modulator V2 is a sine-wave the peak-to-peak amplitude of which is exactly equal to the PA HT voltage. Also for simplicity, assume the PA valve V1 cuts off its output exactly as the HT on its goes to zero. Now, when the AF at the secondary of T1 is series-aiding the HT line, V1 has twice the voltage, twice the current, and hence four times more power than it would run with no modulation. Likewise, when the output of T1 is series-opposing then V1 has no HT and hence

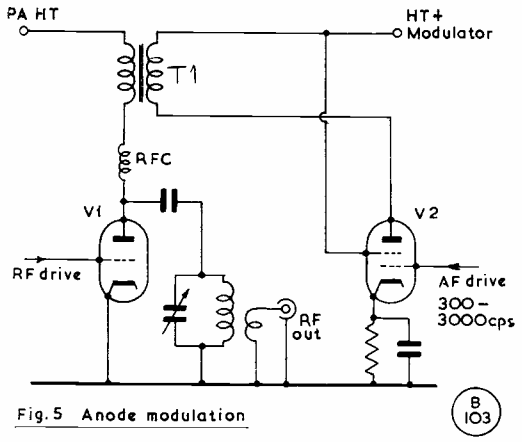

Fig. 5 Anode modulation

Fig. 5, to answer Q.7. A basic anode modulator. V1 is the triode PA, which in practice would require neutralising. V2 is the modulator, driven by audio through a pre-amplifier, suitable for the microphone used. In this circuit, T1 is the modulation transformer.

no output. Thus, for a mean ten watts, peak power is forty watts instantaneously, dropping to zero instantaneously in a linear fashion. So the anode current as read on a meter does not appear to move (or only slightly).

An indication of over-modulation is given by sudden kicks in anode current under modulation. The remedy is, of course, to turn down the audio from the microphone. Incidentally, it should be noted that the triode stage shown does not include any neutralising circuitry, albeit one would be essential in a practical case.

Q. (8). Describe what is meant by
(a) Fadeouts due to ionospheric disturbance
(b) Fading.
What are the effects of each on the reception of electro-magnetic waves at a distance? *(10 marks)*

Answer (8)

Fadeouts are caused by ionospheric storms, which in turn are brought on by solar activity. Often the effect will be a wipe-out in certain paths. Fading, on the other hand, is a result of radiation from the transmitter over more than one path—hence affecting the relative phase of the incoming signals. When the components from different paths are aiding, the received signal goes up, when cancelling, down. The periodicity and depth of fade can vary enormously; it is more of a nuisance with AM telephony than SSB due to the effects of fading being different on each sideband. CW is least troubled by this type of variation, though it still occurs. Changes in the effectiveness of the reflecting layer(s) can also cause fading.

Q. (9). Describe a form of directional aerial suitable for use on any one of the amateur bands.
Sketch the polar diagrams in the vertical and horizontal planes. *(10 marks)*

Answer (9)

Consider the array sketched in Fig. 6. There are two dipoles, stacked one above the other at one wavelength spacing, each backed by reflectors spaced as shown. Maximum radiation will be in the direction of the arrow, each dipole-plus-reflector pair acting alone as a two-element beam, and the upper one tending to deflect the energy nearer the horizontal as compared with either alone. If we know, by calculation or measurement, the horizontal polar diagram, then by application of an array-factor we can find the vertical one, as shown, at least for the free-space condition, in Fig. 6.

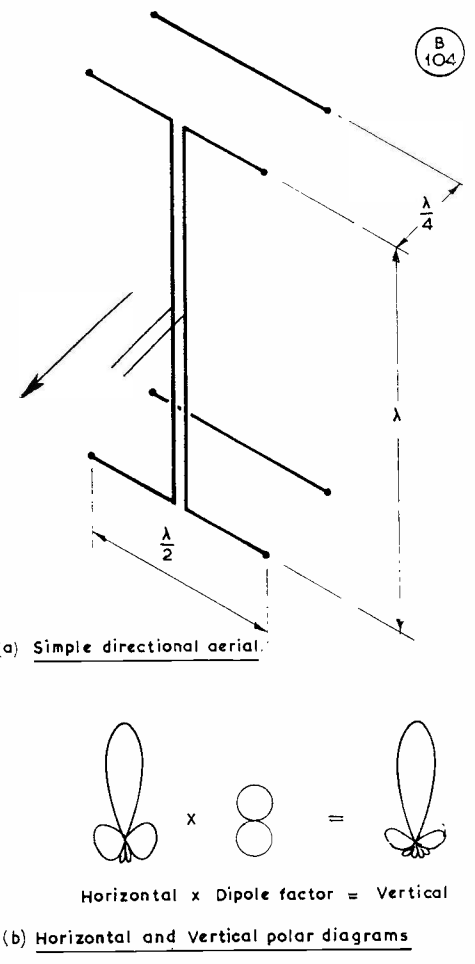

Fig. 6 is to answer Question 9. In (A) is a horizontal array made up of two half-waves in phase, backed by reflectors at quarter-wave spacing. (B) When the horizontal polar diagram has been worked out (either by measurement or calculation), it is possible to draw the free-space vertical diagram by multiplying the H-plane configuration by an "array-factor" to obtain the E-plane diagram shown. Note that the E-plane radiation can be sharper in the forward direction, with smaller but more numerous backward lobes.

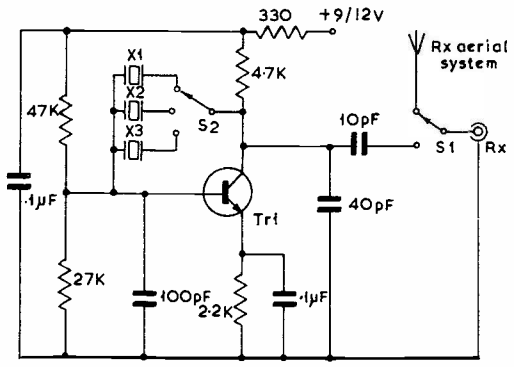

Fig.7. Heterodyne Wavemeter principle

Fig. 7, answering Q.10. Diagram shows use of a crystal oscillator in conjunction with a calibrated receiver to form, when used together, a heterodyne wavemeter. While it would be possible to go into much more detail, the method shown here and discussed in the text illustrates the principle.

Q. (10). Draw the circuit of a crystal-controlled heterodyne wavemeter and explain how it may be used to measure the frequency of an HF transmitter. (10 marks)

Answer (10)

The basic principle of the heterodyne wavemeter lies in the use of a crystal oscillator and its harmonics to establish points at known spacings along the band, and an "interpolation oscillator" which is used to mix with the crystal oscillator to give a coverage of the points between any two of the crystal points, and be accurately calibrated to them.

Perhaps the clearest way to think of the system is to consider an amateur-band receiver of the crystal-controlled RF front-end and tunable first-IF pattern. A crystal oscillator is shown in Fig. 7. There are three crystals, at 100 kHz, 1 MHz, and 7 MHz, driven to choice by a 2N706 transistor. The transmitter would also be in an amateur band—say, 7 MHz. A first check would be to switch the receiver to 14 MHz and find the harmonic, and to 3·5 MHz and find *no* harmonic—just to establish that the receiver is not listening to an image. Return to 7 MHz, and switch on the 7 MHz crystal, and locate it. The 100 kHz crystal may now be switched in and should come up at exactly the same spot. Note the dial reading on the receiver logging scale. Tune up to 7·1 MHz, noting as one goes that before reaching 7·1, we passed the signal whose frequency we are trying to measure. At 7·1, as soon as zero-beat with the crystal is obtained, note the logging scale reading. If a graph has previously been run of logging-scale *vs* frequency, or if the receiver scale is linear, it needs now only to tune the receiver to the wanted signal, note the logging scale reading and read off the graph the frequency of the signal on tune. Errors are possible, due to selecting the wrong harmonic of a crystal, or listening to the wanted signal on an image-response point in the receiver, or by other ways of a similar nature. The crystal frequencies must be checked regularly against a standard, such as BBC Droitwich, MSF or WWV, or alternatively against a high-precision counter used as a secondary standard.

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MARCH Issue SHORT WAVE MAGAZINE will appear on Friday, February 26. Single copies at 5s. (25p) post free can be supplied to orders reaching us by Wednesday 24th, for despatch on Thursday 25th, the day before publication. Orders with remittance to: Circulation Dept., Short Wave Magazine Ltd., 55 Victoria Street, London, S.W.1.

WANTED: AC Power Unit, Type WDA/6211, for the Redifon SSB radiotelephone GR.410 (Service Type C.14).—Capt. Taylor, Royal Signals, Hq 1(BR) Corps, BFPO 39.

SELLING: KW-76 Mobile/Fixed Rx, 10-160m. amateur bands, with mains PSU/LS, £20. Codar A.T.5 Tx, T.28 Rx, with Garex 12v. PSU and home-built control unit/speaker, £35.—Cutter, G3PQG, 1 Fosseway Close, Colerne, Chippenham, Wilts. (Tel: Box 664.)

TRYING To Get Back on The Air: Transmitting gear wanted, mobile or fixed, AM or SSB.—Johnson, Ellerhow, Princes Road, Windermere, Westmorland.

OFFERS Invited: Heathkit Mohican receiver, three years old, factory built and aligned, recently serviced.—Stevens, 86 Henwood Green Road, Pembury, Tunbridge Wells, Kent.

SALE: Heathkit RA-1 Rx with xtal calibrator, in good condition, recently overhauled and re-aligned by Heath, Ltd., price £25, with manual.—Box No. 4996, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Heathkit HO-10 monitor 'scope, in excellent order, with manual, £15. Avo signal generator, coverage 50 kHz to 80 MHz, built-in modulation and attenuator, with circuit, £5. Carriage both units by arrangement.—Michaelson, G3RDG, QTHR, or ring 01-455 8831.

SELLING: K.W. Viceroy Mk. IV CW/SSB Tx, with full lattice filter and internal solid-state PSU, in very good condition, price £85, buyer to collect. —Spear, G3SSQ, 19 Tavistock Avenue, St. Albans, Herts. (Tel: St. Albans 51518 after 6 p.m.)

WANTED: Good K.W. Valiant Tx, with AC/PSU; CW or AM/CW version acceptable. Also wanted, two ex-R.A.F. R.1084 receivers for special conversion.—Marris, G2BZQ, Flat 20, Fairview, Norreys Drive, Maidenhead, Berks.

SALE: New EC-10 Mk. II, £60 plus carriage. SB-600 speaker, as new. £6. New Shure-201 microphone, £4. K.W. E-Zee Match, £9.—Kellow, G3ZHK, Glenvale, St. Dominick, Saltash, Cornwall. (Tel: St. Dominick 543.)

FOR SALE: Joystick de luxe Ae. with Joymatch ATU, used only twice, price £9 including postage. —Stratton, Ganthorpe Farm House, Ganthorpe, Terrington, York.

IF You are in doubt about what the charge should be for your Small Adv., send us with your notice a signed blank cheque (safeguarded by being endorsed and initialled "not more than £2", or some such reasonable amount) and we fill in the correct cost. (The probability is that we will make it less than you would have done yourself!) For years now, readers with something to advertise in these columns have accepted this arrangement, and we have never yet had a complaint.—Advertisement Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Collins 51S-1 with 55G-1 preselector, general coverage 200 kHz to 30 MHz, with digital read-out. A professional receiver, to a superb specification up to laboratory standards. New price over £1,000. Accepting £650.—East, 41 Avenue Close, Avenue Road, London, N.W.8. (Tel: 01-722 7040.)

OFFERING: R.C.A. AR88LF, with modified EF183 front end as per "Radio Constructor" of May 1965. Good condition and calibration on, with spare valves and AR88D manual, price £28, buyer to collect.—Ring van Went, Sonning 3635 (Reading), evenings.

OFFERS: For Zenith Trans-Oceanic portable radio, standard bands and short-wave. little used.—Ring Lenglachner, 01-235 3731, office hours Monday to Friday.

SALE: Trio 9R-59DE receiver with modified PSU and crystal calibrator, £35.—Barnes, 46 Meadow Rise, Saxilby (551), Lincoln.

WANTED: Morse Keys (Tappers), civil and military types, for collection. Specimens such as the A.M. B1, Marconi, Admiralty and foreign types are required.—Shedd, 20 Heathgate, London, N.W.11.

WANTED: Mobile PSU, National NCX-D, also mobile mounting bracket for NCX-3 transceiver. State condition and price required.—Haslam, G3XSI, QTHR.

FOR SALE: Trio JR-500SE receiver, two years old, price £40 or near offer.—Corbett, 33 Albert Avenue, Glasgow S.2, Scotland.

RTTY: The following Creed equipment available surplus to requirements—75, at £25; 54. with perforator attachment, £20; 54, at £18; a 54 receiver only, £12; 7B, at £12; 7TR reperforator, £7 10s.; Auto 6S/5M, £12.—Wigg, G6JF, Yabbacombe Farm, Kingsbridge, Devon.

SALE: R.C.A. AR88D communications receiver, coverage 550 kHz to 31 MHz, in good condition. —Ring Brighton 34321.

SELLING: Vanguard Mk. II Tx, needs some attention.—Haynes, G3CWL, Sans Nom, Fir Tree Road, Leatherhead, Surrey.

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