The SHORT WAVE Magazine

25p

VOL. XXIX FEBRUARY, 1972 NUMBER 12

WORLD WIDE COMMUNICATION

MULTI-METERS

MODEL 500 30,000 O.P.V. with overload protection mirror scale 0/·5/2·5/10 / 25 / 100 / 250 / 500 / 1,000v. D.C. 0 / 2·5 / 10 / 100 / 250 / 500 / 1,000v. A.C. 0 / 50μA / 5 / 50 / 500mA. 12 amp. D.C. 0/60/K/6 Meg./60 Meg. Ω. **£8·87½** Post paid.

TMK MODELTW-50K 46 ranges, mirror scale, 50K/Vol. D.C. 5K/Volt A.C. D.C.: Volts ·125, ·25, 1·25, 2·5, 5, 10, 25, 50, 125, 250, 500, 1000v. A.C. Volts : 1·5, 3, 5, 10, 25, 50, 125, 250, 500, 1000v. D.C. Current : 25, 50μA, 2·5, 5, 25, 50, 250, 500mA, 5, 10 amp. Resistance : 10K, 100K, 1 Meg., 10 MegΩ. Decibels : —20 to + 81·5 dB, **£8·50.** P. & P. 17½p

MODEL 5025 57 Ranges. Giant 5½in. Meter, Polarity Reverse Switch. Sensitivity : 50K/Volt D.C. 5K/Volt A.C. D.C. Volts : ·125, ·25, 1·25, 5, 10, 25, 50, 125, 250, 500, 1,000v. A.C. Volts : 1·5, 3, 5, 10, 25, 50, 125, 250, 500, 1,000v. D.C. Current : 25, 50LA, 2·5, 5, 25, 50, 250, 500mA, 5, 10 amp. Resistance : 2K, 10K, 100K, 1Meg, 10 Meg. Decibels : —20 to + 85 dB., **£12·50.** P. & P. 17½p.

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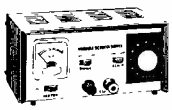

RP214 Regulated Power Supply. Solid state. Variable output 0–24v.D.C. up to 1 amp. Dual scale meter to monitor voltage and current. Input 220/240v. A.C. Size : 185 x 85 x 105mm., **£8·97.** P. & P. 25p.

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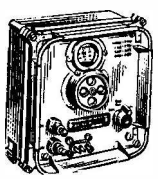

Small portable crystal controlled wavemeter. Size 7″ x 7½″ x 4″. Frequency range 500 Kc/s.–10 Mc/s. (up to 30 Mc/s. on harmonics). Calibrated dial. Power requirements 300v. D.C. 15mA and 12v. D.C. 0·3A. Excellent condition, **£4·47½.** Carr. 37½p.

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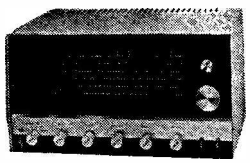
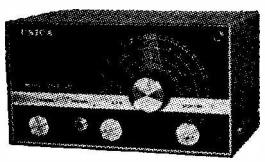


Dual conversion on all bands. 2 x 455 Kc/s. mechanical filters. Product detector. Variable B.F.O. 100 Kc/s. crystal calibrator. "S" meter Huge slide rule dial. Operation 230v. AC or 12v. DC. Size 15″ x 9¾″ x 8¼″. Complete with instruction manual, **£57·50.** Carr. paid (100 Kc/s. Crystal £1·97½ extra).



UNR–30. 4 BAND COMMUNICATION RECEIVER

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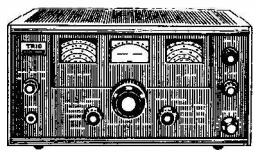

4 band covering 550 Kc/s. to 30 Mc/s. continuous and electrical bandspread on 10, 15, 20, 40, and 80 metres. 8 valve plus 7 diode circuit. 4/8 ohm output and phone jack. SSB–CW • ANL • Variable BFO • S meter • Sep. bandspread dial • IF frequency 455 Kc/s. • audio output 1·5w. • Variable RF and AF gain controls 115/250v. A.C. Size : 7″ x 13″ x 10″ with instruction manual, **£47·50,** Carr. paid.

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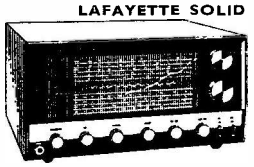

5 Band AM/CW/SSB amateur and short wave 50 Kc/s.–400 Kc/s. and 550 Kc/s.–30 Mc/s. F.E.T. front end. 2 Mechanical filters. Huge Dial. Product detector. Variable BFO. Noise limiter, S Meter. 24½″ Bandspread. 230 v. A.C./12v. D.C. Neg. earth operation. RF gain control. Size : 15″ x 9¼″ x 8¼″. Wt. 18 lbs. Exceptional value, **£45.** Carr. 50p.

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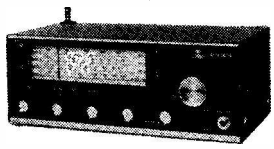
UR.1A SOLID STATE COMMUNICATION RECEIVER



4 bands covering 550 Kc/s.–30 Mc/s. continuous. Special features are use of FET transistors, S Meter, built-in speaker, variable BFO for SSB reception, noise limiter, bandspread control, sensitivity control. Output for low impedance headphones. Operation 220-240v. A.C. or 12v. D.C. Size : 12¾″ x 4¾″ x 7″. Excellent value. Only **£25·00.** Carr. 37½p.

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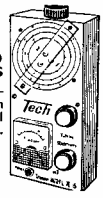

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500-0-500μA		150mA	£1·60	150v AC	£1·60
	£1·60	200mA	£1·60	300v AC	£1·60
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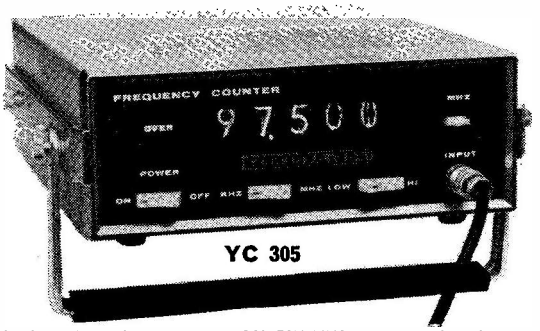

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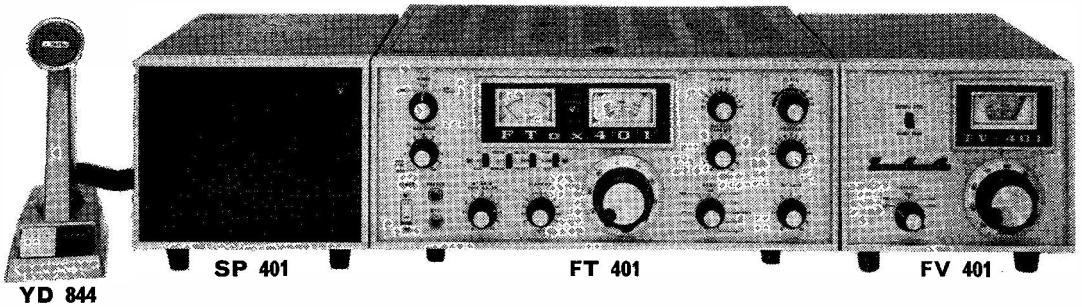

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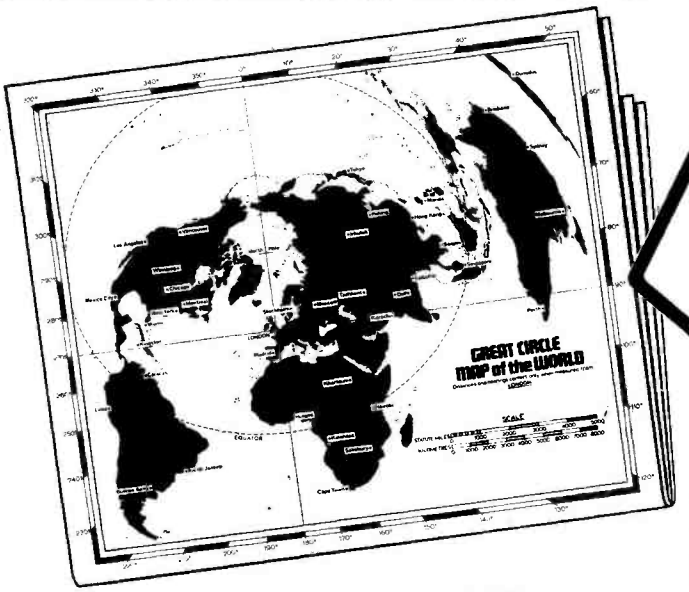

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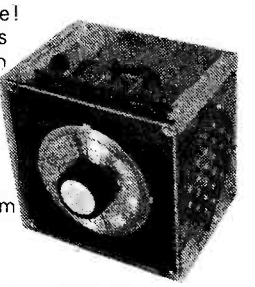

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SHORT WAVE MAGAZINE

(GB3SWM)

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CONTENTS

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT-WAVE Magazine

EDITORIAL

Solutions? *The piece in this space last month needs now to be taken further —but first let it be said that the writer expresses opinions and puts forward ideas based on 45 years' practically continuous experience of the background of Amateur Radio in this country. Indeed, he started in 1926, proudly as BRS-80, before becoming fully licensed in 1928.*

During all the time since, contact has been maintained in one way or another with the RSGB and its affairs. In pre-War days, one saw the careful and painstaking build-up of the Society (and had some small hand in it) and the husbanding of its resources till, by the mid-post-War period, substantial reserves had been accumulated.

The foolish and ill-considered Doughty Street decision not only dissipated much of this capital but also incurred a considerable indebtedness by borrowings and the raising of £20,000 in debentures, alone costing £1,200 a year to service.

From the moment the Doughty Street venture became a firm commitment, the RSGB started to slide into a deficit situation, getting in deeper with each year that passed. There are all sorts of reasons for this, which there is not space to discuss in detail here. The question now must be: "What is the solution?"

Our answer would be to sell the Doughty Street premises, pay off the debentures and as much as possible of the debt, and revert to leased accommodation—which anyway is the most sensible course for a small membership association. (This would, of course, have to be arranged before disposing of Doughty Street). The fact that does not seem to be understood by those responsible is that there is no need for the RSGB to operate from expensive London premises at all—it could work just as effectively and far more economically by going outside London, say within two hours or so by fast commuter service. Places like Reading, Northampton, Colchester or Leicester are only a few of the obvious possibilities.

One useful step towards economy has apparently been taken already—the size of the journal is being reduced to 64 pages, instead of the 72 or 80 pages carried in recent years. This will in time show a healthy saving in the production bill. Another overdue decision is to charge at least something for members' small advertising, instead of giving away

pages of free space—as originally conceived, this did not have quite the result the RSGB may have expected!

It is often said that the solution to the financial problem is "more membership", thinking only of increased income. But, as explained here in August 1970, at the time when the RSGB subscription was last put up, this is not necessarily so—it can be shown that there is a point at which an increased membership becomes too expensive to service, in terms of cost of print-and-distribution of the journal and staff to cope with the additional work. In the case of the RSGB, a membership of about 13,500 (at the present subscription rate) would seem to strike the right balance and should enable economies to be made in all directions, such that the loss of subscription income would be more than offset. (Though in fact detailed information not available to us would be needed to establish what this "controlled membership" figure ought to be.)

In the interests of all concerned—including the Council of the RSGB and those responsible for taking major Hq. decisions during the last five years or so—it would seem now wise to appoint an independent Committee of Inquiry to go into all these matters, and advise on what steps should be taken or planned for the immediate future.

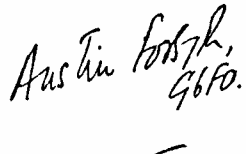
This Committee, of five members drawn from "out in the country", three at least to consist of a lawyer, an accountant and a senior business executive and all themselves holding callsigns, should be given full powers to investigate the Society's affairs and prospects and prepare a report for publication. (A difficulty here could well be to find individuals of sufficient stature willing to serve for what could turn out to be a gruelling tour of duty!).

* * * *

The foregoing is not intended to be in any way "personal". Personalities are not involved so far as we are concerned. To suggest a Committee of Inquiry is not in any way to cast a slur on the RSGB Council, past or present. Indeed, it might well be that the Committee's report would justify decisions taken during the last few years.

Our whole point is that in the interests of Amateur Radio in the U.K., it would be as well to have as many as possible of the stones turned over and the financial position into which the RSGB is getting itself discussed and explained for the benefit of all—even the silent majority who customarily vote "leave it to Joe".

Whether as members of the RSGB or readers of this Magazine, *or subscribers to both or neither, we are all in Amateur Radio together, which is what matters—and that alone is justification for the ideas and opinions expressed here. Let them be tested to see how and where the most good can be done.*



WORLD-WIDE COMMUNICATION

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

ONE has to admit, at times, that what with winter conditions when the bands at the upper end of our frequency range are either suffering from sunspot-shortage, or dead during leisure hours; with Forty full of clottish QRM; Eighty even fuller of malicious QRM on anyone trying to work DX; and Top Band full of funny noises and funnier QSO's—that one almost feels like building a two-metre converter and transmitter for relaxation. However, we can take heart—the bands should start to show signs of life, for those who have to work, by the end of the month. All you have to do in the meantime is get rid of your TVI!

And by February-end, there is no real reason why, with a certain investment in filters and ferrite rings, not to mention a bit of good neighbour relations, *you* couldn't go on, say 14 MHz, in the London outer area without fear of TVI, provided you are game to have a go, and advertise your desire to clear TVI and go on the air in TV hours. Why not get on and work some of that DX the rig is capable of digging up for you?

Of course, it's not *quite* as bad as that first paragraph would make it seem. Ten has had the odd spasm of life around lunchtime; Fifteen and Twenty have been good during the day and on occasion well into the evening; Forty and Eighty their own inscrutable selves, and Top Band—well, let's have a look at the mail.

Top Band

Let W4WFL/1 (Farmington, Conn.) have the first shout—after nearly 20 years on the air, he finally got over the water during the ARRL 160-metre contest, to work HB9NL and G3XVX—not to mention VP9BO for another new country on the band. Morgan hopefully muses that he only needs 94 more countries for a Top Band DXCC!

HB9NL (Bueron) comes in at this point; Franz, using the Drake R4A-T4X set-up to an eighty-metre Zepp, booked in all the usual W1 and W2 boys, plus W3, W4, W8, W9 and a hearing of WØ; also VE, PY, KV4, and such, to a total multiplier of fourteen out of 31 QSO's, making a claimed 868 points. One reckons that it should take a bit of beating.

G3DCS (Ipswich) reports little operating this last month due to the conditions of the bands whenever he has been able to get on; however, to keep his hand in he paddled a key with several OK/OL stations on 160m.

It may be recalled that last month G3YMH was asking what had happened to the 4X4 boys—well, G3RTU is otherwise known as 4Z4IX, and he had four skeds with 4X4 lined up, while he was operating at G3FVA. None of them came up, but it is known that both ends *were* in fact on at the right times. All that lacked was the essential opening, and there is always another chance—indeed, Keith will be back in 4X4-

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	339	182	312	330	171	116	20
G3DO	340	217	253	333	90	83	9
G3NOF	322	207	235	313	37	73	4
G3KMA	266	210	217	210	132	67	11
ZL3GQ	285	146	164	245	178	127	5
W6AM	350	151	163	350	146	120	7
G3LZQ	265	140	156	215	72	38	8
G3IGW	212	129	153	169	136	107	50
9H1BL	202	117	129	143	74	57	8
G3YDX	164	115	101	97	91	92	17
G3DNF	141	71	100	103	45	37	2
G3IDG	131	77	97	56	29	18	12
G3XAP	144	45	91	55	88	32	14
G3DCS	139	32	84	95	36	37	11
G3RJB	180	84	63	169	60	37	8
G3PQF	175	119	53	107	85	56	13
G3VLX	76	10	26	38	27	38	19
GC3YIZ	92	54	24	41	21	9	2
G3ZEM	110	—	—	108	28	32	13

(Placings this month are based on the "21 MHz" column. This is the last appearance of this Table.)

land next season and trying hard. Meanwhile, there is 5BDXCC to keep him amused until his return!

G3TR (Crawley) reports in, confirming various rumours of him being heard on Top Band in VK—indeed, John is pleased to be able to point to an entry in his log, where it records his QSO with VK6KN, at 2055z on December 11; G3TR was also heard on January 2 at 1915z by VK3CZ, and—the interesting point—by VK5KO at *1735*. Again on January 4, VK3CZ became audible, between 1900 and 1915, with VK5KO coming up to RST 229 at 1935z. Hence, John has regular skeds set up now, with VK3CZ, VS6DO, and VKØPF. To make sure of turning the trick, John is on watch from 1900 to 1955, 2045 to 2120, and 2230 till 2300z. Working VK on 160m. is, by any standards, about the ultimate in DX. These statistics from G3TR show vividly the pattern of the game—signals peaking up and going out again over a period of a few minutes, the period varying slightly day-by-day as the dusk time alters, together with an operator at each end ready to put in what many would regard as an excessive amount of listening effort in order to do the trick. And for a G/VK contact on Top Band, one needs to be pretty smart on the uptake—when the path is open the ability to pull the essentials out of an RST-229 signal without a call for repeats is vital, if the QSO is to be finished before the other man goes out. Incidentally, on a more mundane sort of level, G3TR also lists K1PBW, DL's, OH, DK's, HB9's, OE5NT and PAØ.

G3YMH (Staines) says his gotaway list is far too long to write down, but he did ring the bell with ZD8AY, K1PBW, K2GNC, W1BB/1, W1ST, W2IU, W2EQS, W3GM, W2UWD, W2FD, W1WQC, W1HGT and W3IN, all on CW, plus K1PBW who was raised on SSB. In addition, ZD9BM was heard on December 27 at 0100z, at RST 339, calling CQ DX. Ron has it by way of Fifteen that 5Z4MO is looking for QSO's around 1930z, transmitting on 1804 kHz and listening around 1825 kHz. It seems that 5Z4MO has on several occasions heard G's going about their lawful Top Band occasions but has not yet succeeded in getting one to take the proffered bait.

Unfortunately, the report from G3LIQ (Hull) was just too late for last month's piece. A pity, because Dennis has a letter from VK5KO which he quotes: For years, VK5KO has been checking for DHJ every morning, until suddenly, in early September, DHJ surfaced. Between July 29 and October 30, VK5KO rolled up 97 contacts with JA, W, and VE. He then goes on to give times for VK/G working through December, and a suggestion that G's avoid 1825, the preferred area being 1821-1823 kHz. As a final point, Dennis mentions that he was told by VE3EK that VE7UQ is on 1803 kHz, and looking for Europeans every morning from 0600z onwards.

G3RKJ (Harlow) mentions having worked a station signing EQ2BQ in the small hours of the morning of January 8—since the station gave all the proper particulars and sounded "right" it looks as though Keith may have turned up the real McCoy here.

W1BB has come up with another record of events as he sees them: He has it that KR8CF was worked by K6DDO for another new-country "first." KØDCF managed a hearing of JA7AO—the farthest East and North that a JA has yet penetrated into U.S.A. on Top Band. GM3WDF heard VE7UZ at 0230z on November 19, which gives some encouragement to the chaps who would like to work the West Coast. Back on the question of purely W/EU contacts, Stew notes that many of the lads are finding it to be quite a good scheme to try the W sunset times, resulting in contacts around the 0001 to 0030z hour—seems a good idea for chaps who just *hate* getting up early.

As an item of encouragement for those of us who have never managed to get across to W, G3XAP (Stowmarket) points out that after four years of trying, using assorted long-wires, dipoles and *full-sized* verticals, over Christmas he slung up a temporary aerial to work the boys—and rang the bell with K1BPW and W1HGT! The moral to this little story is just this—the latest temporary bit of wire has the benefit of the enormous radial-farm Phil has put down for his forty-metre phased-verticals.

G3KRH (London, N.W.11) is one of the "silent majority" as far as this column is concerned—but he has been moved by the imminent demise of our Top Band Table, as it has been known for so many years, to get his spot booked for the last appearance. Indeed, thanks to the pleas of Dick and others, the card-index will remain in being during the whole of the period the last-year Table is being run, so that when the counties are all changed over we can have a final showing of the all-time counties. But, don't forget to try and do the lot between now and then. Incidentally, G3KRH, like your scribe, would like to see some GI signals—Dick needs three of them and G3KFE the whole lot barring Armagh and Down. Offers, please!

For G2HKU (Sheppey) this is a busy time of year and so his activity has not been great. CW yielded DL8PC, DL9EM, OK1FTC, OK2BFN, HB9CM and OL5ANJ; SSB did for GB3LP, GD3GMH, GM3SHB and PAØPN.

DX-Pedition

Present plans at W4WFL/1 call for a European holiday in March or April, taking in F, 3AØ, HB9, HBØ, and possibly one or two other spots—but the one that should get the big work-out is Andorra, for which Morgan has the call C31EF and a most delightful QSL.

Here and There

Poor old Jack, G2DC (Ringwood) is still in the grip of the "screws" which has resulted in almost a cessation of CW activity for the moment, and a reduction on the SSB side, as when things are at their worst, even twiddling the dials can be painful. Jack is justifiably somewhat upset about this and it is certainly the cruellest luck on a dedicated radio amateur of great skill. Several chaps have advised him to try an el-bug keyer, but he has doubts about the mastering of such a beast at his age—and he has no intention of letting the G2DC signal radiate any of the sort of noises *some* people get out of such devices! Fair comment in a way, but one would think the squeeze-keyer technique would come fairly easy to an accomplished CW man, given a few hours of practice on an audio-

Station G3XBR, owned and operated by Bernard Broughton, Hi-Beams, St. Tudy, Bodmin, Cornwall—he remembers the early days of 2LO and crystal sets. About six years ago, he heard on his marine radio Rx Edna Cooper, G3UGO of Newquay and president of the Cornish Radio Amateur Club. This was Bernard's introduction to Amateur Radio and by December 1967, he had his own full licence, due largely to encouragement by G3UGO. From the start, Heathkit gear has been used throughout, consisting essentially of an SB-201 transceiver and SB-200 linear, into a 6-element Hy-Gain TH6-DXX (which, with its 24ft. boom, was erected by G3XBR single-handed). The main interest is DX and the acquisition of operating certificates, nearly 70 now being held—including DXCC and WAS by working YL/XYL's only, as a compliment to G3UGO. Other interests at G3XBR—who runs a radio amateur holiday centre at St. Tudy—are photography, gliding and sailing. But what gets us is that DXCC gained by working women amateur operators only!

oscillator. Worth a try, anyway, if it eases the pains.

Another correspondent to be in the wars is G8HX (Mansfield) whose doctor has been "slinging the book at him" in the way of tests and X-rays and so forth. Over Christmas Frank tried Eighty, but was deterred when the light on the stairs came up to full brightness every time the key was pressed—seemed an awful waste of RF!

G3YRR (Gimsby) had an interesting QSO on December 16 with W8LK, ex-W8DNM, who was celebrating 52 years as a licensed amateur. Don could recall hearing the early signals from Poldhu to Glace Bay, Nova Scotia. The first speech he ever heard was the Eiffel Tower station in 1919, when he turned his grandfather out to listen; the latter was then seventy and had been working with telegraphs in the Wild West days when the first ones were put in operation—some span, from Wild West telegraphs to SSB on Twenty in one QSO!

Going back to that business of why the G's don't enter the contests, G3IDG (Basingstoke) takes an unfair advantage when he points out that often there are European countries with fewer entries than from the U.K.—agreed, but with far fewer in the proportion of total amateurs. SM, I, DL and other Europeans—Scandinavia in particular—show far greater *proportionately* of contest activity.

Again on the "Contests and U.K. Participation" theme, G3AAQ offers a few thoughts: Jake is somewhat averse to entering for blood, because of the disadvantage the G's are under as compared with the permissible power-levels in other countries; and anyway the rough-and-tumble of the contest, the over-excitement and the occasional spiv operator are all enough to put him off, saving a few chosen ones, like the FOC events.

G3IDG has the crux of the matter when he says that he finds it a question of nervous tension, lost sleep, and so on—to cite the expense of posting the log and of getting the contest log sheets from the organisers is pushing it a bit *too* far! But, of course, that is the very point, this lost-sleep-and-nervous-tension question—we G's, by and large get our excitement from TV—well, some of us, anyway! In most cases there is not even enough energy left to think, let alone act or decide anything during working hours—it must all be saved for the nightly sacrifice of mind to the Idiot's Lantern. Your conductor would take an evens bet—indeed a hundred to one—that if TV went off the air throughout the country for a month the crime rate would drop, workers would give more output, G's would enter more contests, and people would be happier. The only snag might be the population explosion . . .

G3URA (Eastbourne) writes to say he has a CW *alter ego* when the real owner of the call uses only SSB. Seems the pirate is on Twenty CW—if anyone comes across the pest,

Dick would be obliged if they would unmask the villain. Incidentally, this has so incensed G3URA that he intends to get in some CW practice specially to come on and challenge the blighter, which should make for an interesting contact!

The death occurred on December 9 of Ernst Krenkel, RAEM, who was president of the Soviet Federation of Radio Amateurs, chairman of the Russian Philatelic Society, and director of Russia's institute for the design of meteorological instruments.

He acquired the call RAEM after his nine-months' stay on an ice-floe in 1937/1938, collecting, with three colleagues, scientific data while the floe drifted and at times almost broke up. He was an experienced Arctic man, having served at various polar research stations from 1924. He was also associated with the Byrd Antarctic expedition in 1929.

As an operator, he was not heard on the bands as much as one would have liked—obviously his life was too full—but those who worked him will recall a QSO with a fine signal, well operated, while anyone who heard him dealing with a novice stuttering over his first QSO will know him as a kindly and helpful man. He will be missed in Amateur Radio circles far outside his own country.

TOP BAND COUNTIES LADDER

Station	Confirmed	Worked
Phone and CW		
G2DF	98	98
G3ADH	98	98
G3VLX	98	98
G2NJ	98	98
G2HKU	98	98
GI3WSS	97	98
GM3YOR	79	92
G3XWZ	76	90
G3KFE	72	88
G3YMH	69	93
G3LXD	64	83
Phone only		
G2NJ	98	98
G3PQF	98	98
G3KRH	94	95
G3XDY	72	89
GI3WSS	67	83
G2HKU	55	58

This is the last appearance of the Table in this form.

Twenty

Naturally enough, at this time of year 20m. is patchy after dark, and often goes out quite soon; in the mornings, the VK opening over the long path has been starting around 0800 or later, peaking at 0900, says G2DC. His Sideband made it with CE2AG, M1D, MP4BI, TT8AC, VE8ML (with an *enormous* signal from his beam and 180 watts p.e.p. input), VP9GR/M, ZL1-4, VK1-8 and 5N2ABG. A CW one that Jack could not resist was ZL3PO/C.

That dipole at fifteen feet is still serving G3ZPF (Dudley), the more so as his TVI problem is now a thing of the past. New countries worked in the month comprised MP4MBM, FL8HM, VQ9R, CN8MJ, 3B8AW, 6Y5SR, UN1CC, ZS3KC, GI3TLP, UF6HV, 72XBA, 9V1QW, 2J2WR and UG6AW, making the countries 115—it would have been 116 if the 4S7 compiling the list for the recent XU effort had been logging the stations put through in his *own* log, and had not therefore bounced the 'ZPF card. Other stations of interest included JY6RS, OD5FH, WM1NSA, 9H3B, 9H3WPD, EA6BU, VP9GO, HK3COC, VO1CU, 9Y4T, JY8RO /AM, M1I and 9J2JY, all of course SSB.

G4AMT (Penzance) had a couple of faults on the transmitter, now rectified, and a Quad which "went down to earth" thanks to the Cornish gales. Twenty has yielded only a handful of QSO's with a W contact quite an event, albeit a spasm of /A from friend G4AMJ did rake up W7HZB on the key.

Said G4AMJ (St. Ives) has been off school for the holidays—he is all of fifteen—and has his HW-101 tied to a long-wire for Eighty and Fifteen, with Twenty served by a two-element beam erected just prior to writing. This came up with OY6, and shoals of W's. Incidentally, G4AMJ says he is not sure how many countries G4AMT has worked, but whatever it is, he is determined to beat him. Sounds like good healthy rivalry!

G3MHF (Eastbourne) has a dipole for Twenty sitting up at about 20 feet, fed with some CW; it produced UKØFAI (Sakhalin), EA9EO, VB1MSA, UK2PAR (one of the young generation at 14, with good CW sent at a steady 25 w.p.m.), K7ABV, W6KG, ZL1DI, SM5ZI (who came straight back with 'MHF's name after no QSO for eleven years) and YK1OK, who is obviously a Czech national, as he was heard to be working OK's by the load, in Czech. Mike is a teacher of English to foreign students in Eastbourne, and says he would be interested in setting up a sked with any others who are teaching in this field. G3MHF is *QTHR*.

The analysis of band conditions from G3NOF is in general agreement with the others; but Don makes the additional point that he has heard nothing of the Pacific during the month. Around 1700 there have been several good polar openings—over the North to VE7, W7, and KH6, or the South to ZL. However, on most evenings the band has started to die almost as soon as darkness falls. The log for the month lists QSO's with A2CAL, KH6BB, KV4AA, PZ1AP, PZ1DR, VE4SD, VE6ABM, VE6PP, VE7UZ, VE7WJ, VE7YB, VE7ZQ, VE8HH, VB1MSA, VK's (including one with VKØCC at Mawson Base), VP2MA, VP9GO, W6-7, ZD3Q, ZE1DP, ZL's, ZS's, 5H3MV, 5H5LV and 5Z4DW.

The return of the wanderer! G3ZAY (Petts Wood) has come back to us, but not for long as his A-Level passes have landed him a place at Cambridge University. However, in the small amount of time Martin has had there was an allocation to Twenty, to throw up all W and VE call areas.

Twenty for G2HKU in these days of heavy commitments meant no more than a continuance of his regular ZL QSO's, with ZL1VN, ZL1WE and ZL3SE.

A refugee from Top Band is our old friend GM3YOR (Kirkcaldy) who retired behind a key and some 14 MHz RF with a view to more countries. The result was a batch of W's, K6KII, UL7GAP, UL7VAC, some UA9's, PY8FM and 8P6AE.

Only PJ2CL is considered worthy

of notice on this band by G3DCS (Ipswich). However, Enver provided your scribe with a couple of chuckles, when he pointed out that Hertz are no longer the "in" term among the professionals, and in mentioning that he had "accidentally rectified a fault on his rig!"

As elsewhere related, W4WFL/1 has been having quite a month. Apart from his Top Band efforts, Morgan mentions that he finally connected with VK—a tribe who had been avoiding him like the plague. However, we may shortly lose him if he achieves his long-stored ambition to keep a couple of hives of bees.

Forty

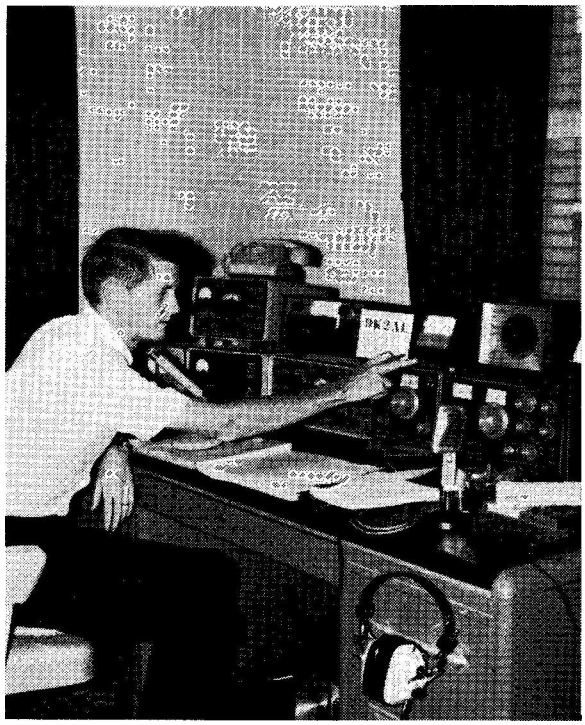
As G2DC remarks, quite a bit of DX has been leaking through the QRM of an evening from VK and ZL, not to mention the 0600 to 0730z period. However, the only stations to be called, and raised, were EA6PA, JA1AGA and VK3MR.

Having redecorated the living-room, G8HX came to the reluctant conclusion that his DX-100 *plus* AR-88 *plus* BC-221 spoilt the *decor*—so it is back to a cold bedroom shack for Frank, and a consequent shortage of contacts in the period under review.

G4AMT has been mainly working locals on Forty CW but did have one contact with a *very* suspect VP2B at 1030z one Sunday, and with W4NH.

The letter from G3DNF (Leeds) indicates that he is suffering—Gordon seems to be hearing chaps like G3XTJ and GM3JDR enticing the trout successfully but not managing to strike himself—a matter of aerials, he thinks. It would be nice to put in a list like one of GM3JDR's "specials!" On a different tack, the last batch of cards inwards made up the required number for the entry score for DXCC, which must have given some considerable pleasure.

Talking of G3XTJ (Palmers Green), Ed found 20m. poor to N. America, but good to JA almost all day, with W6 opening about 1530z. The DX has included contacts like G6ZY/CN/M, JA1OHV, JT1AA, KS4CJ, OX3DL, OX3ZO, UI8AC, UJ8BQ, VK3MR, VK5KO, YK1OK, ZD3Q and 9V1QK, all on CW, plus SSB to OD5HB, ZB2BL and 4Z4LF.



Station of 9K2AL, Box 2320, Kuwait, with a fine array of modern HF-band gear. This picture was taken when EP2DX, Richard Harris from Iran, was visiting.

G2NJ (Peterborough) has pursued his interest in collecting the /MM chaps; Nick's latest were SM7QC /MM around noon, aboard the *Vingaholm* from Lake Charles, U.S.A. to Rotterdam. In addition SM4DIP/MM has been noted and worked around the mid-day period.

We have heard in this section of GM3JDR; let Don come in himself at this point: He agrees with G3XTJ about the poor path to W during the day, and the good one to JA, the latter being up to 589, and UKØKAA actually gave him 599. GM3JDR's two-way CW list shows UKØFAA, UAØLAH, UVØAB (Dickson Is.), both UKØKAA and UVØIP on Wrangel (the only two on that Island), JA5BSQ, JA1DQT, JA9BE, JA3MIO, JA1OHV. JA2XIT, JA1NPV, JA1CWZ, JA1FHX, JA1ITX, JA2CG, JA3MXR, JA5ACF, JA2GQJ, JH1PZN, JA8IEV, JH1OGC, JA5CPN, JA9YBA, JA8FKH, JA1XEL, JH3BGG, OX3VJ, ZF1AA, KL7UM, JAØAIG/MM (near Clipperton), all during the mornings 0830-0900, plus HV3SJ and UL7OF between 2100 and 2130z.

At the moment the home of G3XAP is being modernised, and so temporarily Phil has lost the power to his shack but prior to this there were all W call areas, VE1-3 and VE7, VK3MR, VK2EO, ZL4IF, JA6CLO, VP2A, 4X4WL, UO5AAN, VK3XB, VK2VN, ZL2GO, W2DXL/W9, 8P6DR, VK2HL, VK2EO, UG6AD, UL7GW, EA9EO, 4Z4HF, PY4ABH, U5ARTEK, OY6FRA, CT3AS. EA8BK. PJ9JT, UD6CN, PY1DUB, PY2EWL, PY2EWZ, VK3APN, UD6AR, UL7NAF and ZD3Q.

Despite his lack of time, G2HKU tries to look at all his regular bands every month; this provided an SSB contact with EA9EO in Spanish Morocco and a CW one to YV7GN.

Another chap who "spreads the load" over most bands is W4WFL, and Morgan is getting out a little more healthily from his new QTH, where aerials are more easy to put up—he tickled, as the old policeman used to say, with GI5UR and

9L1VW in response to CQ calls, not to mention ZP3AO for a new one.

Eighty and Ten

Strange bedfellows, these, but they have this much in common—few, if any reporters.

G4AMT stuck to SSB on Eighty, he having no ATU at the moment to cope with the CW end of the band; all his contacts were over the period 0600-0900z, by way of VE1FO, VE1ADV, VE1EL, VE1EZ, VE1WZ, VE1AM, VE3NE, VA2UN, WBØFFG/P/TP, ZL3GS, PY7BLV, WB8BZG, W2HCW, WA2USX, WA8OBG, WB8EUN, K1KNQ, K2WLR, OY7JD, VP2VAM and OX3XD. The aerial in use is a sloping Vee dipole, fed at the apex, 45 feet, with 100ft. of twin feeder.

At G2DC only a few hours were spent on 80m., listening round for something worth working; lots of W's were to be heard in the mornings, 0500 to 0600z, but the only stations Jack called were YV1AD and ZL1SV. As for Ten—*Nix*.

One of the end-fed long-wire merchants is G4AMJ; his netted him VE1FO, VE1ADV, VE2KF, VE1AVN, VE1WZ and VB1MSA on SSB plus a UK9 on CW. As a P.S. to his report, we can add ZL2BT, 9Y4PA, some more VE's and W1-4, all additions on SSB.

"Ten only" is the story from G3VPS (Hailsham) who seems to have recovered, momentarily at least, from his attack of VHF-bug's disease. SSB to the indoor dipole on Ten did for FL8MM, G3KHK/4X4, ZE, ZS, W's and VE, while CW added UA9, VK6, ZE, 7Q7, VP2A, CR7 and W, plus a crop of short-skip QSO's of considerable interest as natters pure and simple. Incidentally, Peter has carried the analogy of DX-chasing with angling a little *too* far—he claims there were days when "no amount of CQ's would raise a sole!" On a rather different tack, thanks to VU2IRA, G3VPS is getting more of his pals interested in Amateur Radio—just by looking at Jinny's picture on her QSL card!

G3NOF is a pessimist. He says he feels conditions were none too good on Ten, with mainly short-skip, and then mentions contacts with CE3UM, FL8MM, G3MUL/CE3, VP8MM, W1, W2, W3, W4, W5, W8-Ø, ZS1FH and 9J2DT! Occasionally, Don has a look at Eighty, where conditions were quite good; contact was made with CN8BB, EQ2WB, HV3SJ, K1NOL, K4MQG, KP4AN, LZ2ZK, VB1MSA, VE1FO, VE1QM, W3GM, ZL3GS, 9H1BX and 9Y4AU.

Eighty for G3ZAY was worth his while, raising as it did such SSB stuff as VP2MM, VP2MJ, WBØFFG/P/TF, PY7BLV, VE1, VE2, W1, CR4BC, PJ2CW, 8P6CX, OX3JW, EL2CB, VP2LY, 9Y4PA, ZC4BJ and VP7NY on AM.

On Eighty G2HKU managed HBØXHW on CW, with 4X4NJ and 9H1BX to complement him on SSB. Some new countries were picked up on Eighty by GM3YOR when Drew pounded brass to raise UA9CM, VE1ZZ and W's, all new ones to him.

To G3DCS the bands have both been all W—WA1HJT, W4DRM, W1DIT, W2UEZ, W2LL and 3A1CG on *Eighty*, plus W8CCN on *Ten*.

Now Fifteen

Naturally, mainly daylight. For G3DCS, odd W's here and there only. However, to G3ZAY goes a proportion of the spoils—his new FT-560 did the trick with CX6AM, VS6CY, PY's, 8R1J, DU1KJT, KR8EA, VS6DO, 5T5AD, 5T5YL, VU2IE, G3MUL/CE3, 9H3B, all W call areas, ZE1BJ, ZL's and VK's.

G3NOF comments on the shift in time of long and short-path openings to VK/ZL with the season, to around 0830 and 1200z respectively. There were EP8CS, JA4KFA, JA5YFG, JA6URB, KS4CJ (Swan Is.), VS6CY, ZD8TS and ZL3UY to attest to his reasoning.

G4AMT could not report anything on his favourite band this time, thanks to the ravages of the winter on his Quad. On the other hand, G4AMJ had been on the band only one day when he wrote, but already he had knocked off three new countries, in the form of 9H1, JX, and VU2JN, who came back to a CQ. Last-minute additions in the postscript indicate further gains were made the following day, by way of VK3 and VK6.

It was a case of all SSB for G2DC, who found Fifteen by far the best band. He hooked up with HI3PC, KR6KF, PZ1AV, UL7FA, VB1MSA, VK2WC, VK3LT, VK3ZT, VK5MF, VK6OD, ZS1, ZS2, ZS6, ZL1ADO, ZL1VN, ZL3RP, ZL3SE, all W and VE call areas, and 5Z4MO.

Those QSL's

DJ6SI advises, by way of W4WFL/1, that cards for the

L.Th. ("Bob") Bergé, Box 331, Antwerp, is ON4QX and runs all-British equipment—perhaps because during the 1940-'45 War he was a radio operator in the Royal Navy. Licensed since 1936, he is one of Europe's leading DX men and holds some 250 operating awards, with 294 countries confirmed on CW. He has also done a lot of travelling around in the DX context and his card shows that he has been licensed under nine European callsigns.

DJ6SI/LX, LX3BD and HBØXHW exercise should be sent direct to DJ6SI. From the same source, W4WFL, we have it that ZS6BBK is looking after the QSL chore for VP8JT in South Georgia. W1NYA, who has been handling the cards for TA3AY, advises he is up to date to the last logs received by him—September 15, *1970*. Any later ones cannot be confirmed; it is understood that TA3AY has been jailed by the Turkish authorities(!).

G3NOF has his usual pile. *6Y5GB* to VE3GMT; *ZD8TS* to G3WDV; *ZD3Q* to OZ3PO; *5H3MV* to VE7SE; *VKØCC* to VK2BRK; *A2CAL* to DK2SI; *VP3MA* to VE3BWY; *KS4CJ* to KV4AM; *VP2MM* to W1URM; *PZ1DR* to Box 396 Paramaribo; *FP8CS* to Box 2, St. Pierre; *W6MTE /KS4* to Swan Is, *via* Miami AMF, Miami, Florida; *9Y4VU* to W3EVW, and *FG7XT* to K5AWR.

Odds and Ends

We note from the latest issue of Geoff Watts' *DX News Sheet* that 3D2 is the new prefix for Fiji, and 3D6 for Swaziland, both of which are represented on the bands.

WA5VTU, Dave Decker, apparently got close to Spratley Island on January 6-7, but could not land due to high seas; at the time of writing he is believed to be no longer in the vicinity. VK3JW plans to make a trip to Mellish Reef in late March as VK3JW/M, plus, possibly VK3JW/F on Frederick Reef, and VK3JW/T from Turtle Island; however, this is somewhat dependent on the attitude of ARRL in the future over the question of giving "country status" to various unclaimed reefs and islands; the whole vexed problem is still under consideration at the time of writing—*see* "Points of Interest," p.669, January.

Tables

This month is the last for the existing arrangements. Next month sees our first showing of the Top Band CW/Phone County Table, scored as explained on p.656, January. And if there aren't enough to start the table with a nice long list, out comes G3KFE's rusty ragged chippy chopper to put it out of its misery!

Signature

That's the lot, good people. Our deadline for next month is **February 7** latest, addressed CDXN, SHORT WAVE MAGAZINE, BUCKINGHAM. Meantime, good hunting.

(Closing dates for months following are *March 13*, *April 10* and *May 8* —those who communicate by air-mail may care to note these dates.)

MOBILE RALLY FIXTURES

During the next few months, we shall be publishing details about the Mobile Rallies arranged for the coming season. So far, we have two firm dates notified: The annual North Midlands at Drayton Park, Tamworth, Staffs., on Sunday *April 16*, and the Anglian at the Suffolk Show Ground, Ipswich, on Sunday *June 25*.

Organisers are reminded that they should let us have their details as soon as possible, and listing will commence in the April issue. Address to: "Mobile Rally", SHORT WAVE MAGAZINE, BUCKINGHAM.

POINTS OF INTEREST

The brothers Thompson, of Morpeth, Northumberland, have recently become fully licensed, and with consecutive callsigns. T.N. is G4AVN, and R.J. is G4AVO.

* * *

We congratulate George Twist, Ll.M., G3LWH/EI5CF, Chief Constable of Bristol, on having been appointed C.B.E. in the New Year Honours List. He is also a holder of the Queen's Police Medal.

With his special knowledge and understanding of radio communication, G3LWH is at present in charge of an experiment by Bristol Constabulary in collaboration with the Directorate of Telecommunications, Home Office. This involves the transmission by fascimile of documentary matter from Force Hq. to Police radio cars. The advantages of the system now being tested are that while normal speech working on the same frequency is not impeded, a high degree of privacy can be ensured in message handling and the equipment can go on copying traffic while the crew of the car may be temporarily absent.

* * *

Just to give you an idea of what can go on outside our bands in the purely domestic context: Mullards have produced a magnetron, Type YJ-1420, for microwave ovens operating in the 2·43-2·47 GHz range, capable of an RF power output of 900 watts at an anode voltage of 3800v. Some RF filtering is built in—you will be glad to know.

* * *

B. H. Morris (Radio), Ltd., 84-88 Nelson Street, Tower Hamlets, London, E.1 (*01-790 4824*), the well known radio factors, inform us that since December 16 they have had a large quantity of Trio equipment, hi-fi and radio, pilfered from a container lorry. Anyone offered such gear in what the firm calls "unusual circumstances" is asked to contact B. H. Morris, Ltd., immediately.

* * *

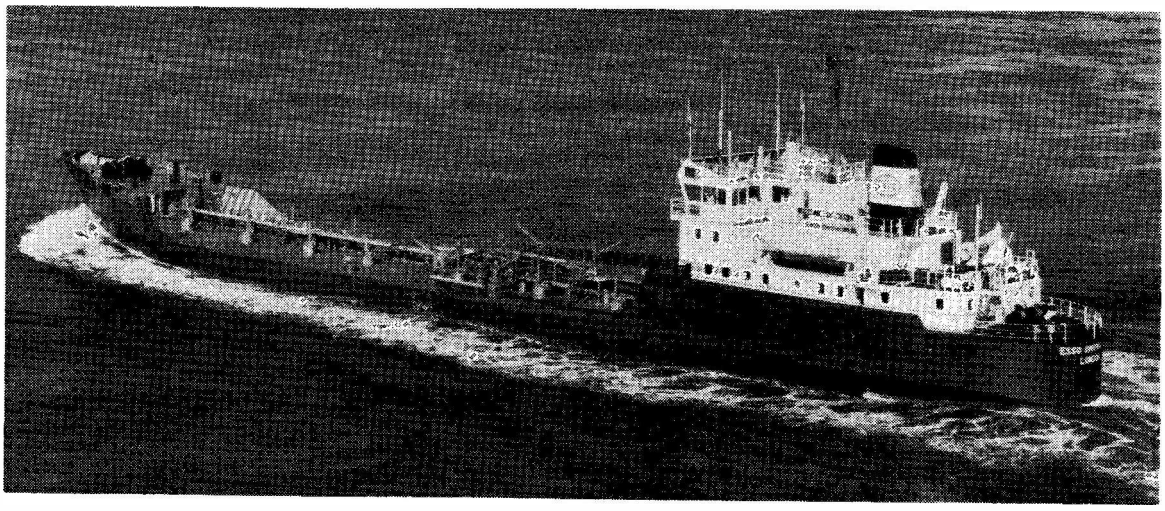
There are now nearly 17,000 U.K. amateurs licensed, in the Class A/B categories, the Class-B's being about 18% of the total and making their mark mainly on the two-metre band. Approximately 3,200 of all British amateurs are also licensed for mobile operation.

* * *

With reference to that Map on p.659 of our January issue, it now seems that—though in fact we obtained it from quite another source—the copyright is claimed by the RSGB. On the evidence they have submitted, as a matter of courtesy we accept this.

* * *

An interesting new appointment notified recently is that of Lord Orr-Ewing, G5OG, as deputy chairman of the Metrication Board. He is also chairman of Ultra Electronics, Ltd. and on the board of several other companies.



This smart little ship is the new 3,350-ton coast-wise tanker "Esso Inverness", GOPY, built at Appledore, North Devon. Her radio officer is Richard Constantine, G3UGF/MM, active on two metres and getting himself well known on the air all round the coast. The 8-element Yagi for two metres is mounted on the upper bridge deck, on the port-side rail. The "Esso Inverness" was launched only about a year ago and recently gave assistance, in very heavy weather, to a small vessel off the Cornish coast.

Picture courtesy Esso Petroleum

GOING VHF /MM

EXPERIENCES ON TWO METRES

R. C. CONSTANTINE (G3UGF/MM)

FEW people realise just how difficult it is to obtain a Maritime Mobile licence in the U.K. Apart from the annual fee of £9 and the limitations of crystal control, the would-be operator must have the written permissions of the ship's owner, her master and the marine radio company. Before granting a licence the equipment must be surveyed and approved both by the Board of Trade and the Post Office—so it isn't really surprising that G/MM's can be counted on the fingers of one hand.

I first sampled /MM whilst assigned to the Royal Research Ship *Discovery*, an oceanographic research vessel. My first application took over three months to process, so you can see that the prerequisite of any amateur /MM activity is to find a ship one likes. It wasn't easy operating my HW-32A-with-dipole from a "rolling cork" but, as always, the results more than justified the effort. Being a scientific ship brought with it some rare kinds of interference problems, mainly caused by unscreened experimental gear, but far more serious was cross mod. on the two dozen or so domestic S/W portables using a communal aerial to receive the BBC on 19 or 25 metres. However, many interesting QSO's were achieved during quiet moments, including daily skeds with the home QTH.

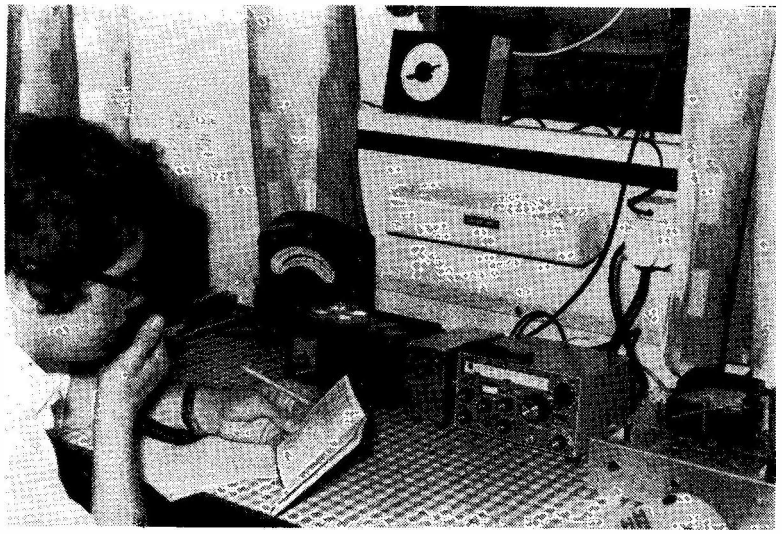
Always eager for a new experience I saw great potential in transferring to one of Esso Petroleum's three new coastal tankers. I got a posting to the *Esso Inverness* in March of 1971. The possibility of VHF operation near to the coast was obvious and as all my previous VHF activity had been strictly portable due to my poor home location, here was a real chance to get my feet "seriously wet."

Getting Going on VHF

Fortunately no one raised any objections to my application, and subject to the normal red tape I was operational by August. I decided that a beam was the only way but that I would have to use a rotator. An 8-element Yagi was deemed to be a good compromise between gain, bandwidth and wind stability, which is all-important even in calm weather due to the relatively fast forward speed of between 12 and 14 knots. A suitable mount was found on the "monkey island" above the bridge, being relatively clear of most obstructions whilst screened from the ship's TV aerial by the funnel. From there the cables were run to the radio officer's cabin, two decks below on the port side. The only way that the indicator could be set up was to make North correspond with the ship's bow and so always head the antenna relative to the ship's course. It took a little working out at first but with practice it became quite simple and the ship's position could be located relative to that of the beam heading to a known shore station.

A constant problem is salt on the aerial as well as carbon deposit from the funnel but corrosion has been slowed by coating the rotator in grease and covering it with a plastic bag. The aerial hardware is also liberally coated and the Yagi is washed in fresh water regularly—this being necessary when the SWR begins to rise.

The original Tx was home built, most of it having been constructed on board. Unfortunately, it never saw a QSO as it was smashed beyond repair during some unexpected heavy weather shortly before completion. The PSU was salvaged, temporarily, and pressed back into service to drive the new Tx, which is the series-gate modulated rig shown in the picture. Reports on the

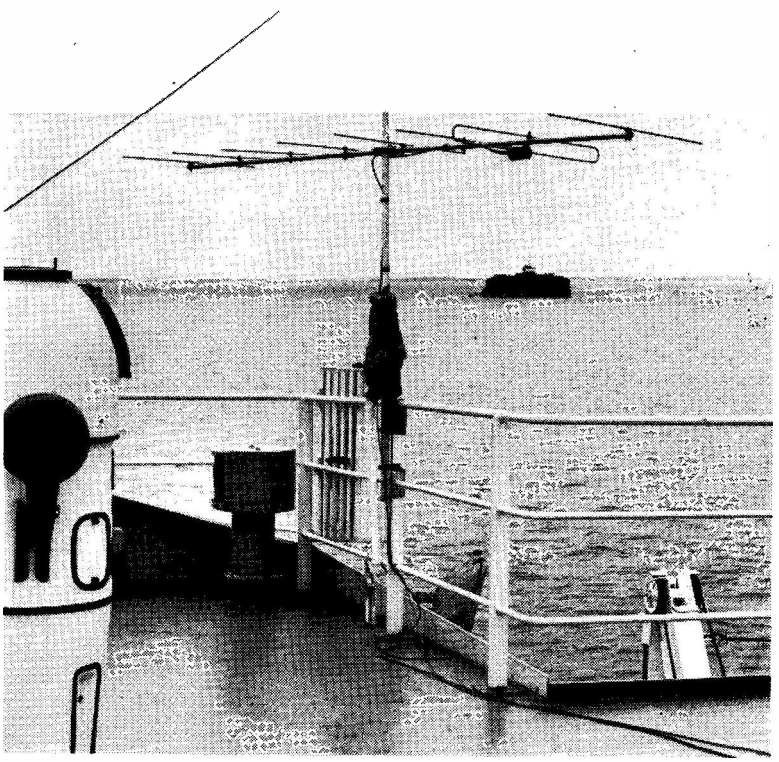


G3UGF/MM at his two-metre rig aboard m.v. "Esso Inverness". The Tx is plate modulated, using a pair of EL84's, and the receiver is a DL6SW-type converter, IF 28 to 30 MHz, into a Davco DR-30 as main receiver, this being a small solid-state job—see text.
Picture courtesy Esso Petroleum

speech quality have ranged from "beautiful to rubbish" and after four builds I stopped trying to please all of the people all of the time. It's a wonderful way of making the most of your resources provided that you don't ask just too much from it; I have also concluded that some people or their receivers just don't like it. Since the photograph was taken I have built a small outboard plate-modulator using EL84's and the resulting reports have been most complimentary.

The Avo and diode probe indicator have also been replaced by a VHF SWR bridge and power meter. The receiver set-up remains the same—a DL6SW converter feeding 28-30 MHz into a Davco DR-30 Rx. This is a lesser known American receiver covering only the amateur bands and giving many refinements in spite of its tiny size. It has 27 semiconductors in it including some FET's and runs from a home built matching 12-volt PSU. I hope soon to make an SSB exciter for 2 metres using the external facilities of the Rx but that is still in the thought stage.

(over



The 8-ele Yagi used by G3UGF/MM in his operations from the m.v. "Esso Inverness". This aerial is mounted on the port side of the monkey island (above the main navigating bridge) and has to be strongly constructed because the ship creates a "normal head wind" of up to 14 knots. It is protected against salt wind and water. The zero setting for the beam is fore- and aft, and rotation is with respect to the ship's head—see text.
Picture courtesy Esso Petroleum

Results

Since my activities have become known QSO's have become easier to get as more stations beam seawards. The vessel's routes are most convenient and give lots of stations the chance of a contact. The ship spends a few weeks at a time operating to West coast ports from its base at Milford Haven refinery and then transfers to South and East coast operation from Fawley refinery near Southampton. On occasions the ship visits ports in Eire and Northern Ireland and travels as far North as Inverness itself on the East coast. So you can see that G3UGF/MM really gets around. This is excellent as it has already enabled me to sample VHF activity all over the country and to give QSO's over a very wide area.

Maritime mobile on VHF brings with it all kinds of unexpected complications—for instance, very slow flutter, possibly due to coastal obstructions or some kind of refraction. Often my antenna, 45 feet above actual sea level can be still 100 feet below ground level dependent on the coastline.

One night in the Manchester Ship Canal the locals refused to work me because, as I heard one remark, "with an S9 signal and a Yorkshire accent he's just got to be a pirate"!

Unfortunately, the national habit seems to be to stick to the old band plan system which means that stations either work in fixed channel nets with crystal controlled receivers or they only tune their little bit of the band which often, to my ears, causes them to miss out on quite a bit of the activity. To counter this I have had to double my number of crystals in order to be heard at all.

There's plenty to keep me busy both on and off the air. Immediate plans are to make the gear more compact, as it all has to be stored away when I go on leave. Should I decide to stay with *Esso Inverness* over a longer period there are plans afoot to persuade the Ministry to let me try 4 metres and 70 cm.

RTTY CONVERTER CONSIDERATIONS

VALVE DESIGN WITH INTERESTING PRACTICAL POSSIBILITIES — HOW TO GET PRINT USING THE STATION RECEIVER

LET us first discuss a few points regarding RTTY as a method of communication for amateurs. One has heard it spoken of coupled with such phrases as "heavy QRM," "wideband FSK," "jingle-bells" and there are still a few amateurs to whom radio teleprinter transmission is mentally linked with the transmission of MCW or spark! Although RTTY *does* use FSK, the frequency shift is normally only 800 c/s and may be even less in the modern systems. On top of the 800 c/s bandwith thus required there is a small figure to be added dependent on the speed of operation. Using the international standard of 50 bauds* this additional width should not exceed 100 c/s, so that if we say the total bandwidth required is 1 kHz, this may be taken as the *maximum possible* requirement. In this 1000-cycle band, using RTTY, information can be sent at speeds up to 60 or more w.p.m., with an effect at the receiving end about four times as great as an A3 (phone) transmission using the same power. Interference to stations using RTTY will not be troublesome unless (*a*) It is very close to one of the frequencies used, or (*b*) It is of the wipe-out variety. There is no sideband splatter to annoy nearby fellow-amateurs, and TVI due to shock excitation is avoided since only the *frequency* of the transmitter is altered, its amplitude remaining constant.

When one considers the amount of information that can be transmitted in the bandwidth occupied, it is immediately obvious that RTTY is an extremely efficient communication system. (Of course, the commercial companies realised that years ago!)

General Principles

Having disposed of any possible objections to RTTY on moral grounds (!) let us now examine briefly the working of the system. While the mechanical/electrical details of a teleprinter machine are too complex to go into in this article, it may be stated that when the transmit printer is at rest the radio transmitter is radiating continuously on one frequency—called the *Mark* frequency. On depressing a teleprinter key, a 20 mS pulse is transmitted on the alternate frequency (differing from the mark frequency by the frequency shift employed)—this being known as the *Space* frequency. Following this signal is a combination of five 20 mS signals which may be on *Mark* or *Space* frequency according to the character depressed. Finally, a further 30 mS signal is transmitted, this completing the cycle of events.

At the receiving end, the different transmitted frequencies are converted to reversing DC which is applied to the coils of the printer electromagnet. That is to say, the frequency corresponding to *Mark* must be converted to DC of one polarity, while the frequency corresponding to *Space* is converted to DC of the opposite polarity. The reversing current through the electromagnet initiates a mechanical movement which results in the correct letter being selected on the typehead, and printed. While very much over simplified, this is the basic principle of operation.

Hence, the requirement at the receiver end is a device to produce the necessary level of DC to operate the printer, the direction of which being dependent upon the frequency of the radio signal being received at any instant.

The fundamental answer to the above requirement is some form of discriminator circuit—study of any such circuit will show a current output, the direction of which varies with the applied frequency, and there is of course

* *Baud*—a unit of circuit signalling speed, taking all mechanical, electrical and propagation factors into account. Over a given circuit, a rating of 50 bauds would be equivalent to a signalling speed of 62·5 words per minute, the average word being taken as a 5-letter group. (*Editor.*)

no reason why commercial practice could not be followed and a complete receiver built delivering its output in this form, suitably amplified, solely for RTTY use. From an amateur point of view this is not very satisfactory, since few amateurs will wish to build a receiver simply for RTTY use when they already possess very good receivers with conventional audio outputs. What is required is an *RTTY converter* enabling a conventional receiver to be used for teleprinter reception.

Since the incoming signal from the transmitter is in the form of continuous wave signals (the frequency shifting between two definite frequencies) if the receiver BFO is switched on, then the audio output will be in the form of two audio tones of any frequency one cares to chose, but separated from each other by the frequency shift. An RTTY converter will, therefore, be essentially a discriminator operating in the audio range, and this is what is to be described.

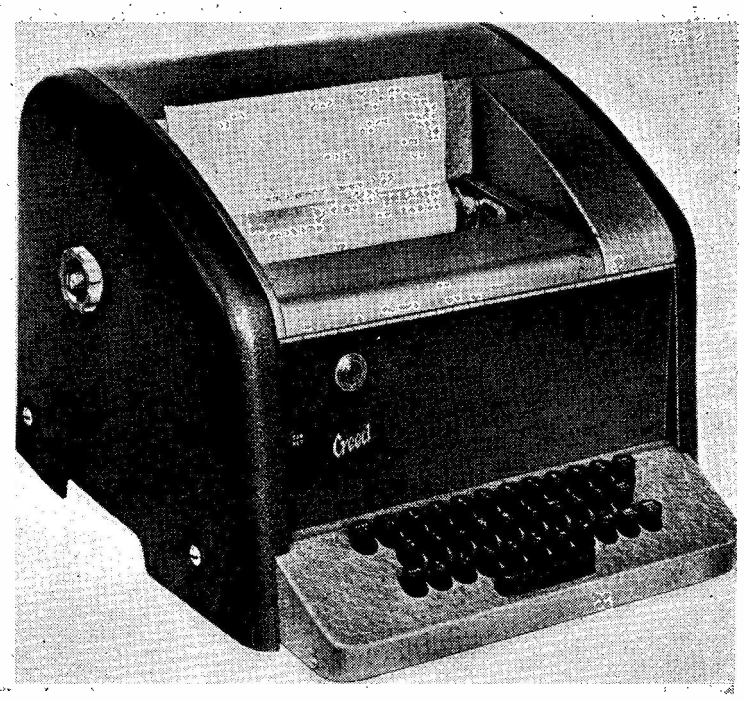
Most discriminator circuits rely on the resonant property of L-C circuits, making use of phase and/or amplitude changes which take place when frequencies near to resonance are applied. While perfectly simple when *radio* frequencies are employed, this becomes a good deal more difficult at audio frequencies, because large values of inductance are needed. These inductances are usually toroids because only this form of construction results in a sufficiently high Q. Toroids are difficult to wind when large, and not very easy to find on the surplus market. If for any reason it is required to change the resonant frequency of such a circuit (so as to accommodate different values of frequency shift) further complications are introduced, since impossibly large variable condensers are required; the only solution is to use a number of condensers with switching which results in jumps of frequency instead of smooth variation.

However, in the converter discussed here, these disadvantages have been overcome, since R-C circuits are used in place of L-C circuits. By making the "R" part variable, in the form of potentiometers, it is a simple matter to accommodate any value of frequency shift desired. Thus we get a neat solution to the problem, using normal audio circuitry.

Basic Converter Circuit

Basically, the circuit consists of two small AF amplifiers in parallel, identical in all respects except that they each amplify a chosen frequency much more than all other frequencies. One frequency chosen is that being delivered by the receiver corresponding to the *Mark* signal, the other that corresponding to *Space*. The outputs from these two amplifiers are rectified by simple diodes, and the DC resulting is combined in anti-phase in a common load resistor. This means that if the *Mark* amplifier is delivering a signal, DC will flow through the load in one direction, whereas if the *Space* amplifier is in operation, the DC through the load will be in the reverse direction. This reversing DC will, after suitable amplification, be applied to the teleprinter. The *Mark* and *Space* amplifiers use frequency-conscious negative feedback circuits in order to make them responsive to one audio frequency only, and these negative feedback circuits are designed around the "Bridge-T" filter network.

The Bridge-T network (*see* Fig. 1, p.735) is based on the Wien Bridge, and has the same property—that is, it will pass all frequencies from input to output except one particular frequency. While there will be some attenuation at all frequencies, attenuation at the chosen



The Creed Model 75 page-printer is a fine example of a modern teleprinter instrument, produced by a British firm with a world-wide reputation for high-grade telegraph apparatus. The Creed 75 is not yet to be found at "the average amateur RTTY station" but is the sort of machine to which all keen radio teleprinter operators will aspire, nevertheless!

frequency will be so large that one can, for all practical purposes, say that no input voltage will appear on the output side of the bridge. In the converter the bridge-T network is connected in series with a negative feedback circuit, resulting in heavy negative feedback at all frequencies except one—that to which the bridge is "tuned." The degree of negative feedback must be controlled since, at the "tuned" frequency, phase changes take place which introduce positive feedback; these, if excessive, will cause oscillation. The positive feedback is all to the good, since by carefully controlling it, not only are frequencies other than the chosen one heavily attenuated, but the required one is actually peaked up. The bridge network in one of the amplifiers is fixed and tuned to around 700 c/s. The network in the other is made variable and can cover from 1-3 kHz, thereby catering for any desired frequency shift between 300 c/s and 2300 c/s.

Converter Circuit Details

The practical circuit is as in Fig. 2, p.733. First in the valve chain is a limiter. This is essential so that the final DC produced by the diode rectifier shall be sensibly independent of the strength of the incoming signal. The circuit for limiting is that shown in any recent issue of the *ARRL Handbook*, to which readers are referred for details of operation. This circuit (like all others in that excellent publication) works extremely well and is to be recommended in place of simpler diode circuits. The component values given suit the voltage input from the writer's receiver (600 ohms output), but may need to be slightly adjusted in the light of individual requirements.

Next, a 12AT7 for each audio frequency (*Mark* and *Space*) is connected as a two-stage RC coupled amplifier with negative feedback applied between the anode of the second stage and the cathode of the first, *via* the appropriate bridge-T network, and a variable resistor to control the amount of feedback. The outputs from these amplifiers are fed to the individual sections of a further 12AT7 for voltage amplification. The amplified tones are then capacity coupled to two EA50 diodes, where they are rectified, and applied to a common load resistor in anti-phase.

Looking at Fig. 3 (p.735) if we consider diode D1 conducting as the result of a steady *Mark* tone, current will flow through the common load resistor in such a direction as to make the top of this resistor negative with respect to earth. If D2 is conducting as the result of the application of a steady *Space* tone, the top of the resistor will be positive with respect to earth. In actual practice there will be a small output from D1 on a space tone, and similarly from D2 on mark (as the amplifiers do not have zero-response off the chosen frequency) but the current from the driven diode is very much larger than from the other one, making the overall effect as though it alone was conducting.

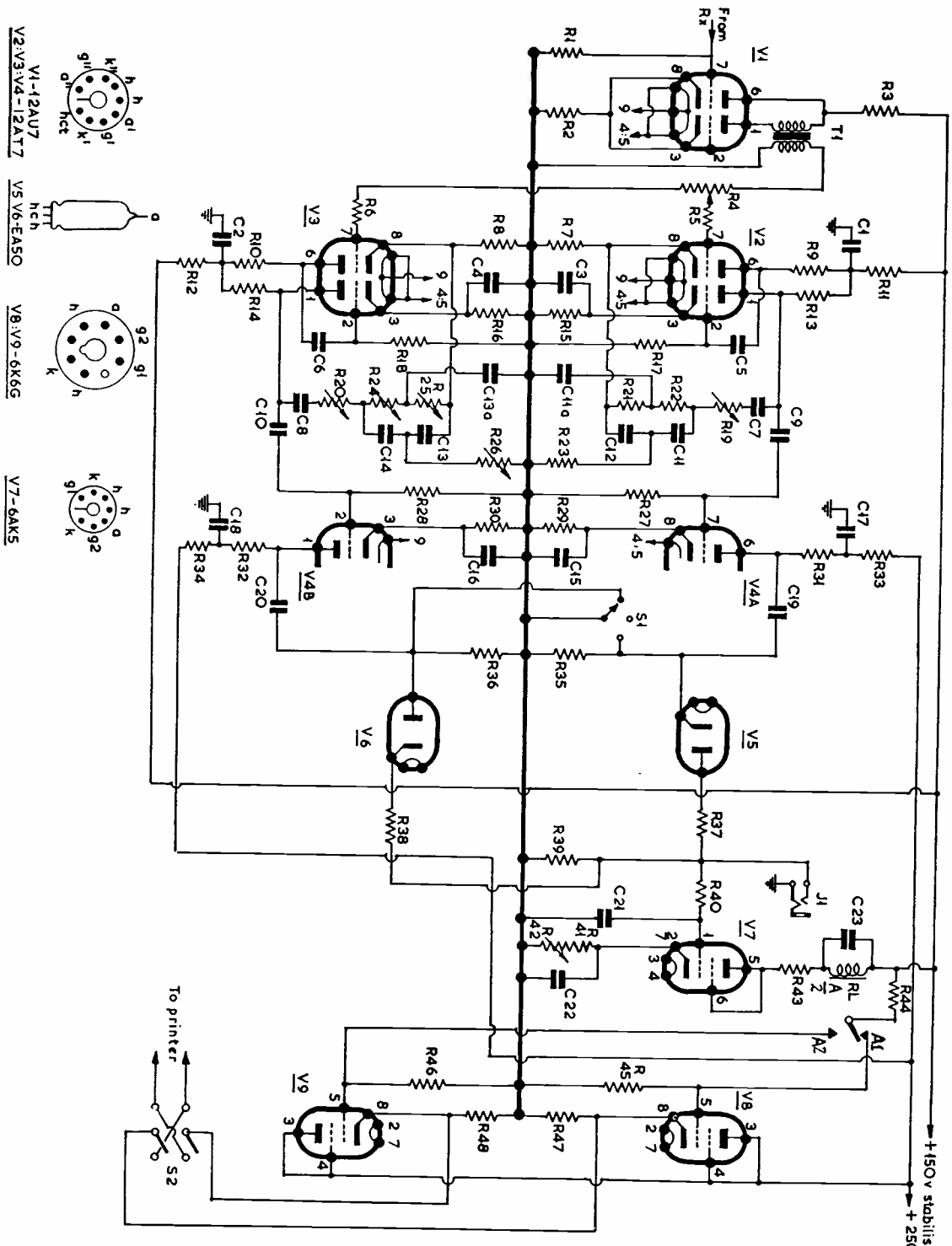
Amplification of Printer Signal

Having obtained a change-voltage in the diode common load dependent upon the frequency of the incoming signal, the next conundrum is to amplify this to a sufficient level to work the printer. Three problems immediately arise! (1) The actual current applied to the printer must be independent of variations in signal voltage—and some variations are to be expected in spite of the action of the limiter; (2) The DC component, *i.e.*, the current due to transmission of a continuous *Mark* tone while the transmit printer is at rest, must be retained; and (3) In the absence of *any* signal it is desirable that the converter shall automatically deliver a continuous *Mark* current to the printer which will otherwise race—that is, print no characters, but run continuously, wasting yards of paper! (There is nothing more unnerving than a chattering teleprinter doing nothing!) These three problems together make the use of any AC type of amplification extremely difficult, and the simplest solution is to relay.

This solves all three difficulties simultaneously: The output voltages from the discriminator is in the form of voltages at practically no power, so that the relay could not possibly be used direct from this source. The relay is therefore operated by the anode current of a valve which varies as the result of the discriminator voltages being fed to its grid. A valve having a *Gm* around 5 mA/V is suitable and a 6AK5, triode connected, can be used. This is cathode biased to show a standing anode current of around 9 mA, which is about the centre point of the characteristic. The anode current flows through the coils of a *Siemens* 2000-ohm hi-speed relay, the spring

C1, C2 = 16 μF elect.
C3, C4,
C15, C16 = 25 μF, elect.
C5, C6,
C7, C8,
C9, C10,
C19, C20 = ·01 μF
C11, C12 = ·001 μF
C11a,
C13a = ·01 μF
C13, C14 = ·002 μF
C17, C18 = 8 μF elect.
C21 = ·02 μF
C22 = 50 μF elect.
C23 = 0·1 μF
R1 = 50,000 ohms
R2 = 200,000 ohms
R3, R44,
R45, R46 = 500,000 ohms
R5, R6,
R31, R32, R37, R38, = 47,000 ohms
R7, R40
R15, R16 = 1,000 ohms
R9, R10,
R13, R14,
R35, R36 = 100,000 ohms
R11, R12,
R21 = 22,000 ohms
R17, R18,
R27, R28,
R39 = 220,000 ohms
R22 = 82,000 ohms
R23 = 5,600 ohms
R29, R30 = 1,500 ohms
R33, R34 = 10,000 ohms
R41 = 250 ohms
R43 = 100 ohms
R47, R48 = 4,000 ohms, 10w.
R4, R19,
R20 = 500,000 ohms
R24, R25,
R26 = 100,000 ohms, potentiometer
R42 = 1,000 ohms, w/w var.
V1 = 12AU7
V2, V3
V4 = 12AT7
V5, V6 = EA50
V7 = 6AK5
V8, V9 = 6K6GT
RL = 2,000-ohm high-speed relay
T1 = Audio xformer 1:1
S1 = Alignment switch, 1-pole, 3-way
S2 = Normal/Reverse switch, 2-pole, 2-way

Fig. 2. Circuit complete of the FSK converter for T/P reception, designed and described in the article. It allows for a useful range of shift variation, and for reversal of the impulses to the printer, so that "mark" and "space" can be selected in the correct sense. It is also possible, for test and setting-up purposes, to go over to "local control," for printing through the converter from the machine's own keyboard.


V1-12AU7
V2:V3:V4-12AT7
V5 V6-EA50
V8:V9-6K6G
V7-6AK5
From Rx
R1
R2
R3
T1
R4
R5
R6
C1
C2
R9
R11
R10
R12
R13
R14
C3
C4
C5
C6
R15
R16
R17
R18
C7
C8
C9
C10
R19
R20
R21
R22
R23
R24
R25
R26
C11a
C11b
C12
C13
C14
C15
C16
C17
C18
C19
C20
R27
R28
R29
R30
R31
R32
R33
R34
S1
R35
R36
R37
R38
R39
R40
R41
R42
C21
C22
C23
J1
RL
R43
R44
R45
R46
R47
R48
A1
A2
S2
To printer
+150v stabilised
+ 250v

tension of which is adjusted to counterbalance exactly the magnetic pull due to the steady anode current. The grid of the 6AK5 is fed from the discriminator load *via* a simple low-pass filter (of which more later) so that if the discriminator load becomes negative with respect to earth as the result of a *Mark* tone, the anode current of the 6AK5 is reduced, thus allowing the relay tongue to make contact with the upper stud, under the action of its spring; conversely, if the 6AK5 grid is driven positive as the result of a *Space* tone, the current through the relay is increased above the standing figure and the relay tongue makes contact with the lower stud. It is found in practice (in the writer's gear) that the relay will make positive contact with upper or lower stud for a variation of only about 1 mA above or below the standing figure, and since normal operation results in variations of plus or minus 7 to 10 mA, the relay operation is extremely satisfactory.

It will be realised that the use of cathode bias for what is really a DC amplifier will introduce considerable negative feedback, with consequent loss of sensitivity. For example, if the 6AK5 grid is driven positive by the discriminator, the increase of anode current will result in an increase of cathode bias, thus offsetting the original anode current increase to some extent. This is helpful rather than otherwise, in preventing overloading and excessive anode dissipation of the 6AK5, particularly when the grid is driven in a positive direction. On the other hand, maximum sensitivity *is* required for quick relay operation, so that a 50 μF capacitor is connected across the cathode bias resistor. This means that the instantaneous change of current from *Mark* to *Space* is not appreciably reduced, thereby ensuring correct relay operation, but very shortly after that, the steady current will settle on a value somewhat nearer the standing figure as the condenser discharges. Since T/P signals consist of more 20 mS pulses than anything else, one can consider that the amplifier is adequately by-passed, the negative-feedback effect only becoming noticeable on the longer signals, when it helps to reduce dissipation.

Filter Circuit

The simple low-pass filter between the discriminator load and the grid of the 6AK5 is required to remove as much as possible of the AC component in the rectified signal from the diode. In view of the fact that as "square" a DC pulse as possible is required at the grid of the 6AK5, it is not possible to remove, by filtering, all the AC component, and it is therefore necessary to connect a 0·1 μF condenser across the relay coils, to prevent them from "singing" at the frequency of the applied tones, and to maintain a steady contact pressure.

It has already been said that the relay spring must be manually adjusted to counterbalance exactly the steady anode current of the 6AK5, and so any variation in the anode current due to ageing, or to slight changes in component values, should be followed by further relay adjustment. This would clearly be tiresome, so part of the cathode bias for this valve is made variable, enabling the value of anode current to be readily brought back to the required figure if any changes take place.

Printer Operation

While the simplest possible method of operating the printer from the relay would be to connect the teleprinter coils direct to the relay contacts and a centre-tapped DC supply, it must be remembered that considerable inductive effects will be present due to the application of "square-waves" to the printer coils and that sparking is to be expected as a result. This would almost certainly lead to erratic relay operation, to avoid which it would be necessary to fit sparking suppressor circuits. It is, therefore, much simpler in the long run to feed the printer coils from valve circuits which electronically reverse the current applied, thereby avoiding complications.

In this converter the printer coils are connected in a bridge circuit as shown in Fig. 4, p.735. Under normal conditions, with the circuit considered entirely on its own, both valves are biased well back and the bridge as a whole is balanced, resulting in no current through the coils. Reference to the diagram will show that the 6K6 grids are connected to the relay studs, and that the relay tongue is taken through a limiting resistor to a positive source. If the relay tongue is making contact with the upper stud (as the result of a *Mark* tone) then the grid of valve A is made positive, thereby overcoming the cathode bias and causing the valve to conduct. This unbalances the bridge and current flows through the printer coils in the direction X-Y. If, however, the relay makes contact with the lower stud as the result of a *Space* tone, valve A is cut off, valve B conducts and current flows in the direction Y-X. Using the values shown, current through the coils is in the order of 18-20 mA, which is the correct figure. The cathode bias resistors should be matched quite closely so that the current through the printer coils is the same in each direction—this is rather important. (R47, R48, Fig. 2, p.733.)

Using the circuit shown, the relay operation is entirely spark free, the current it carries being only a fraction of a milliamp, and sensibly "square-waves" can be applied to the printer coils without inductive troubles. The additional valves and circuitry required to bring this about are very much worthwhile compared with trying to operate the printer directly off the relay contacts.

It is very convenient to be able to print directly from the machine's own keyboard without having to disconnect the converter in order to feed the printer coils with a local signal. To facilitate this, a jack socket is provided connecting, as shown, to the diode load. If a small reversing voltage of the order of plus/minus three volts, obtained from a battery *via* the printer keyboard (as shown in Fig. 5, p.735) is applied to this point the 6AK5 will operate in exactly the same manner as if the voltage were the result of rectification by the diodes causing the printer to operate. A further advantage of having this local position available is that it checks the operation of the 6AK5, relay and printer bridge network. Consequently, if the printer works on "local" it must print on incoming signals, providing it is running at the same speed as the transmitting printer and is compatible with the system of transmission.

If a centre-zero mA meter having an FSD of 50-50 mA is available, it may be connected in series with the T/P coils, when it should show equal deflection on either side

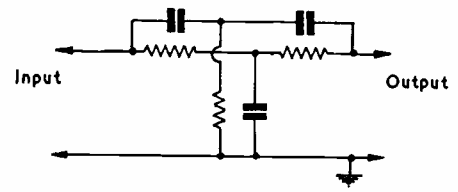


Fig.1 BASIC BRIDGE-T NETWORK

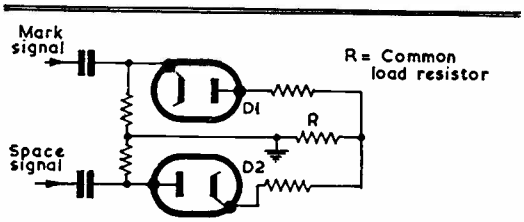


Fig. 3 BASIC DIODE CIRCUIT

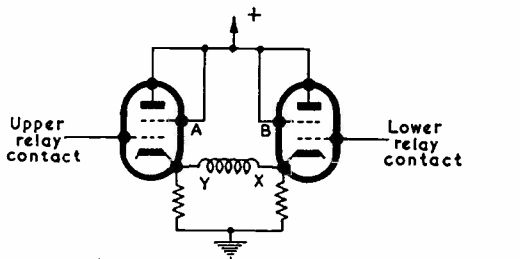


Fig.4 T/P BRIDGE CIRCUIT

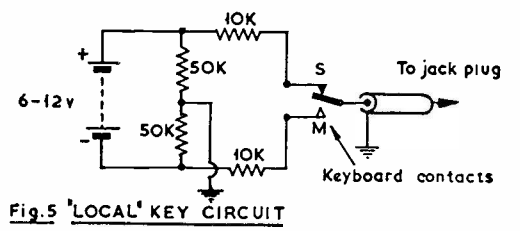


Fig.5 'LOCAL' KEY CIRCUIT

Figs. 1, 3, 4 and 5 above are discussed in detail in the text.

While this meter is useful, it is not essential, since the 6K6 current is unlikely to change.

Another meter, to measure the anode current of the 6AK5 is, however, more or less essential and should be wired permanently in circuit. It is suggested that a meter having a full-scale deflection of 20 mA be used—if the standing anode current of the 6AK5 is then set to 10 mA, this may be looked upon as a centre-zero meter, variations of anode current being considered as more or less than the standing current of 10 mA. Alternatively, a meter having an FSD of a much lower figure can be used with a preset variable shunt, in which case, with the anode current of the 6AK5 set at 9 mA, the shunt can be adjusted until the meter in use shows half scale. Providing the anode current is once set to a figure of around 9-10 mA, all that is required subesquently is a comparative indication.

Construction

The theoretical diagram on p.733 supplies practically all the information that is required for building the converter, since any amateur who is experimenting with RTTY is unlikely to need information on how to string a few valves together. The input to the converter is nominally suitable for medium impedance, but it will work satisfactorily off any source that will supply the necessary AF voltage. If it is worked from a receiver having a low impedance output (3-5 ohms) it will be necessary to interpose a matching transformer. It is suggested that the two 12AT7 amplifiers be constructed side-by-side, since this will result in short leads. In the writer's equipment the EA50's have been soldered directly in the wiring under the chassis, without using holders. Opinions vary as to whether this is "the done thing." but it certainly makes for short leads. The relay should be mounted in a position which will allow easy adjustment of the spring tension with the power switched on, as this is necessary during the initial setting up. Gain and other controls should be fitted in positions which permit short leads.

It must be remembered that the converter is essentially a multi-stage AF amplifier, so that adequate precautions must be taken to avoid hum and instability due to bad layout. If hum is present at the diodes it will seriously interfere with operation! The 4000-ohm cathode bias resistors associated with the 6K6 valves dissipate a fair amount of heat and should be mounted where their temperature rise will not adversely affect other components.

The power supply is conventional, delivering around 250 volts DC. The VR150/30 provides a stabilised voltage for those stages where variation in HT voltage might alter performance characteristics.

" . . . Sorry, OM, negative copy here . . . "

REGULATED POWER SUPPLY FOR BENCH WORK

IN THE TRANSISTOR CONTEXT — UP TO 40 VOLTS AT 500 mA

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

THE need frequently arises, particularly during experimental work with solid-state devices, for a stable, variable, voltage source with an output of ± 40 volts or so at currents up to about one amp. If the required output is known and fixed, then a series of zener diodes of high power ratings will often fill the bill but, particularly during development stages, this is rarely the case, and such items tend to be expensive. A study of contemporary designs for stablised power supplies shows that either the circuit is so simple that adequate protection for both the load and the supply is not incorporated, or that the circuitry is complex and costly, and a multiplicity of transistors and diodes is used to achieve the desired standard of safety.

The complete design discussed here overcomes these objections by using an IC as the series stabilising element with a series pass transistor to increase the output current capability. Several circuits are shown which should meet most of the requirements for experimental purposes, and a unit giving positive or negative output up to 40 volts or so at 500 mA, with load and supply protection, is described in detail.

Basic Designs

The designs which follow are based on the *Fairchild* μA723 precision voltage regulator, but equivalent devices are made by several manufacturers—among these are the *Mullard* TBA281, the *SGS* L123, the *Signetics* 5723L and the *ITT* MIC723 as direct replacements, but these are not widely available on the surplus market, whereas the μA723 is.

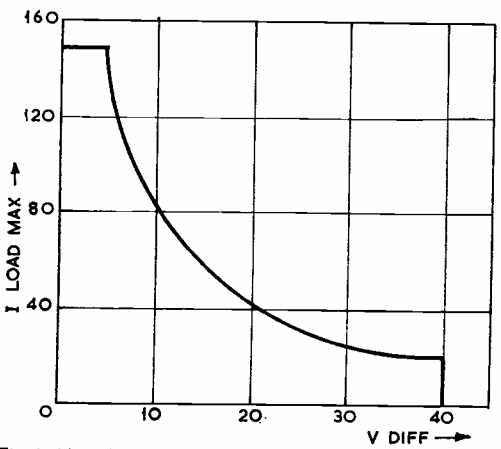


Fig. 1 Max. Load Current

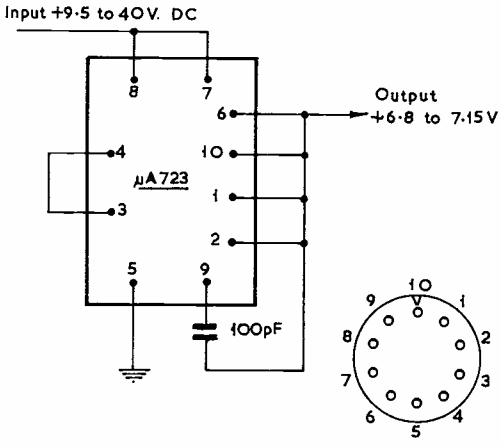
P 125

Typically, the device regulates to within 0·1% of the output voltage when the input voltage is varied from 12-40 volts, and 0·03% of the output voltage when the load current is varied between 1 mA and 50 mA. Ripple rejection is up to 86 dB with input voltages lying between 9·5v. and 40v., and output voltages between 2v. and 37v. The maximum current which may be drawn without an external pass transistor depends upon the input/output voltage differential, and varies from 150 mA when the differential voltage is not more than 5v., down to 20 mA when it is 40v., this variation being related to the 800 mW power dissipation limit of the device. The graph at Fig. 1 shows maximum load currents *vs.* input/output voltage differential. Current limiting circuits are shown, and the way in which these may be varied to suit particular cases is described in the text.

The basic circuit is shown in Fig. 2. C1 is a frequency compensation component, and the output voltage will lie between the limits shown, which represent the internal reference voltage design spread. The maximum permissible current drawn by the load is a function of the input/output voltage differential mentioned above. The base connections shown are applicable to subsequent diagrams.

Low-Voltage Unit

Fig. 3(a) shows the circuit for the low voltage output regulator (+2v. to +6v.), and with the typical values given for R1 and R2, the output voltages will be within 5% of nominal. For greater accuracy, R1 and R2 may be replaced with the network shown at Fig. 3(b), which provides an adjustment of ± 10%. Any voltage between +2 and +6 volts may be obtained by calculating the



Pin connections

1	Current Sense	6	Output
2	Inverting Input	7	Transistor Collector
3	Non-inverting Input	8	+ve Supply
4	Reference Voltage	9	Frequ. compensation
5	−ve Supply	10	Current Limit

Fig. 2 — Basic Regulator Circuit

P 126

General impression of the PSU as constructed by G3DAH and described in the article. It could have been fitted into a smaller cabinet, there being no very heavy iron-core components involved.

values assigned to R1 and R2 using the formula:—

$$V_{out} = V_{ref} \times \frac{R2}{R1 + R2}, \text{ where } V_{ref} = 7{\cdot}15v.$$

Note that the maximum current which may be drawn from V_{ref} is 25 mA. For maximum (150 mA) current out, V_{in} should not exceed 9v. R3 is the temperature compensation resistor, the value of which is given by:—

$$R3 = \frac{R1 \cdot R2}{R1 + R2}$$

for minimum drift, but this component may be omitted for minimum component count. C1 provides frequency compensation.

R_{sc} is the short-circuit current limiting resistor, and this requires further explanation. A voltage of 0·65v. (V_{sense}) applied between terminals 1 and 10 of the regulator will shut the device down. For example, if R_{sc} is made 10 ohms, then the output voltage will drop to zero when any current in excess of 65 mA is drawn by the load. The relationship may be expressed by the formula:—

$$I_{limit} = \frac{V_{sense}}{R_{sc}}, \text{ or } R_{sc} = \frac{V_{sense}}{I_{limit}}$$

By making R_{sc} variable, a 100-ohm component with

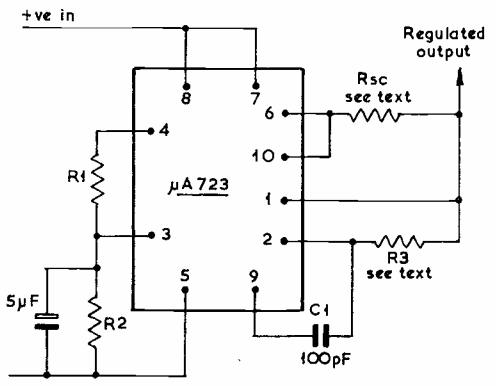


Fig. 3a. Basic Low Voltage Regulator +2 to 6 volts

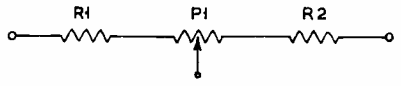


Fig. 3b Output Voltage Adjustment

P 127

Volts Out	Fixed Output		Adjustable Output		
	R1	R2	R1	P1	R2
+3	4·12	3·01	1·8	0·5	1·2
+5	2·15	4·99	·75	0·5	2·2
+6	1·15	6·04	0·5	0·5	2·7

Fig. 3. Resistor values in K-ohms for standard output voltages, as shown above, for the LV regulator.

suitable wattage rating would do; the current limiting may be set to anything between a few mA and the maximum permitted by the V_{diff} and the 800 mW rating. However, if a variable R_{sc} is used, it would be a good plan to place in series with it a resistor of such a value that, with the input voltage used, the maximum permitted dissipation can never be exceeded.

High-Voltage Unit

By moving the divider network to the opposite side of the integral error amplifier, a high output voltage (+8 to +37v.) can be made available, and Fig. 4 shows the circuit with values of R1, R2 and P1 for a range of typical output voltages. For intermediate voltages, use the formula:—

$$V_o = V_{ref} \times \frac{R1 + R2}{R2}$$

for calculating the divider values. R3 is calculated from the same formula used for the low-voltage supply, as is the value of R_{sc}. V_{in} must now be increased to 40 volts for 37v. out. Watch the current drawn by the load as V_{out} is reduced, so that maximum dissipation is not exceeded. Output is variable between 7v. and 20v. with current limiting between 8 and 35 mA.

HV Unit with Variable Output

It may be noted, from the values quoted for R1 and R2 in Fig. 4, that R2 remains constant over a wide range of output voltage, with only the value of R1 varying. By substituting a 20K linear pot. for R1, and making R2 = 6·8K (the nearest standard value) a voltage range of from 7-24v. becomes available for an input voltage of +28v. For inputs and outputs in excess of these figures, R2 must be increased considerably in value, and the strategem of making R1 variable introduces complications. In any case, the V_{diff} then becomes high at low voltage outputs, and the permissible current drain is correspondingly reduced.

Since the relationship between R1 and R2 is no longer a constant, R3 is eliminated from the design and pins 3 & 4 are connected together, R_{sc} is made variable (100 ohms) to provide adjustable levels of current limiting, and a series safety resistance of 14 ohms may be added to keep the unit within the specified dissipation limits at

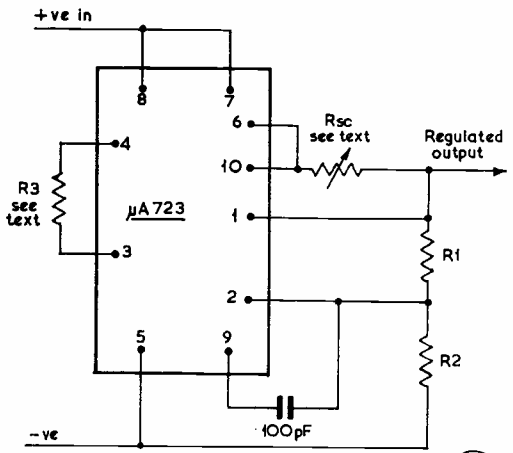


Fig. 4– Basic High Voltage Regulator

P 128

Volts Out	Fixed Output		Adjustable Output		
	R1	R2	R1	P1	R2
+9	1·87	7·15	·75	1	2·7
+12	4·87	7·15	2	1	3
+15	7·87	7·15	3·3	1	3
+28	21	7·15	5·6	1	2

Fig. 4. Resistor values in K-ohms for standard output voltages with the basic HV regulator.

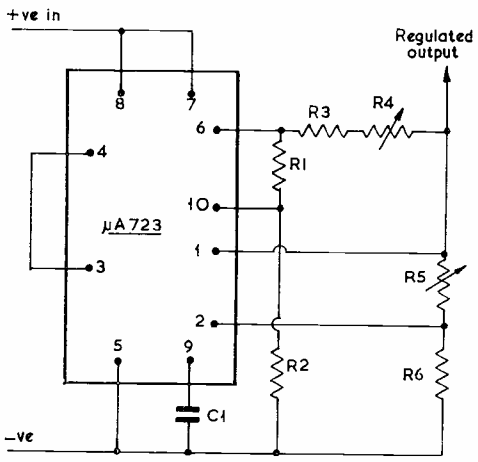


Fig. 5 - High Voltage Regulator with Foldback Current Limiting

Fig. 5. HV regulator with fold-back current limiting, for which values are : C1, 100 pF ; R1, 1.2K ; R2, 8.2K ; R3, 50 ohms, 5w. wire-wound ; R4, 100 ohms, 10w. w/wound ; R5, 20K linear potentiometer ; R6, 6.8K. All fixed resistors rated half-watt, high stability, except as indicated.

all times. Thus, an output of 7v. to 24v., with current limiting between 8 mA and 45 mA is, realised.

Current Limiting

In the designs so far considered, current limiting is obtained by the adjustment of the value of R_{sc}. This means that, above a pre-determined level of output current, the voltage supplied by the regulator reduces to zero, so that even if the output is short-circuited, the load is protected. However, the current drawn from the supply is then at a maximum, and this is often undesirable. To eliminate this feature, foldback current limiting may be introduced as shown in Fig. 5, and this has the effect of reducing *both voltage and current output* to zero when a short-circuit is applied at the output. However, the introduction of R1 and R2 modifies the performance. The safety resistor must now be increased in value (to 50 ohms in the example given) to keep within the permitted dissipation, and the range of current limit control becomes, for example, 15 to 35 mA at an output of 7v. and 28 to 75 mA at an output of 18v. This does not seem to be any particular disadvantage, but if it is unacceptable, and current limiting below these values is essential, then the fold-back feature must be foregone.

Negative Supplies

So far, we have only considered positive output supplies. It is possible to use the μA723 to give negative outputs, and Fig. 6 shows a typical circuit—but there are difficulties in applying current limiting, and more components are required. The simple solution, and that adopted in the final design, is to use two, identical, positive, output circuits, isolate then from earth, and reverse the polarity of one of the outputs. This will then give a negative supply with all the features of the positive supply, and will have the added advantage that if the two outputs are connected in series, a variable supply of up to 40 volts or so becomes available.

If this is done, however, precautions must be taken to protect the 2N3055 from excessive, reverse base/emitter voltage since it is very unlikely that both supplies will current limit at exactly the same level, and if they do not, then one of the 2N3055's will be destructively reverse biassed. The answer is simple. Connect a reverse-voltage crowbar diode directly across the output

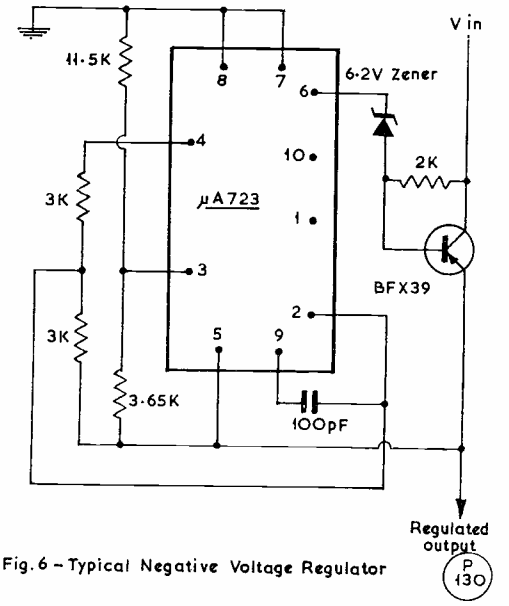


Fig. 6 - Typical Negative Voltage Regulator

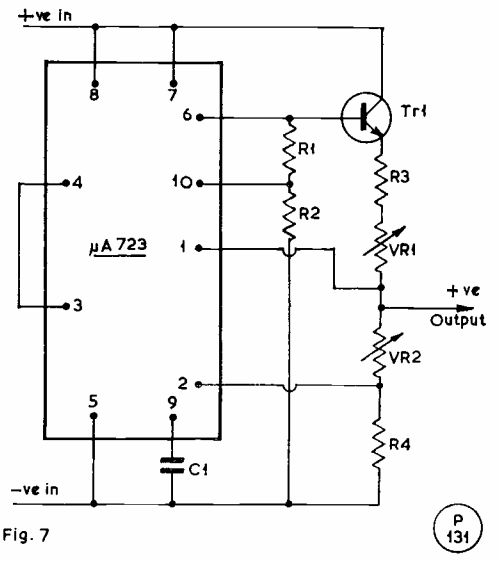


Fig. 7

Fig. 7. HV regulator with current limiting and external pass transistor. The values are : C1, 100 pF ; R1, 1.2K ; R2, 8.2K ; R3, three-ohm 5w. wire-wound ; R4, 6.8K ; VR1, 100-ohm 25w. w/wound ; VR2, 20K linear potentiometer ; and Tr1, 2N3055. (All fixed resistors rated ½w. high-stab., except R3.)

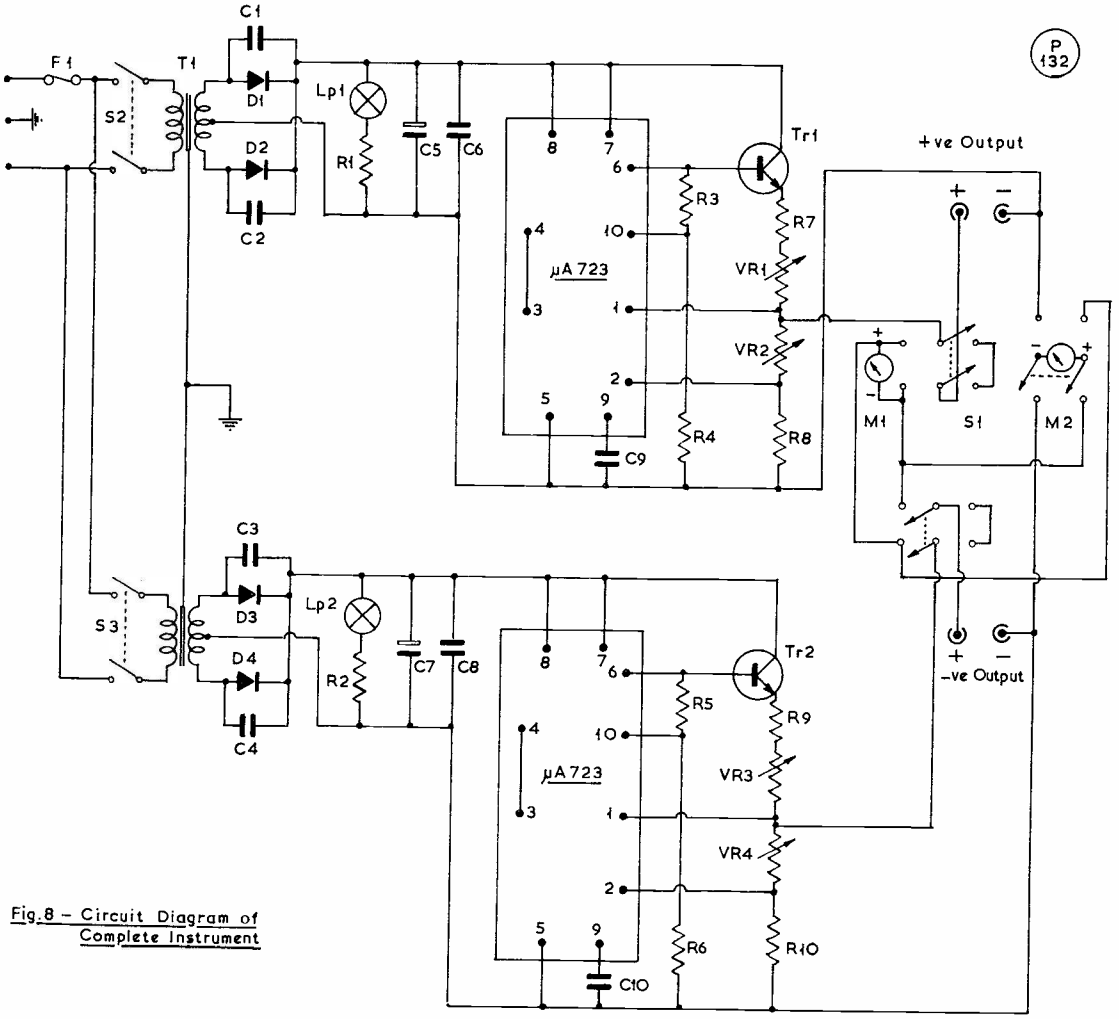


Fig. 8 – Circuit Diagram of Complete Instrument

Table of Values

Fig. 8. The PSU circuit complete

C1, C2, C3, C4, C6, C8 = ·01 μF, 100v. wkng.
C5, C7 = 1,000 μF, 50v. wkng.
C9, C10 = 100 μμF
R1, R2 = 470 ohms, 1w.
R3, R5 = 1,200 ohms, ½w., hi-stab.
R4, R6 = 8,200 ohms, ½w., hi-stab.
R7, R9 = 3 ohms, 5w., w/wound
R8, R10 = 6,800 ohms, ½w.
VR1, VR3 = 100 ohms, 25w., w/wound
VR2, VR4 = 20K linear potentiometer

Lp1, Lp2 = 24v. 1w. pilot lamp
T1, T2 = 20v. 750 mA xformer (*T2 is lower xformer in diagram*)
F1 = 1 amp cartridge
S1 = 6p 2w. switch
S2, S3 = DPST toggle
M1 = 0-500 mA meter
M2 = 0-50v. meter
D1, D2, D3, D4 = 1N4002 rectifiers
D5, D6 = BY-100, or 1N4002
Tr1, Tr2 = 2N3055

of each supply. This consists of a high current silicon diode, such as the BY100 or 1N4001, with its cathode connected to the positive terminal and the anode to the negative terminal of each supply.

One word of warning. Since these IC's are in fact high-gain amplifiers, it is possible that they will oscillate under certain loading and layout conditions. Such an oscillation, if it occurs at all, is likely to occur at supersonic frequency and may be observed on an oscilloscope If such a check shows it to be present (or as a preventive measure) 0·1 μF, 30v. working capacitors may be connected directly across the output terminals.

External Pass Transistor

The permissible current drawn from the regulator can be increased by the use of an external pass transistor, and Fig. 7 shows a circuit using this expedient, the μA723 functioning as a series control element for the 2N3055 pass transistor. With the values given, currents of up to 500 mA may be drawn, the exact level being

determined, and therefore limited, by the value assigned to the resistor in series with R_{sc}. As long as the input supply will carry it, and the external transistor pass it, even higher currents could be drawn but one hastens to add that this has not been tried, and that the V_{sat} of the pass transistor may limit the current drawn. The choice of the 2N3055 and the limit of 500 mA were dictated by the fact that no requirement is foreseen at G3DAH, for higher output currents.

DC Power Supplies

Since the requirement was for positive and/or negative outputs, either the mains transformer must have two identical secondary windings, or two transformers must be used. A single winding with a centre-tap common to both negative and positive supplies *must not* be used under *any* circumstances. The choice is left to the constructor. Protection against fast, high-voltage spikes on the supply can be ensured by using 0·01 μF capacitors across the rectifiers and the smoothing capacitor, and the latter can be discharged by a bleed consisting of a pilot lamp and series resistor, which thus has a dual junction, since it indicates "ON/OFF" as well. Note that no part of the secondary circuit is connected to earth. If it is intended to use the PSU to supply voltage to equipment containing IC's, it would be advisable to use a capacitor of 5,000 μF or so, and resistor smoothing.

Final Design

Fig. 8 shows the complete circuit of the instrument, and requires little more comment, since all the features have been described earlier, with the exception of the meter switching, and this is quite straightforward. The outputs are variable between 7v. and 24v. at currents which may be limited between 10 mA and 500 mA, all of which values are dependent upon the *minima* and *maxima* of the voltages and currents demanded, the V_{sat} of the 2N3055, and the inherent V_{in}/V_{out} of the IC.

Short-circuiting the output reduces voltage to zero, and current to something a little above zero, and by joining the "earthy" ends of the two supplies together, either a positive or negative output of 40v. or so at up to 500 mA is available. However, the crow-bar diodes *must* be fitted, as indicated on p.739.

Construction

The instrument was built into a case which happened to be available, and which is certainly larger than necessary. It should be possible to get the whole thing into a six-inch cube. The components associated with the μA723 are mounted on copper strip *Veroboard*, with a 0·15 matrix, the power supply is mounted in the base of the cabinet and the external pass resistors on the sides, which then function as heat sinks. If some other form of construction is used, separate heat sinks with insulating washers and bushes will be required. It is not essential to use holders for the IC's and they can be soldered directly into the wiring, provided that heat shunts are used during the soldering operations. The photograph shows the general appearance of the unit as installed at G3DAH.

Construction is simplified, and/or improved, by the use of an IC in this particular application, and it is more than likely that the cost will be lower than that of designs using a multiplicity of diodes and transistors to produce similar results.

ELECTRONIC MORSE CODE GENERATORS

OPERATION OF THE PROGRAMMER—PRACTICAL SCATTER DATA UNIT

Part IV

G. E. GOODWIN (G3MNQ)

The first three parts of this article appeared in our June-July-August issues of 1970, discussing various practical considerations associated with a fully automatic signalling device.—Editor.

LOOKING now at Fig. 24, overleaf, the start-button triggers Mono 3 which generates a re-set pulse. This is fed to all flip-flops (BS) and *via* NOR3 a positive control voltage is supplied to the oscillator. BS3 and 4 set so that AND1 produces a positive voltage on rail (*a*), the CQ line. Count proceeds until a reset pulse is generated by the CQ line which, *via* OR1 triggers Mono 1, to move BS1 and 2 on by one count and also *via* NOR3 resets the decade counters. BS3 and 4 have not received a trigger pulse, therefore rail (*a*) is still selected by AND1 and CQ is again generated. Reset occurs again, moving on BS1 and 2 by one count and CQ is once more generated. On receipt of the third reset from the CQ line BS1 and 2 again move on but this time AND7 produces an output which, *via* NOR2, moves BS3 and 4 on by one count.

Now positive rail (*b*) is selected and, depending on the position of SW1/A, the required band identification will be generated. The reset from this line is routed *via* SW1/B which actuates the reset according to the band selected, and the resulting positive pulse triggers Mono 2. This pulse *via* NOR1 returns BS1 and 2 to their initial state and *via* NOR2 moves BS3 and 4 on by one count so that AND3 energises positive rail (*c*), the callsign. This is then generated three times by the same process as the CQ; on receipt of the third reset pulse BS3 and 4 move to the fourth position. Assuming the stop-button has not been pressed, AND4 output, going positive, makes AND5 output positive (since BS5 has originally set so that one input to AND5 is positive), this triggering Mono 3, and the circuit then re-cycles.

If the stop-button is pressed at any time BS5 changes state and AND6 input is made positive. The circuit still goes on as before until AND4 produces a positive output and then AND6 output goes positive which energises positive rail (*d*), pse k. At the reset point on this line the positive pulse is inverted by INV1 which triggers BS6. This removes the control voltage from the oscillator so

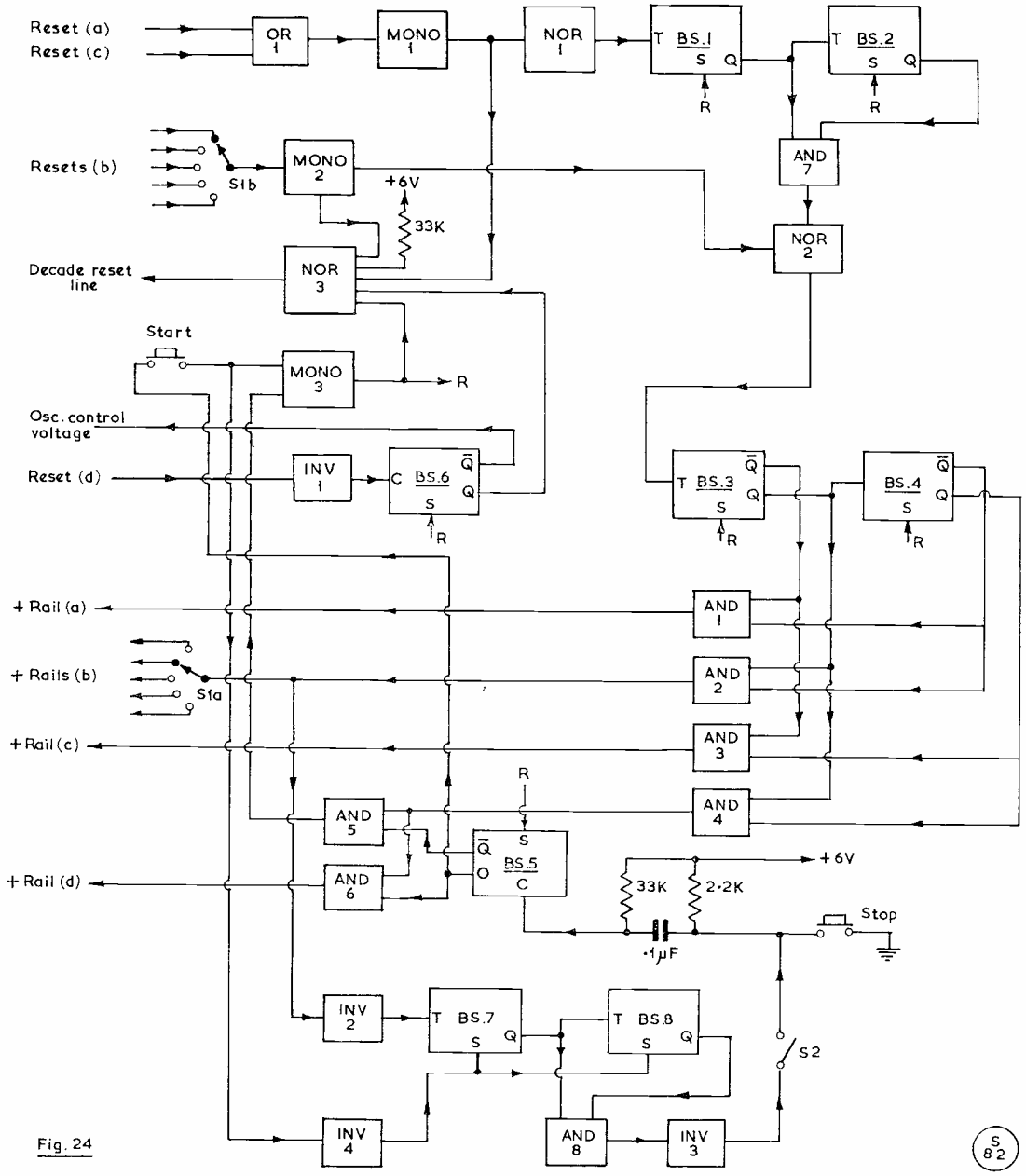


Fig. 24. Block diagram of complete CQ generator.

that no further counts can take place. The positive going output from BS6 also triggers Mono 2 which resets all the decade counters so that the output line can return to zero. (If this did not happen the decade counters would stay on the reset point and continuously key the transmitter.)

The circuit which limits the number of complete calls to three is really an add-on unit which could be omitted if desired but has been found useful in some cases. BS7 and 8 are set to their initial state when the start-button is pressed, INV4 producing the correct pulse. Every time AND2 output goes positive INV2 produces an output which triggers BS7 and 8. On receipt of the

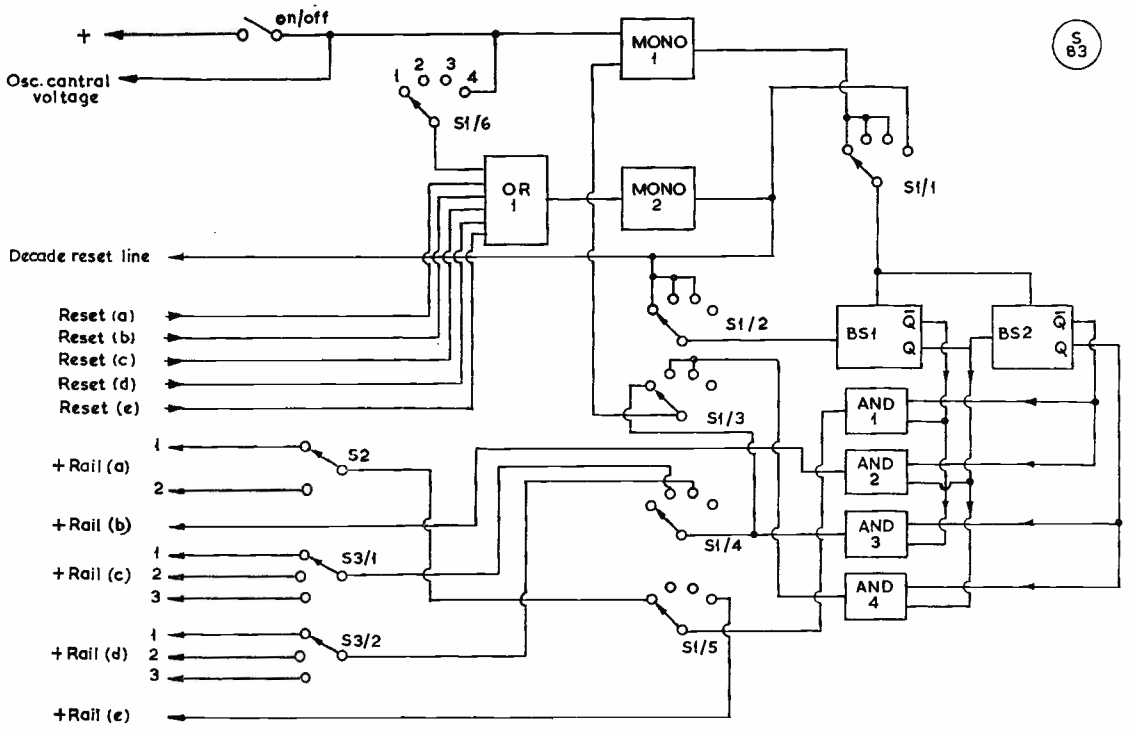


FIG. 25

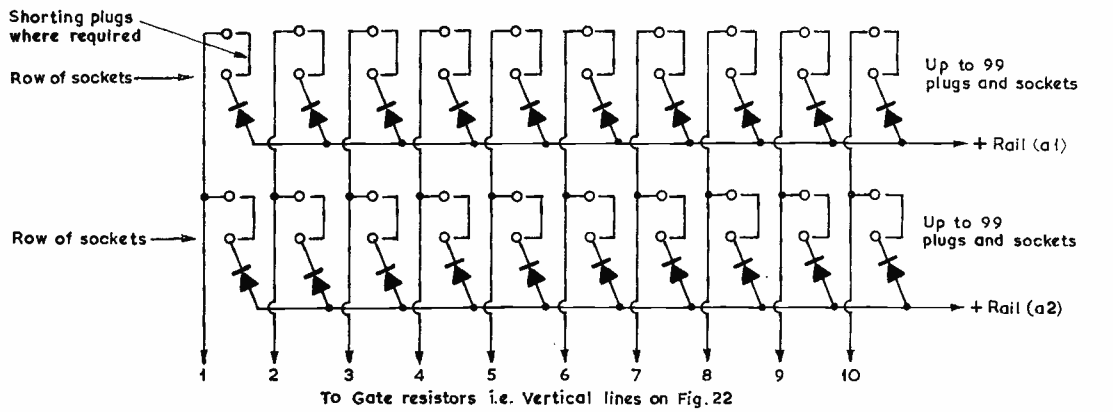


FIG. 26

Fig. 25. Block diagram for M/S data generator.
Fig. 26. Plug-socket arrangement for build-up of callsigns.

third pulse the output of AND8 goes positive which *via* INV3 and SW2 grounds the stop circuit in the same way as the stop push-button, and has the same result in that the generator stops at the end of the next complete call.

Circuit details are: OR1 as Fig. 12 (p.221, June); NOR1/2 as Fig. 15 (p.221, June); NOR3 as Fig. 15 but with 5 inputs, one being 33K to +5; MONO1, 2, 3 as Fig. 8 (June, 1970) with output taken from TR2; INV1, 2, 3, 4 as Fig. 15 with one input only; AND1-8 as Fig. 9 (p.221, June); OSC as Fig. 7 (p.220, June, 1970).

The *Selection Matrix* for this generator will be the same as in Fig. 20, Part II, p.274, July, except there will be 12 positive rails: One for CQ; Nine for Band Identification; One for Call-sign; One for " pse k ", and there will be 12 reset lines but only the CQ, call-sign and " pse k " will have AND reset gates as the band identi-

fication resets are selected by SW1/B.

METEOR SCATTER DATA GENERATOR

The production of data for meteor scatter (M/S) tests is another use for this type of generator, but instead of the programmer selecting the information to be sent, this is done to some extent by the operator. Sending speeds are usually higher than those generally found in amateur circles and some may find it difficult to attain these speeds of 25-30 w.p.m., while the extended duration of these tests could cause extreme fatigue if hand-keying had to be used.

There is, however, the need to vary some of the information, as it is required to call various stations and it would be desirable to have a method of making the call-sign of the station called selectable by the operator. This is most easily done by having a number of plugs and sockets which can be connected together to form the elements of the characters when they have been broken down into their basic dots. Each plug and socket can then represent a dot, three adjacent ones connected form a dash, while those not connected form the spaces between the characters.

The basic format will be the same as the CQ Generator except that the positive rail for the call-sign will not be wired directly on the board with the selection matrix but will be brought out to some convenient place (the front panel, for instance) to a row, or preferably two rows, of sockets into which plugs can be fitted when making up the call-sign.

The data to be sent is: (*a*) Other call-sign; (*b*) Own call-sign; (*c*) R plus report (say 2-4); (*d*) RS plus report; (*e*) Continuous R's.

These are combined by the programmer into the following complete messages each of which is selectable by the operator to suit the state of his QSO.

Several reports are included in the selection matrix and can be selected by switches in much the same way as the band identification in the CQ Generator. Automatic finishing of the message before stopping is not included as transmissions are made at five-minute intervals (or some other fixed period) and it is immaterial whether the message is complete or not.

S1 selects the four modes, S2 selects which of the call-signs set up using the plugs and sockets is transmitted, while S3 selects which of the reports is used. S3 is shown as having three positions but more could be included according to the number of different reports required to be sent.

As interest in meteor scatter increases the possibility of calling CQ is more likely and for this purpose " CQ de " can be sent either by setting this up using the plugs and sockets or by giving S2 a third position and connecting this to a positive rail in the selection matrix with diodes forming the letters. With S1 in the first position " CQ de G3--- " will be generated continuously.

Programmer operation with reference to Fig. 25 is as follows: Assume S1 in position 1 and on/off switch turned on, the operation of which causes Mono 1 to produce a pulse. This is routed *via* S1/1 and sets BS1 and 2 into their initial state. This causes A1 output to be positive; this potential is taken *via* S1/5 to positive rail (*a*), (*a1*) or (*a2*) being selected by S2. Oscillator control voltage is supplied by on/off switch so that pulses are fed to the decade counters. The count continues until the reset pulse from (*a1*) or (*a2*) AND gates appears on reset (*a*). Then Mono 2 is triggered *via* OR1. Mono 2 pulse through S1/2 triggers BS1 and 2 on by one step so that AND2 output is made positive, as is positive rail (*b*). Own call-sign is generated and the reset from this line again triggers Mono 2 *via* OR1 which moves BS1 and 2 on to its third position. AND3 output now goes positive and this is routed *via* S1/3 and triggers Mono 1 which resets BS1 and 2 back to their original state. The cycle then repeats until the on/off switch is opened.

With S1 on position 2 operation is the same until AND3 goes positive. AND3 output is now routed *via* S1/4 to positive rail (*c*), S3/1 selecting the required report. Reset (*c*) triggers Mono 2 *via* OR1. This moves BS1 and 2 on to its fourth position and AND4 output goes positive. This is taken through S1/3 to trigger Mono 1 which, *via* S1/1, resets BS1 and 2 back to their original state and the cycle repeats.

On S1 position 3 operation is as the foregoing except that positive rail (*d*) is selected *via* S1/4 and reset line (*d*) triggers Mono 2.

On S1 position 4 when continuous R is required, the closing of on/off switch triggers Mono 2 *via* S1/6; through S1/1 this puts BS1 and 2 into their initial state. AND1 output is thus made positive and this is routed *via* S1/5 on to positive rail (*e*). Reset line (*e*) triggers Mono 2 *via* OR1, so that S1/1 triggers BS1 and 2 so they stay in their original state and R is sent repeatedly.

Every time Mono 2 is triggered its output pulse resets the decade counters so that the count begins from zero each time.

Circuit details are: MONO 1 and 2 as Fig. 8 (p.221, June) with the output taken from TR1 and two inputs for MONO 1 and one for MONO 2. OR1 is the emitter follower version in Fig. 12 (p.221, June) with six transistors operating into a common load; AND1-4 as Fig. 9, p.221, June, 1970.

The selection matrix will be as before with ten positive rails for the circuit shown, but two of these will be situated on the back of the sockets with the relevant isolating diodes. A schematic diagram of this is shown in Fig. 26 herewith.

G3BZU (R.N.A.R.S.) QRQ CODE RUNS

The latest *Newsletter* of the R.N. Amateur Radio Society reports that, to September 1971, the Morse Code proficiency certificates issued in the various categories were 91 at 20 w.p.m.; 45 at 25 w.p.m.; 17 at 30 w.p.m.; and four—G3CXE, G3JFF, ON5OJ and G3KVV—at 40 w.p.m., being the "gold award". These transmissions, at the speeds mentioned, are made from the R.N.A.R.S. Hq. station G3BZU (Leydene, Hants.) on 3520 kHz at 1900z on the first Tuesday of each month. Only "perfect" copies of entries sent in will be awarded a certificate. A modest charge of 12½p (or three IRC's from overseas) is made to defray expenses, and applications should be sent to G3TZQ, *QTHR*.

VHF BANDS

A. H. DORMER, G3DAH

ALTHOUGH propagation on all the VHF bands has been seasonally poor since mid-December, the last month of the old year produced a couple of surprises. The first was the two-metre extended tropo. opening to Southern France and Spain over the three days December 12—14. Stations right down to Dept. 65—Hautes-Pyrenees, with F9NL in particular—were received at good signal strength on the Sunday morning, and by midday EA1AB was 559 on CW and working up into the Midlands. His signal gradually built up until by midnight he was 599 in places and at times. For example, G3KCB in Cheshire worked him at 2335z, and G3OHH (Mow Cop) at around the same time when the Wrotham beacon was a mere 589 and the EA was 599. EA1AB was joined later by EA1CP, an even stronger signal on occasion. Both the Spaniards are in Santander, in the North of Spain, with a good take-off across the Bay, and both use the same QRA Locator, YD41b. One wonders how many people checked, as G3DAH did, to see whether this was a case of two operators using the same gear with separate callsigns as, for some of the time, only the one or the other was audible — however, eventually simultaneous transmission provided the answer. For those who worked the EA's and who would like to QSL direct, the addresses are: EA1AB, Javier de la Fuente, Palencia 7, Santander, and EA1CP, Jose Perez Secadas, B.Vista Alegre, El Astillero, Santander. They *do* QSL!

G3COJ (High Wycombe, Bucks.) who, as one might expect, was in on the opening, reports contacts with some of the more difficult French Departements, such as F1MJ/P in 19 Corrèze; F1AVO in 40 Landes; F6BLP in 33 Gironde; F6BAI in 58 Nièvre; and F8OB in 64 Basses-Pyrénées. He had a go with F9NL on 70 cm. after completing their 2m. contact, but was unable to proceed with the QSO as, although he was hearing the Frenchman, an imperious and not-to-be-ignored summons came for lunch, and he had to abandon the attempt in the interest of domestic harmony! (One recalls that Brian has suffered from culinary QRM on a previous occasion when he was attempting the same exercise, but this time it was Madame F9NL who intervened with a call to Maurice for dinner!) G6GN (Bristol) also copied the 70 cm. signals from F8NL, but could not put his signal down there. Incidentally, did you know that F9NL is blind?

The second event of note was the Aurora on December 17, which livened up the two-metre band more than somewhat between 1630 and 1830z. GM, SM, OZ, LA, GW, DL and PA were all there, and reported as active also was UR2BU, although he was not heard in contact with any British station. GM2DRD and GM3UAG were particularly strong auroral signals, but GW3LEW's note was alternating between T5A and T9. The opening seems to have caught many operators by surprise, as of the British stations copied, only the "never miss" regulars were heard.

A slight lift, which was more pronounced on four metres than on the other VHF bands, occurred on December 4, when G5NU (Reading), G3DF in Hornchurch and G3RCQ (Chessington, Surrey) were all heard working into the North. G3OHH, was a good signal in the South. An S9 carrier, which turned out to be GB3SX on 70·695 MHz, made a welcome reappearance on the four-metre band after a long absence—was it last June that it went QRT? December 7 also saw a slight lift on all bands with GB3SX and GB3VHF both at 59+ in the Midlands during the late evening, but it was 70 cm. that offered the most promise, with GB3GEC well above normal—but, alas, the promise was once more unfulfilled, since the band remained obstinately empty.

VHFCC Awards

Two awards this month for operations on 70 cm.—both of them "doubles" with two metres—so let's deal with these first.

Mark Marment, G8ABP, Paignton, Devon, gets 70 cm. Certificate No. 13 for contacts made while he was at the old QTH in Birmingham. He was then running 60 watts to a QQV06-40A and a 14-ele Yagi from a site 435ft. a.s.l. He expects to be on 70 cm. (432·300 MHz) again very shortly from the present QTH with 24 watts to a QQV03-20A and a 46-ele beam. Plans also include operation on 23 cm. with a 3CX100 /A5 and a 3ft. dish. His two-metre award, confirmed by Certificate No. 126, is for operation from Devon, whence he runs 30 watts to a QQV03-20A and a 10-ele Yagi. He would welcome skeds on this band with stations in North G and GM; he can be on most evenings.

Seventycem Award No. 14 goes to George Elks, G8CKX (Ambergate, Derbyshire), who already holds Award No. 95 for two metres, gained in May of last year. He runs 10 watts input to a pair of PC88's (miniature frame-grid triodes) driven from a QQV02-6 tripler and feeding a 14-ele Yagi at 525ft. a.s.l. He says that the 30-year old BC-348 IF strip is still doing yeoman service!

And so to Certificate No. 123 which goes to F6BEG in Paris. Gérand Françon holds a callsign well-known to two-metre operators who use CW and/or SSB and, in spite of the fact that he has changed his 4CX250B rig for a QQE06-40A running 60 watts into a 13-ele Yagi, is to be heard on one mode or the other most evenings from about 2200 hrs. on. He has skeds with G3FIJ and G3CO around 144·100 MHz every night at 2100z, so take a look for him if you want a contact. He builds all his own gear, and is at present driving the '6-40A from a solid-state exciter which gives him CW, NBFM and SSB, the Rx being a triple conversion job using FET'S where applicable. If you want a sked, QTH is 14, rue Boyer Barret,

75 Paris 14e. His English is excellent!

Operating from Wellingborough, Northants, Mike Adcock, G8CMU, gains Award No. 124. He runs 16 watts input to a QQV03-10 with AM and NBFM facilities. The converter has 2N3819's in the RF and mixer stages, and the antenna is an 8-ele beam at a site 275ft. a.s.l.

G8COG is the callsign of Bob Eva in Birmingham, and he is awarded Certificate No. 125 for his two-metre work. Although most of the contacts which gained him his Award were made with a Heathkit Two-er, this has recently been relegated to stand-by duty, and Bob now runs a modified "Cambridge" with VXO control and NBFM facilities. The home-constructed converter uses FET's, the antenna being a 6/6 slot at 25ft. from 450ft. a.s.l.

Mike Neville, G8ENI, gets Certificate No. 127 for his work on 2m. from Walsall, Staffs. His Tx is unusual in that it is a "one-off" job made by K.W. Electronics, and offers up 110 watts from a QQV06-40A PA to a 10-ele Skybeam at 38ft. On the receive side he has a pre-amp, a nuvistor converter and an AR88D, and that collection gets him some nice DX, topped in distance by OZ9MO and F5RM in the Pyrénées. The QSL return rate is the almost inevitable 35% or so. Marvellous, isn't it?

Finally, we have Richard Nettleton, G3YED (Leeds). He has been on the two-metre air since February, 1969 with 10 watts from a QQV03-10, a Sentinel converter and a Trio. The 8-ele Yagi sits on a mast at 30ft. on a 500ft. a.s.l. site, which is quite good in most directions, although Richard says that from time to time he finds it easier to work the South of the country then he does the stations in N.E. Yorks. His Award is No. 128.

Contests

A brief report on the 144 MHz Fixed Station contest of December 5 was given in last month's "VHF Bands." Comments from various parts of the country have now come to hand, and it appears that the situation as described for the South held for much of the remainder of England. The North/South path was yielding the best DX for most of the time, with spasmodic lifts to the West, and very little coming through from the East, in spite of the parallel event in IARU Region I. G3OHH reports reception of GC2FZC at 5 8/9 in the morning but the inability to raise him, although Walter was rapidly knocking off contacts with the Southerners. As with all these events (which involve a distance factor in the calculation of total points) it is not possible accurately to assess final scores, but up among the leaders should be G4AGE (Chesterfield), G3ZMD of Luton, G3NHE (Sheffield) and, with the highest score heard, G8BBB (Ely) who was passing over 140 towards the end of the contest.

The 70 MHz Cumulatives on December 8 and 19 did not see anything very startling in the way of DX and conditions could not be described as more than average for both events. Prior to the 8th, there had been a steady build-up in both activity and propagation which had augured well for the contest day, but when the time came, it transpired that we had seen the best of it. However, there was still some DX to be worked, as exemplified by the contacts made to the North and Midlands by G3KSU/P in I.o.W. and G3KMI (Southampton); the latter was passing 019 at 2126 hrs. and G3OHH gave 017 at the end. Much the same picture could be drawn from the 29th, perhaps with ranges slightly lower. Heavy going all round seems to have been the general verdict.

Forthcoming events are the 144 /432 MHz Open on March 4/5, and the 432 MHz Cumulatives scheduled for January 14, 22nd and 30th, February 7, 15th and 23rd and March 2. Times are 2000z to 2200z on each occasion, and only three out of the seven activity periods count towards the final score.

"...and here is the Scottish news"

The December aurora was particularly potent in GM, GM3VZB getting three new countries out of it, but once again the QRM in the CW section of the band was troublesome. It is difficult to know just what is the best solution to this problem. To work the DX, one is obliged to appear at the LF end, since that is where the action is, but the result is near Bedlam in GM with all the signals coming in from the northerly-pointing beams to the South of them, and the strong auroral signals from EU coming off the curtain to the North. To split the CW section is not the answer since the DX operates throughout the whole allocation, and co-channel working is the order of the day in any case; to educate the DX to look up at the HF end of the band would be difficult, if not impossible. Perhaps GM3GUI, who holds very strong views on this problem, can offer a solution acceptable to all? However, for the CW man, there is some consolation in the fact that on Monday and Friday evenings an ever-increasing number of G operators are beaming North and looking for GM contacts at the low end of the band, and this may, in part, compensate for the difficulties they experience during an aurora.

It was pleasant to meet GM3UMW recently and to learn that he is now up on two metres from Kirkintulloch, Glasgow. He is an active member of the Glasgow University Club, but has another claim to fame that may not be quite so well-known—he has recently returned from the States where he had first-hand experience of the operation of the FM repeaters over there, so if you want any gen. on this mode of communication (which is likely to be with us in this country before too long) he is the chap to contact.

The trip which GM3VTB and GM3XWJ made recently to Ben Lomond was productive of some good four-metre contacts, and it is understood that they are being talked into repeating the climb, this time with 2m. gear.

GM3PQU (Edinburgh) now has SSB on Two, but as so many other operators have discovered, notes that not all stations are equipped to receive correctly this mode of transmission. The main problem seems to be the difficulty of getting enough BFO injection when using an AM detector. An outboard oscillator can work wonders!

GM3AEY is the headmaster of Viewforth School in Kirkcaldy which was the subject of a TV programme recently, and for a change it seems

that the programme content was fairly accurate when it came to the part showing the radio club activities, since it was supervised by Harry himself with the help of his geography master who was doing the operating. Some of the reports that one reads in the local press, and indeed some of the reports on the National radio and TV, are just hopelessly adrift when it comes to talking about Amateur Radio. We can laugh with Tony Hancock, but do little else but weep at some of the written and spoken solemn nonsense, and fume at the continued use of the word "Ham" (with a giggle) by the communications media. Look out for GM3AEY on 2m., as he is fully operational on that band now.

Urged on by G3BA, GM6XI has been giving the G8AEV two-metre converter a whirl with gratifying results, and, from the amount of local interest shown in his achievements with it, it looks as if there will be quite a demand for this kit in the Edinburgh area before long.

Our condolences to the operators of GM8EVV/P who braved the icy blasts on Cairn O' Mount on December 30 with so very little success for their efforts, propagation being very poor indeed. One can be sure, though, that they will not be discouraged and that, during the summer months, they will be there again offering good DX to the South.

GM3OXX can now radiate a signal on 3 cm. from Clermiston, so how about having a go at new G/GM record? GM6SR is well on the way to complete recovery after his recent accident, and celebrated his 83rd birthday by taking delivery of a greenhouse! There seems to be no end to Sid's energy and enthusiasm, and certainly we all wish him well.

In spite of the high atmospheric pressure, conditions seem to have been as poor in Scotland as they have been over the remainder of the country.

Three-Band Annual Tables

This issue sees the publication of the last of the Three-Band Annual Tables for 1971. The overall winner turns out to be G3COJ, who pips last year's winner, G3OHH, and G3ZYC who holds equal second place, by one point only, so con-

THREE BAND ANNUAL VHF TABLE

Final Placings
at
December 31, 1971

Station	FOUR METRES Counties	FOUR METRES Countries	TWO METRES Counties	TWO METRES Countries	70 CENTIMETRES Counties	70 CENTIMETRES Countries	TOTAL pts.
G3COJ	39	5	66	19	32	9	170
G3OHH	53	7	63	8	33	5	169
G3ZYC	46	5	49	13	46	10	169
G3DAH	37	3	60	14	34	8	156
G5DF	24	2	57	13	32	7	135
G3ZMD	24	2	57	13	29	7	132
GD2HDZ	28	4	56	10	24	4	126
G8CVD	—	—	61	15	39	7	122
G3JXN	30	2	68	16	—	—	116
G8ATS	—	—	53	12	41	9	115
G8BCA	—	—	56	10	40	9	115
G8CUT	—	—	54	13	24	6	97
G3ZPZ	—	—	80	13	—	—	93
G3FIJ	4	1	45	11	17	6	84
G8BKR	—	—	50	7	21	4	82
G2AXI	24	3	39	4	8	2	80
G3EKP	27	6	24	7	8	6	78
G8BXX	—	—	49	8	15	1	73
G2JF	—	—	53	19	—	—	72
G8BWW	—	—	40	8	10	5	63
G8DPV	—	—	52	9	—	—	61
G3IAR	31	3	21	4	—	—	59
EI6AS	15	5	30	6	1	1	58
G8ECK	—	—	46	9	—	—	55
G8CBU	—	—	40	7	5	1	53
G4ALN	—	—	37	11	2	1	51
G8AUN	—	—	32	9	3	4	48
G8CXC	—	—	33	12	—	—	45
G8EJH	—	—	36	8	—	—	44
G8EMS	—	—	35	8	—	—	43
G8CYN	—	—	32	9	—	—	41
G8APZ	—	—	—	—	33	6	39
GM3EOJ	—	—	18	10	3	1	32
PAØLY (G3TMQ)	—	—	13	6	—	—	19

This is the Final Table for 1971. The new listing started with effect from January 1. Readers are reminded that their claims should be sent to "VHF Bands", SHORT WAVE MAGAZINE, BUCKINGHAM. Claims should be made as soon as possible, to get the new Table going.

gratulations go to Brian Bower, of Flackwell Heath, near High Wycombe, Bucks. G3ZPZ of Chesterfield, Derbys., fairly sweeps the board with all those two-metre counties worked and so heads that Table, with G3COJ moving up from third place last year to second this. Perhaps not altogether unexpectedly, G3ZYC (ex-G8AUE) of Pentrich, Derby, keeps his leading place in the 70 cm. Table, with G8ATS (Bury St. Edmunds) moving up from third position last time to runner up for 1971. G3OHH (Mow Cop, Staffs.), retains the 4m. title fairly easily, with G3ZYC (who appeared on the band for the first time this year with his full licence) taking second place.

In all three sections, the number of contacts made by the leading stations increased over the 1970 figure, which must reflect either greater activity during 1971 or better propagation conditions. The substantial rise in the number of two-metre stations now regularly on the air is self-evident—but one would not have said that propagation was so much better, so the increase in the number of counties worked must be due in part to the number of successful DX-expeditions we had during the year rather than to any extraordinary lifts and openings on the band. The expedition factor is not applicable where Seventycems is concerned, so one must conclude that increased activity is possibly the more significant here.

It is gratifying to note, also, that the total number of entries in each category has increased this year (1971) and it is indeed hoped that this is a pointer for the future. The figures are still very much down on what they were, say, ten years ago, although one recognises some old, familiar and very welcome callsigns among the newcomers.

It only remains to thank all those who have sent entries in this time, and to wish them success in the 1972 Tables. As for this year, well, the new Tables started with effect from January 1, and go through to December 31 on the same basis as before—we are ready and open for business *from now*, so please send in the claims as before to "VHF Bands," SHORT WAVE MAGAZINE, BUCKINGHAM.

"... and here is more news"

GD2HDZ has now completed his move to the new QTH in Laxey and has been on two metres for brief periods since the beginning of the year; he should be active again on all the VHF bands before too long. Cyril Hayward, G4AHH, perhaps better known as G8BBY ("the Wizard of Watford Gap"), is shortly to move QTH and is having to cut down on the volume of the gear so, having disposed of the 70 cm. equipment, he now runs 800 mW of 2m. SSB with an FT277 as the prime mover and a solid-state transverter with a 2N3375 in the PA. He must still have that tower of his though, as he has worked several French stations in the Paris area and, as best DX, DK2LR in QRA FH34j at 970 km—and all with that flea power!

The nightly sked on 70 cm. between G3NEO in Sheffield and G8CRA of Malvern, Worcs., has now been going since November and they have had hardly a miss. Eavesdropping here could be a good band-condition indicator. Frequencies are 433·33 and 433·05 MHz, the time being 2130 to 2145 local. Graham Smith, G3ZOD, *QTHR*, would like to arrange two-metre *CW* skeds for Friday nights and weekends. He runs 16 watts on 144·13 or 144·05 MHz from his 150ft. a.s.l. site in Stockport. G8ACN, equally well-known as G3NOX/T, offers 23 cm. skeds from the QTH near Saffron Walden, Essex. He has a 3CX100A in the PA, into an 18in. dish at a good site on a fine tower, but finds activity on the band very low in his service area. Skeds may be arranged by post, *QTHR*, or via 70 cm.

G3UGF/MM, Richard Constantine on the coastal tanker m.v. *Esso Inverness*, continues his journeyings. By the beginning of December his two-metre score was 343 contacts in 7 countries and 40 counties, and he is hoping to add to that total by operating 70 cm. also. Incidentally, those who worked him during his recent trip up the Manchester Ship Canal might like to know that they were among the 60 stations in 24 hours who did so! Before you start to envy him, in a smart ship with an attractive callsign and all that lovely sea take-off around him, remember also that life is not all a bowl-of-cherries for G3UGF/MM. During bad weather the vessel was in off Cornwall recently, they were called upon to give aid to a small coaster in distress. Richard was therefore kept very busy with the ship's radio and only when the shouting and the tumult had died down did he have time to go and have a look at his beam—to find it hanging drunkenly, secured by the coax only, having been badly battered by the storm. At least we don't have to cope with that sort of unpleasantness. Still, the operating position looks very comfortable. Callsign of the *Esso Inverness* herself is GOPY.

G3COJ (High Wycombe, Bucks.) has made a New Year's resolution to do more construction and less operating during 1972, particularly construction for operation on 23 cm. He will be off the air for a few weeks from now on while station re-building takes place, but will try to maintain a "last-ditch CW capability" in case of an Aurora!

It's dogged as does it! G4AEP was tuning over the 2m. band on the afternoon of December 14 and finding it very quiet, when up out of the noise pops a CW station signing EA1CP! *Panic!* No CW section xtal; no key; only 2 watts from a portable rig, but a good antenna at 150ft. above street level on the Imperial College (London) Electrical Engineering Block. *Thinks!* Borrows xtal from another rig and tunes up on 144·2 MHz as the nearest frequency. Takes plug off old pair of headphones, solders two bits of stray wire to it and plugs into improvised jack on the portable. Calls the EA on CW using the ends of wire as a key. *Result:* A solid QSO at 579. Nice going, Bill. Incidentally, the College Radio Society is going to have another go at Andorra this year during the last week of June and the first week of July, and plan to take 2m. gear with them. More details when they are available. In the meantime, the organisers would welcome advice on equipment, sites, etc., which may be sent *via* G4AEP, *QTHR*.

G3PFR (Warrington) was one of those who worked F9NL and EA1AB for some very useful DX during the December opening. He is normally on SSB, but had to change to CW for the contact, which

ANNUAL TABLE — BAND SUMMARY
January to December — 1971

FOUR METRES

Station	Counties	Countries	Total
G3OHH	53	7	60
G3ZYC	46	5	51
G3COJ	39	5	44
G3DAH	37	3	40
G3IAR	31	3	34
G3KEP	27	6	33
GD2HDZ	28	4	32
G3JXN	30	2	32
G2AXI	24	3	27
G5DF	24	2	26
G3ZDM	24	2	26
EI6AS	15	5	20
G3FIJ	4	1	5

SEVENTY CENTIMETRES

Station	Counties	Countries	Total
G3ZYC	46	10	56
G8ATS	41	9	50
G8CBA	40	9	49
G8CVD	39	7	46
G3DAH	34	8	42
G3COJ	32	9	41
G5DF	32	7	39
G8APZ	33	6	39
G3OHH	33	5	38
G3ZMD	29	7	36
G8CUT	24	6	30
GD2HDZ	24	4	28
G8BKR	21	4	25
G3FIJ	17	6	23
G8BXX	15	1	16
G8BWW	10	5	15
G3EKP	8	6	14
G2AXI	8	2	10
G8AUN	3	4	7
G8CBU	5	1	6
GM3EOJ	3	1	4
G4ALN	2	1	3
EI6AS	1	1	2

TWO METRES

Station	Counties	Countries	Total
G3ZPZ	80	13	93
G3COJ	66	19	85
G3JXN	68	16	84
G8CVD	61	15	76
G3DAH	60	14	74
G2JF	53	19	72
G3OHH	63	8	71
G5DF	57	13	70
G3ZMD	57	13	70
G8CUT	54	13	67
GD2HDZ	56	10	66
G8BCA	56	10	66
G8ATS	53	12	65
G3ZYC	49	13	62
G8DPV	52	9	61
G8BKR	50	7	57
G8BXX	49	8	57
G3FIJ	45	11	56
G8ECK	46	9	55
G8BWW	40	8	48
G4ALN	37	11	48
G8CBU	40	7	47
G8CXC	33	12	45
G8EJH	36	8	44
G2AXI	39	4	43
G8EMS	35	8	43
G8AUN	32	9	41
G8CYN	32	9	41
EI6AS	30	6	36
G3EKP	24	7	31
GM3EOJ	18	10	28
G3IAR	21	4	25
PAØLY (G3TMQ)	13	6	19

was not as easy as it sounds, since the transverter has to be highly filtered in view of the proximity of Jodrell Bank, and nipping from one end of the band to the other can be a lengthy process, since broad-banding must be "out" under these circumstances. Although he runs comparatively low power—100 watts p.e.p. input—Mike has managed to knock off some good DX on SSB, including F, ON, PA, DL, OZ, SM and SK, and this despite the intervening barrier of the Pennines.

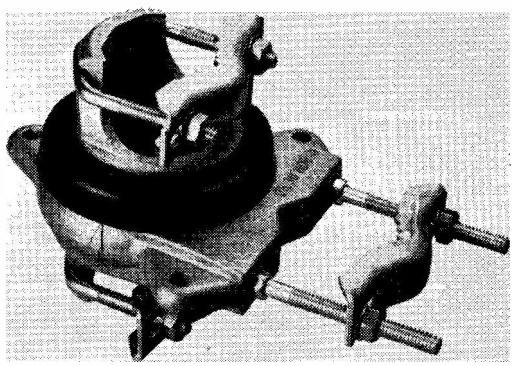
Although the event took place some months ago, for the benefit of those who may be planning an expedition to GC this year, the figures supplied by G8AXZ (who was a member of the successful GC8DIZ/P expedition), may be of value in selecting locations. From Sark, they made 389 contacts, 107 of them in one night; from Herm the tally was 83 QSO's; and from Jethou they had 95 contacts—a total of 348 different stations worked, of which 215 were on AM; 89 on SSB; and 44 on CW. Late though it is, the members of this foray would like to express their thanks to all those who came up to work *them*, and without whom it would have been a pretty dull affair. Particularly, they would like to thank the amateurs on Guernsey who were so helpful during their stay in the Islands.

Some years ago or so, a mention was made in this Column of a couple of chaps who had kept a QSO going on two metres for 14 hours *plus*, and who wondered if this were a record. At the time, the answer to that question was not known, but now up comes G8APZ with a cutting from SHORT WAVE MAGAZINE of August, 1963, which states that the record is held by two WA2's with *99 hours* of blather on 50 MHz. How ridiculous can you get? We learn also from 'APZ that he and G8AZU among others are continuing their Sunday jaunts out into the sticks with portable gear for 70 cm., so keep watch for them either well up the band or on 432·6 MHz, a frequency which they usually carry.

G5DF (Reading), got a timely warning of the December aurora when he noticed a peculiar flutter on VE4UN, whom he was working on 14 MHz at the time. A quick QSY to Two with the beam to the North brought in the GM's and several Scandinavians—so it pays to keep attention on whatever band you may be working. G3PMX points out that the WWV signal on 15 MHz is a good indicator in this respect, and even demonstrated it over the air to your scribe. This check can be more useful than the official SID warning, as it is certainly more immediate.

Deadline

That just about wraps it up this time, except to say "thank you" to all the chums who have sent in messages of cheer and goodwill for 1972. These are heartily reciprocated. So the deadline for the next issue is **Saturday, February 5** and the address for news, views, claims and comment is: "VHF Bands", SHORT WAVE MAGAZINE, BUCKINGHAM. Cheers for now and *Vy 73 de G3DAH.*



The new J-Beam Engineering alignment bearing Type RZ-100 allows for a 9ft. by 1½in. diameter mast to be mounted above the J-Beam rotator unit, the design and general construction being strong enough to support beam heads mounted on the mast. Full details from Publicity Dept., J-Beam Engineering, Ltd., Rothersthorpe Crescent, Northampton, NN4-9JD. (Tel.: 0604-63531).

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for March issue: February 4)

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

AFTER the annual January holiday, with this space filled by the report on **MCC,** comes the annual deluge to be taken into the February piece—about 70 Club stories, some in duplicate (sometimes even in triplicate) to sort out into their categories, with the foolish feeling when one notices that X-Club has managed to appear in both the Northern clip *and* the Midland as a result. . . .

But never mind, it won't happen again—till next year!

The Mail

Geographical again, and we start with those we can't force into regional boxes, such as, for example, **B.A.R.T.G.,** who cater for the RTTY (radio teleprinter) speciality within our hobby. There is no doubt this is a fascinating activity, combining with electronics a degree of mechanical ability as well as the need to improvise. Thus their current *Newsletter* is full of interesting material for the home constructor.

Our next stop is to **Nigeria,** where they still have the problem that no new licenses are being issued or look like being issued for some time to come. However, they make the best of it. An interesting statistic in their case is that out of 56 members, no less than ten are entitled to the prefix "Doctor."

R.A.I.B.C. is for the invalid and blind among us, both SWL and licensed transmitters, activity being by way of nets, various forms of personal assistance, and not least, the monthly issue of *Radial,* a nice friendly sort of effort whose popularity is such that it is now in its 17th year of issue.

Anyone having any connections with the Navy should lash out on a subscription to **R.N.A.R.S.**—apart from the usual nets and services there is a very good *Newsletter.*

On to **A.R.M.S.** and the mobile scene—this month's copy of *Mobile News* carries a piece by G3BID offering a different slant on the eternal YL objection to antennae, so more power to his elbow!

Sitting where we do, we see Clubs come and go, not to mention those which surmount their difficulties. One that could well have come to grief was **WAMRAC,** but this group has not only recovered, but now looks forward to a real and positive expansion into world-wide activity.

British Rail is, as its name implies, a Club catering for those connected with railways. It has also contact through FIRAC with amateurs in the railway organisations of many other countries around the world. Recent issues of the *Newsletter* have, for this reviewer, been greatly improved by the series of interesting letters from railwaymen outside the U.K.

Up in the North

It is a pleasure to report the formation of a club in the **Harrogate-Knaresborough** area, at a meeting held in the Scriven Women's Institute Hall; a Mullard film started the proceedings, followed by the election of a steering committee to get things going. And going they undoubtedly are—we see that they have meetings booked for February 14, when G3PUU discusses a practical design for a RTTY converter, and February 21, when there is to be a follow-up talk about the "machinery" of RTTY. It remains for us to wish them every success in the future.

That's what we like to hear! **Mansfield** report a crisis approaching—they will shortly have no SWL's left, as they will all have become G4/3's! They are, at the time of writing, negotiating for a place at Westfield Folk House; but nonetheless they feel their old venue at the New Inn, Westgate, is so well known that they should continue there for a while on the first Friday in each month, starting at 7.45 p.m.

In **Thornton Cleveleys** the gang get together on the first and third Wednesdays. This means, for February, G3UIG talking about *homebrew* video-tape on the 2nd, while on the 16th there is a Junk Sale. The place is the St. John Ambulance Brigade Hq., Fleetwood Road North, Thornton.

Off to Scotland now, to **Aberdeen,** where the Hq. is at 6 Blenheim Lane. You can find the chaps there on any Friday evening, from about 1930z, although, as the AGM has only recently been passed, we cannot give you the latest rundown on the activities at these meetings.

Coming southwards again, to **York,** still in their hideaway in the British Legion, 61 Micklegate, where they assemble each and every Thursday.

It seems quite a long time since the days when we used to hear from **Newark** each month without fail. They are still very much with us, as their latest effort shows. We understand that they have a place at the local College, with February 3 down for a Junk Sale, plus a reminder of summer in the way of a film. However, we suggest a check with G3YCT—*see* Panel, p.753.

At **Wirral** one senses that things are now on a more even keel after the "adventures" of recent years; they are booked in at the Sports Centre, which used to be the Drill Hall, in Grange Road West, Birkenhead, and have quite a string of interesting talks lined up for the next few months.

Doing their stint for the Silverthorn Radio Club in the November MCC, in which they came 59th (out of 83) with 2520 points—left to right G4AJA, G3XYK and G3VSI. The latter is one of the radio officers on R.M.S. "Franconia" and played a notable part in the rescue operations affecting a Norwegian vessel on fire in the Atlantic last October.

Westerly Parts

An omnibus title covering the West of England, Wales, and Ireland. For a starter, we hear again from the **Shirehampton** (Bristol) group, who will be using three rooms at Twyford House this spring—one for the R.A.E. class under G3YOH, one as the shack and the third for the other activities. Sad to say, the reason Shirehampton has recently been missing from these pages is because G3SXY has been in the wars.

Down in the South-West, **Axe Vale** write to advise us they have moved their Hq. to the Furnhill Hotel in Charmouth, for the first Friday in each month.

The **Chippenham** chaps seem to have been out of these columns for some time—whatever happened to that marvellous *Newsletter* which appeared for a few months a year or two ago?—but they are now back again by way of a letter from the hon. secretary, who says that G5KT is coming along from Bristol on February 8, to talk about the early days, when radio *was* radio. Everyone welcome to this, as all, meetings, the venue being the Boys High School, which we seem to recall being in Hardenhuish Lane.

From two issues of the **Cornish** *Newsletter*, lots of bits of news of interest—but we must stick to our last, reporting the programme of meetings at the SWEB clubroom, Pool, Camborne. On February 3 there is a radio quiz, with a double bill on March 2, meaning G3NKE talking about the Club awards, followed by Geoff Hubber, who is a dab-hand with radio-controlled models. In addition, there is the Newquay group, with Hq. at Treviglas School, for details of which we have to refer you to G3UCQ, as Panel.

Over at **Yeovil,** the preference is for weekly get-togethers, Thursdays being favoured, at the Youth Centre, 31 Park Lodge. The first session in each month seems to be set aside for a "formal," with February 3 down for a tape lecture on Semi-conductor Devices.

Saltash have a change in the hierarchy to report, with G3XWA being let off the hook after a spell of four years as secretary. This group can be found at Burraton Toc-H Hall in Saltash on the first and third Fridays in the month; the very latest information on what is going on can be obtained from the new Secretary, G4AJU, whose address is in the Panel on p.753.

Exeter register some pleasure at the progress they have made, with attendances improving at the Community Centre, St. Davids Hill. February 12 is down for a talk on Oscilloscopes, and February 26 sees a Jumble and Surplus Sale; between these two dates we note a proposed Club dinner.

The lads at **Barry College of Further Education** have recently amended their constitution and their committee, with a view to greater efficiency. Most of the committee members have a special job to do, with no "ordinary members" of the committee in the usual sense of the word. It will be interesting to see how this experiment in organisation pans out—if it works, other Clubs might find the idea helpful. This Club is open to "outsiders" at the discretion of the committee and under set conditions—obviously, this is of benefit to the Club, which thus retains its relationship with the College organisation and Students' Union.

At **Flint** there is a nice KW-2000A to play with at Club meetings, thanks to fund-raising efforts. The lads are to be heard, and met, on Friday evenings—the Hawarden Castle, Church Street, is the venue.

The Midlands

A large lump of country, this, and somewhat hard to define, anyway. Right at the start we have a borderline case, in **South Manchester,** which could be put into the North clip. However, regardless of where they are geographically, they use Hq. at Sale Moor Community Centre, Norris Road, Sale, for weekly gatherings. February 4 is down for G2ALN to show his mastery of Aerials, while on the 11th G4AOK takes over to talk about, and show, his IC El-Bug. February 18 is for G3FNM, to offer Some Thoughts on TVI. February 25 is a tape-and-slide lecture, covering the "1959 St. Pierre and Miquelon Islands DX-pedition." For the VHF-minded there is still more—they have a shack at Greeba, Shady Lane, Manchester 23, where they pursue their interests each Monday. Visitors are welcomed at all and any meeting.

(over

How often does one hear of a chap moaning that a Club would not be viable where *he* lives, out "in the sticks." Such should notice that at their recent Social Evening and Surplus Sale, *eighty* people appeared at **Spalding**! Their next meeting will be on Friday, February 25, at the QTH of G4OO, at Gosberton Risgate, near Spalding, when they will be sorting out the details for their Tulip Time Mobile Rally, on May 7.

If a letter goes adrift, we can get an irate secretary with a complaint the next time round—how nice, therefore to have the **Coventry** hon. sec. taking his absence from these pages last time so philosophically —as he says, it was the first occasion in three years of reporting. We could add that the chaps at Coventry Scout Hq., 121 St. Nicholas Street, Radford Road, have a darn good secretary, to be so conscientious for so long. For February we see a Night-on-the-Air on the 4th and 18th, using the Club rig. On the 11th there is a Hi-Fi lecture, and on the 25th they commemorate the end of their first year of D/F activity by showing a film of D/F interest.

Off to the Eastern counties, where one finds the Clubs a bit thin on the ground; this being so, it is a pleasure to report on the arrival of a thriving new infant at **Stowmarket**, Suffolk. Work is planned on the Club's own spot at Needham Market, just as soon as the planning permission is received to go ahead. This being the case, a line to G3XAP (*see* Panel) would be a good idea before setting off for the meeting on the first Monday in each month; he will tell you how to get there, too.

We are asked to make clear that in **Cheltenham** there are in fact three Clubs—this makes it a bit hard for us, unless the various groups specify who they are! And why *three* Clubs in a comparatively small place like Cheltenham, anyway! We don't mind—but we would like to know!

There will be no general meeting in February for the **Midland** boys, as there is more than enough to keep them occupied at the Bingley Hall, where from February 12 to 26 they will have GB3BBS on the air from the Boats and Leisure Life Exhibition. And if there is a Brummie who doesn't know where Bingley Hall is, this old scribe will be surprised; but in case, trying in Broad Street will put a stranger in the right square.

It is not a long trot from Broad Street to the bus for **Solihull** High Street, where one can find either of the two places used by the local lads. February 1 is an Informal, at the Malt Shovel, at 2100z, while the main meeting for this month is on February 15, at the Manor House, where there is a double turn—meaning G3RGD, to talk about Top Band DX'ing, followed by G3PYR with his suggestions for Improvisations in Construction.

At **Worcester,** there is a membership campaign in the process of organising, so one can hope for a goodly number to attend the meeting on February 7, when those in the Commercial Room at the Crown Hotel, Broad Street will hear a Post Office representative talking about Telecommunications Development.

As long as your conductor can recall, there has been a large and active club called **Slade,** meeting at Church House in Erdington High Street, Birmingham, where they gather on alternate Fridays. This group has a wider interest than most, covering *all* to do with electronics, so on February 11, Mr. J. Smith will be talking about Sound Effects for Stage Productions; on the 25th, G3SRS goes on the air, led by G8EYL on 144 MHz.

The compiler of the latest effort from **Melton Mowbray** is something of a humourist—he suggests that the talk and film by the Rentokil people, slated for April, will be helpful to OT's with woodworm in their breadboards! On a more serious note, the chaps at the St. John Ambulance Hall, Asfordby Hill will, on February 18, hear Mr. Reeves discussing Receiver Trouble-Shooting.

South Birmingham use Hampstead House, Fairfax Road, West Heath, as Hq. meeting there on the first Wednesday in each month; this gives us February 2, on which date, we are assured, there will be an interesting talk by G3VTJ.

South-East

First, a look at **Maidstone YMCA,** who must be one of the best-equipped Clubs in the country, as far as facilities go, thanks to a combination of luck, skilled negotiation, and business-like executive members. For February, on the 5th there is a session when G3XUN and G3ORH teach beginners Theory and Morse. February 11 sees G3ORP trying to bring reason into the complex topic of Choice of Receiver, in terms of pounds *vs.* performance, British *vs.* imported, commercial *vs.* homebrew, and, maybe most of all, evaluating specifications issued by sellers. Back to the G3XUN/G3ORH team and the beginners' Theory and Morse on the 18th, leaving G3REM to lecture on Vehicle Interference Suppression. Incidentally, the Y-Sportscentre is in Melrose Close, Maidstone.

Members' VHF activities are up for discussion at **Acton, Brentford and Chiswick** on February 15; as usual, you can find them at 66 High Road, Chiswick, perhaps better known as Chiswick Trades and Social club.

North Bucks. next, and here the form is to get together on the second and fourth Wednesdays of every month at Wolverton and New Bradwell Youth Club, Aylesbury Street West, opposite Wolverton College of Further Education. It is understood that at least two lectures are in the pipeline but were not completely finalised at the time of writing. For the latest situation, therefore, we have to recommend you to G3WXO at the address in the Panel, opposite.

At **Horsham** the vital first year of existence is now history, and a move has been made into larger premises, at the Guide Hall, Denne Road, where they can be located on the first Tuesday in each month, February 1 being a Film Show. In addition to this, you could try looking in at the Star in Roffey, on February 18, when there will be an informal.

Brighton Technical College have meetings in the Richmond Terrace building, on alternate Mondays, giving what looks like February 14 and February 28 as the dates this time. However, although we can say all are welcome, we do not at this writing have the exact programme, for which we have to refer you to G2CMH, as Panel.

The **Reading** crew seems to have moved their Hq. since last we heard from them; they now meet at the Electronics Workshop in Ashmead School, Northumberland Avenue. February 1 is the latest date for which we

have a firm programme (Frequency Measurements) but there will be another session on the 15th, no doubt.

Baden-Powell House has its own Amateur Radio group, who can be found there on February 17, at 1930z. Scouts intending to look in should note the address, which is in Queens Gate, South Kensington.

There must be a higher proportion of YL members of **Dartford Heath D/F** Club than any other Amateur Radio group in the whole country—perhaps because of the influence of G3XVC; certainly, their activities are aimed at the whole family. In addition to hunting for hidden transmitters, they have regular meetings at Hq. in Broomhill Road, Dartford. February 4 sees a representative of the Post Office talking about the Television Detector, while on the 18th there is a nice informal club-night.

It is the second Thursday in the month for the **Southgate** crew, at the Hq. in the Civil Defence Hut, opposite Arnos Grove Tube station in Bowes Road. We understand G3AAJ will be the speaker, taking as his theme Marine Communications.

Guildford are still at the Model Engineering Hq., in Stoke Park, and meeting on the second and fourth Friday in each month. Although we have no details of the

Names and Addresses of Club Secretaries Reporting in this issue:

ABERDEEN: J. McCall, GM3HGA, 1 Pinewood Place, Aberdeen (*33838*), AB1-8LT.
ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, London, W3-8LB.
A.R.M.S.: N. A. S. Fitch, G3FPK, 40 Eskdale Gardens, Purley, Surrey.
AXE VALE: J. W. Cross, Coverdale, Woodmead Road, Lyme Regis (*2882*), Dorset.
BADEN-POWELL HOUSE: A. Watts, G3FXC, 312 Tudor Drive, Kingston, S rrey.
BALLYMENA: M. G. Williamson, 13 Antrim Road, Ballymena, Co. Antrim.
BARKING: H. G. Davidson, G3FZP, 223 Salisbury Avenue, Barking, Essex.
BARRY (Coll. of Further Education): D. H. Adams, GW3VBP, 49 Colcot Road, Barry, Glam.
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SHORT CLUB NOTICES

CLUB NAME	HEADQUARTERS LOCATION	MEETING DAY MONTHLY
Ballymena	*Not stated*	*Not stated*
Barking	Gascoigne School, Morley Road	Feb. 10
Bedford	The Dolphin, Broadway	Feb. 3, 10, 17, 24
Dunstable Downs	Chews House, High Street, South Dunstable	Fridays (AGM 11th)
Edgware	St. Georges Hall, 51 Flower Lane, Mill Hill	*Not stated*
Farnborough	310 Farnborough Road	2nd and 4th Tuesdays
Greenford	Community Centre, Oldfield Lane	Feb. 4, 18
Hereford	Civil Defence Hq., Gaol Street	Fridays
Kingston	Penguin Lounge, 37 Brighton Road, Surbiton	Feb. 9
Mid-Sussex	Marle Place, Leylands Road, Burgess Hill	*Not stated*
Nottingham	Sherwood Community Centre, Mansfield Road	Thursdays
Plymouth	Virginia House, Bretonside	1st and 3rd Tuesdays
Redditch	Old People's Centre, Park Road	Feb. 10 (AGM) and 24
Rhyl	Mona Hotel, Market Street	Alternate Tuesdays
Southdown	Victoria Hotel, Latimer Road, Eastbourne	1st Monday
Star	New Inn, Bramley Town Street, Leeds	Wednesdays
Sutton and Cheam	The Harrow, Cheam	3rd Tuesday
Sutton Coldfield	Clubhouse, Sutton Coldfield FC, Coles Lane	2nd and 4th Monday
Torbay	Bath Lane (rear 94 Belgrave Road), Torquay	Feb. 22
Wolverhampton	Neachells Cottage, Tettenhall	Mondays

N.B.—In each case, Secretary's name and address appears in Panel, p.753.

February programme, we notice they make most of their own entertainment, and have had interesting topics on almost all their dates.

It is quite a while since we last heard from **Harlow,** where a new secretary takes over the reins. They still have their Hq. at Mark Hall Barn in First Avenue, between the A.11 and Kennings Garage, and members are often to be heard using 28·8 MHz as the net frequency, around 2100z. For more details we must pass you on to said hon. secretary—*see* Panel, p.753.

Not far away is **Bishops Stortford,** who will be having a lecture on Oscilloscopes by the Man from Tektronix, G3VVS—it is understood Stuart will be bringing along some mouth-watering items such as 'scopes which are quite capable of looking at two-metre RF, as well as showing how such tools can be used.

Heading for the sea next, we come to **Chichester,** whose secretary lives at Selsey. This group get together in the Lancastrian Boys School, behind the Police Station. The lads can be found there on the first Tuesday and the third *Thursday* in each month.

For **Verulam** the Hq. is St. Albans Town Hall, in the Council Chamber, where on February 16, G3SVK will be showing slides and films of his sojourn in the Shetlands as "England's most Northerly amateur station."

Back South again, this time to **Worthing,** who send us their very interesting newsletter *Ragchew*. From it, we glean that they meet at the Rose Wilmot Youth Centre every Tuesday evening; the main event in February seems to be the Home Construction Contest, an activity in which we sense the Club to be strong.

One of our "regulars" is **Shefford,** who have a place at the Church Hall, Ampthill Road, with G3TDW talking on February 3 about the nature of Ionising Radiation, followed by Frank Voyner on Satellite Communication, on the 10th—probably the best man in the country on this topic! The juniors get a look in on the 17th, with a Quiz, and G3OWQ rounds-off the month with his talk about a Linear Amplifier.

A change of Secretary is notified at **North Kent.** On February 10, Dain Evans, G3RPE, will be giving his "Talk on Microwaves in the Amateur Radio Context". From one end of the spectrum we shoot straight to the other, for on February 24, the lads will have W1BB'x Top Band DX tape-and-slide lecture. These are both at the Congregational Church Hall, Bexleyheath.

Just up the road are neighbours **Cray Valley,** at the Congregational Church Hall, Court Road, Eltham. On February 3, G3OQD will be addressing the multitude, his subject being SSB transmitters; this will be followed on February 17 by a "donated" Surplus Sale, which, we presume, means all the proceeds go to Club funds—good idea.

Ashford, Middlesex, is the location of the **Echelford** crowd, their Hq. being at St. Martin's Court, Kingston Crescent, in the Hall; it will be a Surplus Sale on February 24.

Sad to say, the **Chiltern** information for December was late in arriving, so your conductor now has three lots to choose from! However, they all say the Hq. is at the Ernest Turner Works (G4NT), Totteridge Avenue, in the canteen—which, over the years has been the scene of many radio amateur gatherings. February 8 is a Surplus Sale, and on February 23, G3JGO will be coming along to talk about TVI and the ways-and-means of tackling it.

If you are a member you must make a special effort to turn up at the **Crystal Palace** meeting on February 19, because it is the AGM, at Emmanuel Church Hall, Barry Road, London S.E.22. The mainspring here is Geoff Stone, G3FZL.

Conclusion

Considering the number of "Short Notices" in addition to those in the text, we have a right **Bumper** Bundle this time, possibly an all-time record as regards Club reports. Keep up the good work by sending us your *March* notice to arrive by **February 4, latest,** addressed as always to "Club Secretary," SHORT WAVE MAGAZINE, BUCKINGHAM.

Closing dates for the next few issues are *March 10,* for the April issue; *April 7* for May; and *May 5* for June.

Q. & A. FOR THE R.A.E.

Concluded from January Issue

THE first part of this article, answering the first two questions in Part I of the May R.A.E. and Questions 3-7 in Part II, appeared last month—and there was an error in one of the answers. To Q.1(a) in Part I (p.690), the maximum speed should have been given as 20 w.p.m. and not as stated — as several readers have pointed out. (Though in fact "12 w.p.m." will appear in a great many licences now extant.) Thus the answer, while not being seriously wrong, is inexact and so should be corrected.

Q.8. Draw the circuit diagram of a CW telegraphy transmitter capable of operation on at least three *amateur HF bands. Describe carefully the operation of the system of keying employed, and explain the steps to ensure a good waveshape.* (*10 marks*)

Answer (8)

Note values are not called for and not inserted. The use of plug-in coils as indicated eliminates the need to draw extensive switching.

This transmitter is grid-block keyed in the final stage. R10 will be the normal grid resistor for the stage, value defined by the drive requirements of V4. Under key-down conditions grid-current flows through RFC5, R10 and K to ground and the stage operates normally. When the key, K, is open, then 20 volts negative appears through Rx and R10, RFC5 on the valve grid, cutting it off, and also swamping out the drive voltage from V3, so that V4 shows no output whatever. This requires, with the usual small tetrode, about 200 volts open-circuit from the bias supply, of polarity as shown. C_x could be set for a start at 4700 pF, and R_x about 20 times greater than R10. C_x will have its major effect on the click on the "make" of the key, while increase of R_x will reduce the click at the "break". Practical tests will have to be carried out, first observing the waveform on an oscilloscope, and then on the air. If the keying still sounds "clicky" no matter what adjustments are done, revert to the original values and neutralise the stage, before recommencing tests. In addition, there is a possibility that there will be a local click at break due to the key contacts sparking, though unlikely with grid keying. It may be removed by putting an RF choke in series with each key-lead at the key, joining the key-leads at both ends of the chokes by a parallel capacitor, as shown inset. It should be noted that any local click, which requires the use of the filter shown in the inset, must be dealt with before any tests are made of the wave-shaping previously mentioned, or they will mask the effects.

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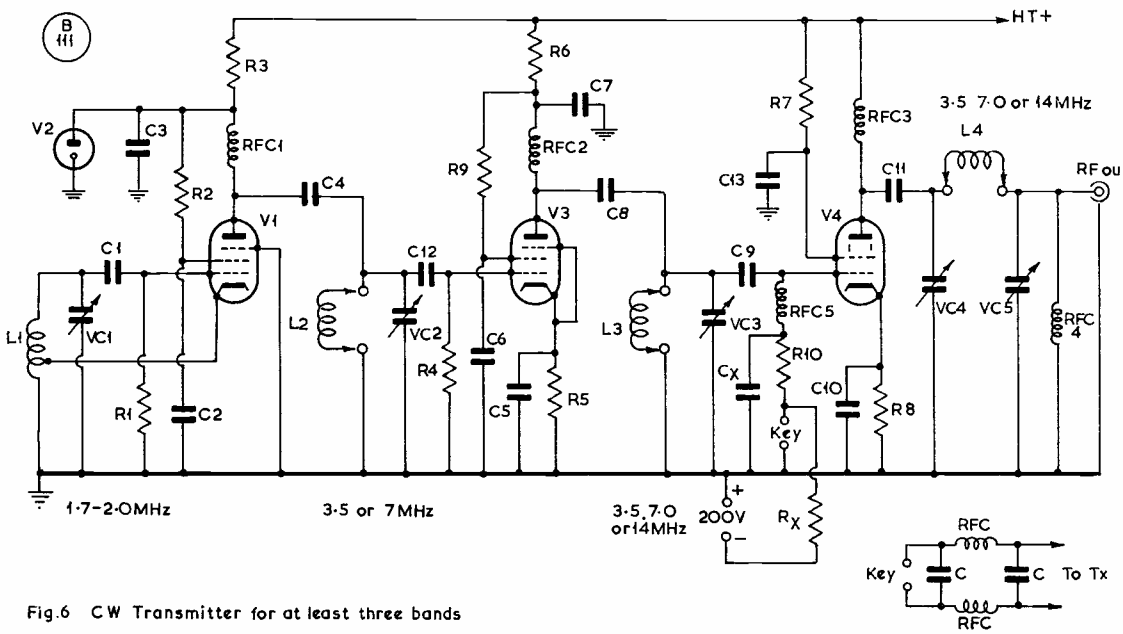

Fig.6 CW Transmitter for at least three bands

Fig. 6. (*To answer Q.8*). **The items involved in the chosen keying system should be clearly noted, as the answer requires a careful and thorough explanation of the working of your method. Plug-in coils save time; but it becomes necessary to indicate on the drawing the frequencies to which the various circuits can be tuned.**

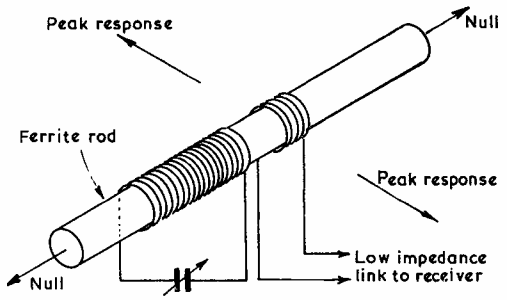

Fig. 7a. 1·8MHz Directional Receiving Aerial

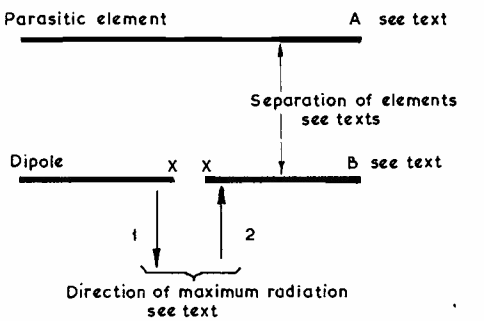

Fig. 7 b. Directional aerial for Transmitting on an HF Band (B 112)

Fig. 7. *(To answer Q.9).* **Both alternatives are offered in drawings and text; but only one would have been attempted by an individual candidate. Fig. 7.a. Shows a ferrite rod used to make a directional receiving aerial for Top Band, as explained in the text. Fig. 7.b. gives dimensions and data for a two-element Yagi array, in conjunction with the text.**

Q.9. Describe the construction of either *a directional aerial for receiving in the 1·8 to 2 MHz band,* or *a directional aerial for transmitting in an HF band. Describe the directional properties of the aerial selected. (10 marks)*

Answer (9)

(*Note:* Both questions are answered; a candidate would of course only take one of the alternatives offered.)

Look at Fig. 7(a). Here we see a ferrite rod, with a coil wound on it at the centre, the ends of which are taken to the variable capacitor shown diagrammatically below the ferrite rod; the coil and capacitor together form a tuned circuit resonant in the 1·8 to 2·0 MHz range. Overwound on top of the coil (but shown to one side for clarity) is a second winding of a few turns to provide a low-impedance link coupling to the receiver. In use, the capacitor is resonated to the desired frequency, and it will be found that maximum response is broadside to the aerial as shown, with nulls off the ends of the rod also as shown.

Consider Fig. 7(b). A simple directive transmitting aerial could well comprise a dipole and parasitic element, the latter acting either as a director or reflector, the combination being called a Yagi array.

The length of the dipole or driven element B will be given by 468/f(MHz) = l, where l is in feet. The separation between B and the parasite A may be 120/f feet. If A is to act as a reflector, it will be made 492/f = l feet long, and the maximum radiation will be in the direction shown by the arrow (1). On the other hand, A may be reduced in length to be 435/f = l feet long, when it will act as a director, and maximum radiation will be as shown by arrow (2). The dimensions given would be applied for the mid-band frequency for 7, 14, or 21 MHz, but at 28 MHz one would have to accept operation over part only of the band. The dimensions serve as a starting-point for experimental (and slight) adjustment of the lengths, after which a suitable feed arrangement, such as a gamma-match, is used to obtain a VSWR on the feeder of 1 : 1 at mid-band, to 50 ohm cable. It is preferable to feed the gamma-match system through a balance-to-unbalance circuit, so that the feeder down the mast to the transmitter is unbalanced and does not either radiate or pick up any signal. X-X in the diagram are the feed points.

Q.10. Draw the circuit diagram of a push-pull final amplifier stage suitable for use with an amateur sound transmitter. Include and explain the metering arrangements necessary for measuring the DC input to the stage.

What alternative method of determining the power input can be used with single-sideband (type A3J or A3A) emissions? (10 marks)

Answer (10)

See Figure 8: The anode voltage cannot be measured by putting a meter directly in the anode circuit, as this

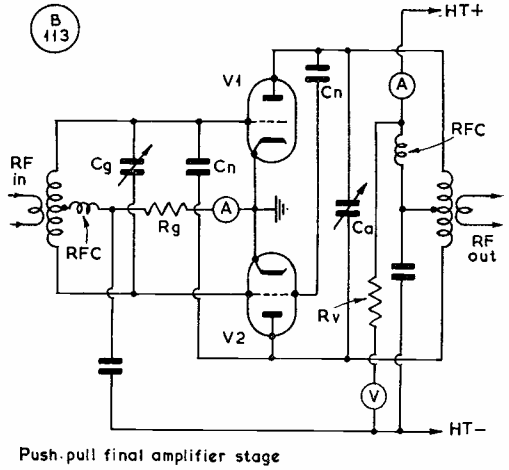

Fig. 8. *(To answer Q.10).* **A push-pull RF stage, cross-capacity neutralised, Cn, and having grid current, anode current and anode volts measured. The use of these is discussed in the text.**

would upset the operation. Thus the meter V is fed through its series resistor R_V, value determined by the FSD and DC resistance of the meter, from a point on the anode side which is decoupled from the RF by RFC and the decoupling capacitor, The meter A in the feed to the two valves measures the current drawn by the two valves—mean, not instantaneous—and the other milliammeter, in the grid return, will be noting the drive current. In use, the drive current will be "peaked" by tuning the grid circuit and/or the adjustment of excitation from the previous stage. HT will now be switched on and the PA stage resonated, coupling being set by adjustment of the output coil to the PA tank circuit. When it is correctly tuned up, one may measure the voltage and current indicated by the two meters in the anode circuit. Then they will be multiplied together to give the watts input to the anode circuit of the final stage, which must not exceed that laid down for the band in use, normally 10 or 150 watts.

For SSB, an alternative method is to convert the stage to Class-C temporarily and load it up to 150 watts input. An oscilloscope may be connected somewhere convenient to the output side of the circuit—probably on the feeder or through a pick-up probe at the aerial tuning unit (ATU)—and the deflection of the trace noted. The stage is then converted back to its SSB operating conditions and loaded up. Instead of CW drive, now apply speech; the deflection on the oscilloscope must not exceed twice that previously noted.

Important!

Candidates intending to sit the May R.A.E. should have their applications in before the end of February—Course Tutors will give guidance on this point. Those reading for the R.A.E. on their own should apply to the local office of their Education Authority, quoting "City & Guilds Exam. Subject No. 55".

Model of the new Racal RA-1770 series of double-superhet receivers, in three different versions, designed to provide a choice of continuous tuning or synthesiser control. The frequency range is 50 Hz to 30 MHz, divided into 1-megacycle bands selected by a 30-position switch in the free tuning version, RA-1770. In the synthesiser designs, RA-1771 and RA-1772, frequency selection is in 10-Hz steps. Fully solid-state, the receiving modes available are CW/DSB/ISB/SSB/FSK. The RA-1770 can also be fitted with up to six crystal-controlled channels for spot-frequency working.

NEW QTH's

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

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G3XLZ, J. J. Tozer, 26 Lizard Walk, Southway, Plymouth, Devon, PL6 6EZ.

G3XZF, W. Felton, 7 Riverton View, Lincoln.

G3YQQ, J. A. Bibby, 167 The Green, Eccleston, Chorley, Lancs., PR7 5SA.

GW3ZTH, J. D. V. Ludlow, 1 Maes Glas, Cefn Cribbwr, Bridgend, Glam. (*Tel. Kenfig Hill 561.*)

G3ZYE, R. Bellerby, 4 The Cop, Rossall School, Cleveleys, Lancs. (*Tel. Cleveleys 6826.*)

G4AFU, P. Rollin, No. 2 Flat, 221 Chippinhouse Road, Sheffield, Yorkshire, S7 1DQ.

G8BMI, G. T. Theasby, 12 Southfield Avenue, Riddlesden, Keighley, Yorkshire, BD20 5HX. (*Tel. Keighley 62859.*)

GM8CUW, A. R. Thackery, Valhalla, Westerloch, Lerwick, Shetland Islands.

G8DAB, B. S. Smith, 3 Alverton Avenue, Parkstone, Poole, Dorset.

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MARCH Issue: Appears February 25. Single-copy orders 25p, post free, to reach us by Wednesday, February 23, for posting on February 24. —Circulation Dept., Short Wave Magazine Ltd., 16 Victoria Street, London, SWIH-0HF.

GOVERNMENT Surplus Wireless Equipment Handbook: Contains circuits, data, illustrations, valuable information on British/U.S.A. receivers, transmitters, transceivers. Includes modifications to sets and test equipment. Surplus/commercial cross-referenced valve and transistor guide. Price £2·85, post/packing 15p.—**Myers (B), 112 Stainburn Crescent, Leeds, 17, Yorkshire.**

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2½p per word, minimum charge 50p payable with order. Add 25% for Bold Face (Heavy Type). Please write clearly, using full punctuation and recognised abbreviations. No responsibility accepted for transcription errors. Box Numbers 12½p extra. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, London, SW1H OHF.

READERS

FOR SALE: Eddystone 888A Rx, £60. R.C.A. AR88LF, £30. DX-100U Tx, £40 or offer; carriage extra.—Bushell, GW3OSV, Park East, Clarbeston Road, Pembs., West Wales.

EXCHANGE: R.1481 VHF receiver, covers 66 to 86 MHz, good 4-metre Rx, with two-metre converter, in good condition, less PSU FOR: BC-639A VHF receiver, or any 2-metre Rx in working order. External condition not important.—Box No. 012, Short Wave Magazine Ltd., 55 Victoria Street, London, SW1H-0HF.

WANTED: Manual, circuit diagram or any details for Ferguson receiver 204. Loan or purchase. Postage refunded to all correspondents.—Nicholls, 8 Findlay Place, Swanage, Dorset, BH19-1JW.

WANTED: HP-14 DC mobile PSU (for HA-14 Linear) in mint working condition. Fair price; no junk. Components considered.—Hockey, 9G1GT, Rosaburn, Garelochhead, G84-0EJ, Dunbartonshire. (Tel: Garelochhead 225).

EXCHANGE: Closed circuit TV camera with spare Vidicon, less lens, for receiver CR-100, BC-348, HRO, etc.—Wareing, 29 Clarendon Road, Swinton, Lancashire.

WANTED: Lafayette HA-600 in good condition. Also two-metre converter with PSU. (s.a.e.).—Hannah, 11 Lancaster Avenue, Skegness, Lincs.

WANTED: By collector, Cossor 41-STH or equivalent; any bright emitter valves; also early type Tx valve about ½ kW.—Box No. 5061, Short Wave Magazine Ltd., 55 Victoria Street, London SW1H-0HF.

EFFECTS of the late G3SBH: Including BC-221, Sommerkamp FL-200B, watt meter, 813 and 832 valves, Collins, TS-69AP frequency meter and astro compass. Lists for price of many items.—Spencer, G3ILO, 1 Field Lane, Cam, Dursley, Glos.

WANTED: Codar RQ-10X Q-multiplier/filter, self-powered unit with trimmer tool. Must be in mint condition and to Codar specification. Top price paid. Not able to collect.—Dening, Langcliffe Lodge, Settle, West Riding, Yorkshire.

WANTED: Transmitter and receiver, any bands or modes, for new G4/3. Unfinished project acceptable. SELLING: Equipment and components, s.a.e. lists.—Hudson, G8DVV, QTHR.

SELLING: Yaesu FT-101 transceiver, as new, and unused FV-200 remote VFO, for price of transceiver only, £240.—Barry, 15 Fairlawn Court, London, W4-5EE.

WANTED: Collins KWM-2, Drake TR-4 or similar. Top price paid for transceiver in perfect condition. Will inspect and collect.—Robinson, G6RJ, QTHR, or telephone Ipswich 78748 after 7 p.m.

FOR SALE: Lafayette KT-340 Rx. Thoroughly lined up and with choke smoothing installed in HT rail, complete with handbook, £20 or near offer. —Lindars, 52 Heathcote Drive, East Grinstead (23950), Sussex.

WANTED: Eddystone 750 Rx in good working condition.—Lindars, 52 Heathcote Drive, East Grinstead (23950), Sussex.

SALE: Hy-Gain 103BA 28 MHz Beam (best offer) prefer buyer collects; brand new, too big to erect properly.—Gardner, G3FYR, 31 Priory Avenue, Petts Wood, Kent, BR5-1JE. (Telephone Orpington 32368).

WANTED: Panadaptor 1031B, Collins RCX or similar. Also Heath SB-620.—Sturdy, 73 Rawcliffe Lane, York (27123), Yorkshire.

SELLING: Eddystone EA-12 receiver in mint condition. Buyer to view any time. Price £140 or offer. —Clements, 33 Stallard Street, Trowbridge, Wilts.

DISPOSING: R.C.A. AR88D, very good condition, £25. Hundreds of modern crystals, including BC-221. Loads of Junk. WANTED: 35·5 or 37·0 MHz xtal and home-built 144 MHz transmitter; also home-built Rx using Electroniques valve front-end.—Maxwell, GW3UMD, 1 Nantfawr Crescent, Cardiff (751332), South Wales.

OFFERING: **HW-100** transceiver, complete with mains and mobile power supplies. Excellent condition, as new. Offers over £115.—Ring Fenwick, 01-624 5481 (Maida Vale).

WANTED: Late Eddystone 840C or EC-10, £35 offered. (Delivery Essex).—Box No. 5062, Short Wave Magazine Ltd., 55 Victoria Street, London SW1H-0HF.

FILTERS: For SSB, Tx or Rx, 455 kHz, bandwidth 1·8 kHz at 6 dB; limited number at £4·75. Also PZT carrier xtals at 50p. VHF/UHF power transistors, all new: 2N3866, 2N4427 at 70p; 2N3053 at 20p; 40290 at £1·25; 2N3375 at £3·75; BF378 low-noise transistor for 23 cm or 70 cm, Ft 2300 MHz, small number at 70p. All items 5p postage. Send stamp for list and further data.—Elliott, G3FMO, Oatlands, Southend Road, Howe Green, Chelmsford, CM2 7TD, Essex. (Tel: Chelmsford 71604).

FOR SALE: 250 volt, 20 megohm Megger Testing Set, also Eversheds direct-reading resistance box, for use with this Megger. Both in oak cases and probably collector's items. Two wire recorders with working instructions (not in very good condition). Box of spares, spools of wire, valves, etc. L.F.3 oscilloscope. Buyers inspect and collect, please.—Gowen, G3RQN, 61 Westerleigh Road, Yate, Bristol.

SELLING: Receiver 1 to 16 MHz, converted to 12v., built-in DC/DC inverter, £6. TCS transmitter, unmodified, £8. Much modified TCS transmitter, large power supply, ready to go on air, coverage 160-80-40 metres, £9. (Delivered N. London). HC6/U crystals 1·908, 1·909, 1·910 MHz, 65p; 1·780 MHz, 45p; inclusive post and packing.—Martin, G3PWM, QTHR, or ring 01-445 9772.

SELLING R.C.A. AR88D receiver, with speaker and manual, coverage 540 kHz to 30 MHz, very good condition, bargain £55. Trio JR-60 receiver with speaker and manual, as new, coverage 540 kHz to 30 MHz, and on two-metres 142 to 148 MHz, a real snip, £60. Codar CR.70A receiver with PR.30 and RF preselector, covering 560 kHz to 30 MHz; tip-top condition, with instructions and speaker, £20. Grundig tape recorder Model TK-14, with tapes and reels, good condition, just plug it in, 230-250v. AC, bargain £20. Transistor power supply. Nombrex Model 22, input 200-250v. AC, maximum output 15v. DC, voltage and current control meter, as new, with instructions, £10. Hansen Model ZQM-2 transistor checker, for P-N-P and N-P-N and diodes, a good instrument for amateur or novice, as new, £8. Hamgear PM-1X preselector, 1·6 to 32 MHz, an instrument to hot up your receiver and to make the most of your aerial: just plug in to mains and receiver, with instructions, £8·50. Heathkit solid-state voltmeter, Model IM-17, AC/DC voltages, with manual, as new, bargain £15. Heathkit capacitor checker, for fixed or electrolytic, etc., such as resistors and transformer turns, with magic-eye valve and manual, 230-250v. AC, new, £15. Heathkit signal generator, RF-1U, coverage 100 kHz to 200 MHz, general purpose, with manual, 200-250v. AC, new, £15. All foregoing equipment in perfect working order, and will be money well spent. Buyers collect or small instruments sent by post, at cost.—Phelps, 59 Forest View Road, East Grinstead, Sussex. (Tel: East Grinstead 23459 between 9 a.m. and 8 p.m.).

FOR SALE: Labgear LG300, £30; Heathkit DX-100U, £30; National HRO, miniaturised, bandspreads, £25; Heath HR-10B xtal calibrator, £22·50; BC-348, perfect, £6.—de la Bertauche, G3RCO, QTHR, or ring Seaton 21016.

DISPOSING: KW-2000B, little used, £165; Echelcom-2 transmitter, £15; Huslar Mobile, all coils, £15; dummy load, £4; K.W. ATU, £10; Shure 444/T microphone, as new, £10. Several other oddments.—114 Lodge Lane, Collier Row, Romford, Essex. (Ring: daytime, 01-592 7800; evenings, Romford 61191).

EXCHANGE or SELL: 200 watt CW/AM Tx, coverage 80-10m., 813 final, or will exchange for communication receiver.—Goode, G2DTQ, 71 Church Road, Shareshill, Wolverhampton, Staffs.

SELLING: Trio 9R-59DS receiver, with matched speaker, in perfect condition, £33. Buyer collects. —Potter, 37 Wykeham Hill, Wembley, HA9 9RY, Middlesex.

WANTED: AR88D, condition immaterial but must function, will collect.—Handy, 105 Humber Avenue, Coventry (22201), Warks.

WANTED: R.209 Rx, must be in good working condition. Please give details of Rx and price required.—Ramsay, 12 Mayfield Road, Northfleet, Gravesend (69267), Kent.

SALE: KW-2000 with AC/DC PSU's, Shure microphone, up-dating mods. by K.W. Good home-mobile performer and smaller than KW-2000 A/B, price £135. Large Marconi key, £1. Taps 2/4/6BA, 8p each, 3 for 20p.—Knight, G2FUU, Homefield, Back Lane, Upper Nazeing, Waltham Abbey, Essex. (Tel: Nazeing 2274).

SELLING: 1971 MCC-winning Codar A.T.5 Tx with mains PSU, in excellent condition, £16 or EXCHANGE Hi-Fi gear or W-H-Y?—Willy, G3YRU, 9 Northmoor Road, Longsight, Manchester.

SELLING: Hammarlund HQ-180A Rx in mint condition, with matching speaker and manual; also fitted with timing clock. Price £135. WANTED: Sony CRF-230 Global.—Hermes, 62 Apsley Road, Cirencester, Glos.

FOR SALE: Heathkit RA-1 Rx, with crystal calibrator, Q-multiplier (all by Heath), £32 or near offer.—Box No. 5063, Short Wave Magazine Ltd., 55 Victoria Street, London SW1H-0HF. (or ring Jones, Wetherby 4265.)

WANTED: Collins 51J-3 or J-4. Details of price and condition please.—Box No. 5064, Short Wave Magazine Ltd., 55 Victoria Street, London SW1H-0HF.

SALE: Two-metre gear: DL6SW converter, IF 4 to 6 MHz, £5; valve converter, ditto, £3·50. Ten element Yagi, £4. Home-built valve Tx, £8. Metered 350v. PSU, £4. Class-D wavemeter, £3·50. Write or phone for details.—Adams, 89 Oakdale Drive, Heald Green, Cheadle, Cheshire. (Tel: 061-437 4198).

SALE: Eddystone S.640 Rx, coverage 1·7 to 30 MHz, in good condition, £20. R.1155B (no Top Band) with mains PSU, £8. Hitachi short wave adaptor, 13 to 90 metres, suits any car radio, £6. All with manuals.—Smith, G8FLH, 7 Brentingby Close, Melton Mowbray, Leicester, LE13 1ES.

SELLING: Codar mobile PSU, £9. Heath DX-60B Tx, £25 or offer? (Both these items in brand new condition.) Codar 12/RC control unit, £1·50.—Morris, G4HU, 34 Birch Avenue, Romiley, Stockport, Ches.

PERSONAL circumstances force sale Eddystone Model 770R VHF Communications Receiver, tuning 19 to 165 MHz, wth S-meter, handbook and speaker, excellent condition, £75 or offer? **Eddystone Model 840C** communications receiver, general coverage 480 kHz to 30 MHz in five bands, with manual, practically new and hardly used, £42. Write, or call evenings.—3 Dane Road, off Norman Road, Ilford, Essex.

DISPOSAL: Decca radar equipment Type 45, comprising 16-inch display unit Type 4209, transceiver unit Type 4204, motor alternator Type 4206, and scanner. All in working order but less interconnecting cables. First offer of £100 secures. Total weight about half a ton, buyer collects. (Essex).—Box No. 5067, Short Wave Magazine Ltd., 55 Victoria Street, London SW1H-0HF.

OFFERING: Brand new Mosley TA-31Jr. triband dipole, (20-15-10m.), unpacked, complete with instructions, best offer? No attempt to assemble (no mechanic!), with nuts and bolts etc.—Gardner, G3FYR, 31 Priory Avenue, Petts Wood, Kent, BR5 1JE. (Ring 66 32368.)

ON OFFER: Eddystone 12v. EB-35 Rx. Eddystone 12v. EC-10 Mk. I receiver, TR-33Jr. 3-ele beam for 10-15-20 metres. 35-foot alloy mast. Joystick de luxe. Joymatch ATU. Offers? (South London).—Box No. 5068, Short Wave Magazine Ltd., 55 Victoria Street, London SW1H-0HF.

WANTED: A BC-348 or R.1155 receiver, for young short wave radio enthusiast.—Paul, 2 Tobyfield Road, Bishop's Cleeve, Cheltenham, Glos.

SALE: Require room in shack. Shure 444, £5·50; K.W. P.E.P. meter, £9; HA-350, with speaker, calibrator and Top Band coverage, £50. Resistors: ½-watt, 5% most values, 1p each, 65p for 100. Standard jack plugs, various Mullard electrolytic capacitors. Send for list.—Woodhouse, G3TWX, 52A Barnby Gate, Newark, Notts.

SELLING: Trio 9R-59DS receiver, fitted voltage stabiliser, as new and hardly used. Also H.S.4 headset and 4H Joymatch ATU. Price £40 the lot. —Sharp, 26 Longstock Crescent, Totton (4305), Southampton, Hants.

SELLING: Heath HW32-A 20-metre SSB transceiver in mint condition, £45. Also 50ft. Telomast, bargain at £10 (carriage extra).—Acton, G3MBJ, 32 Hillcrest Avenue, Winshill, Burton-on-Trent, Staffs.

WANTED: Heath Two'er; T.W. Communicator; Green and Davis two-metre gear and TMR-5 Rx, also 2m. receiver.—Box No. 5069, Short Wave Magazine Ltd., 55 Victoria Street, London SW1H-0HF.

SALE: National HRO, eight coils and PSU, £17·50 or near offer. Buyer to collect.—Streek, Cawood Road, Wistow, Selby, Yorkshire.

OFFERING: K.W. Viceroy Mk. IIIA, 6146B's in PA, full lattice filter. K.W. 500 linear.—Pallant, Wheatley, Martins End Lane, Great Missenden (2642), Bucks.

SELLING: Codar CR-70A receiver, seven months old, purchased new and in perfect order, £18.—Booker, 7 Howard Close, Ashchurch Gardens, Tewkesbury, Glos.

MARCH issue SHORT WAVE MAGAZINE will appear on Friday, February 25. Single copies at 25p post free can be supplied to orders reaching us by Wednesday 23rd for despatch on Thursday 24th, the day before publication. Orders with remittance to: Circulation Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London SW1H-0HF.

DISPOSING: KW-2000, late model, with AC/PSU and manual; Mods. ALC, wider (to 3·5 kHz) filter and switchable AVC. Recently re-valved and realigned. Price £110.—Benham, G3YJP, QTHR, or ring Letchworth 6392.

SALE: Heathkit HW-32A with HP-13A PSU for mobile, price £65 plus carriage.—Kemsley, G3FUN, 1 St. Mary's Road, Faversham, Kent.

FOR SALE: Heathkit Mohican GC-1U receiver, AM/CW/SSB mains/battery, in very good condition, with mains unit and manual, £25.—Ring Lance 021-706 0557 (Birmingham).

SALE: Creed 54 teleprinter with reperforator attachment, £18. Creed 54, £16. Creed 6S/5M tape reader, £10. Creed 7TR reperforator, £5. Siemens printing reperforator, £10. R.C.A. AR88D, Air Ministry type with IF gain control (AP. 100386 TU) accompanying PSU and AP.67980 tuning indicator, £45.—Wigg, G6JF, Yabbacombe Farm, Kingsbridge, Devon (Tel.: Loddiswell 324.)

OFFERING: For balloon-supported Verticals, Met. balloons at 70p, 275ft. reels aluminium wire 60p, post/packing included.—Stratton, G3XKV, Ganthorpe Farm House, Ganthorpe, Terrington, York.

WANTED: KW-2000A, state price and condition.—Buckley, G3VLX, 17 The Weald, Chislehurst, Kent. (Ring 01-467 8093, evenings or week-ends.)

SELLING: Mullard transceiver, with 2/6146 PA and 2/6146 modulator, for 240v. AC, with handbook, etc., £15.—Rayer, G3OGR, Reddings, Longdon Heath, Upton-on-Severn (2244), Worcs., WR8-0RJ.

FOR SALE: Codar CR-70A receiver, little used and in excellent condition, price £18.—Odell, Dauntsey's School, West Lavington, Devizes, Wilts.

SALE: Murphy PSU (suits recent G.W.M. Tx as advertised) with connecting cables, plug and circuit diagram, price £6 or near offer.—Osborne, G3YGM, QTHR.

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