

RADIO BYGONES

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No. 11 – JUNE/JULY 1991

TEST EQUIPMENT OF BYGONE DAYS



A SINGLE-VALVE LOUDSPEAKER RECEIVER

THE MYSTERIOUS A. J. ALAN

A SPARK OF NOSTALGIA

RADIO VALVES & TUBES – 3: ‘CV’ EQUIVALENTS

Station Tester Mk II, manufactured at the War Department W/T Factory in Soho, London W. It was used to check receivers and transmitters, and covered the band 100–1200 metres in three ranges. Note the two spare detector crystals in the lid

MUSEUM PIECES

This month featuring a variety of test equipment from bygone days, including items from the

Historic Wireless Collection of Bill Journeaux of Poole, Dorset, the Chalk Pits Museum, Amberley, West Sussex, and the collection of P. J. May, Poole



JHWC

OUR FRONT COVER

Two models of the Townsend Wavemeter, designed by Prof. J. S. Townsend and used extensively during WWI. On the left, RAF Wavemeter No. 3, covering 300–4000 metres. On the right a version by A.T.M. Co. Ltd, dated 1918 and covering 3000–12 000 metres

JHWC

A wavemeter manufactured by the Marconi Scientific Instrument Company Limited of London. Three additional range coils are housed in a compartment in the base of the cabinet. The instrument, which uses a single 'R' valve, was possibly a prototype model. The top panel appears to have been used previously for another project, as there are patterns of unused holes drilled on the underside. Further information about its origins would be most welcome



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FOR MANY YEARS, I have been in the happy position of being able to borrow a valve tester whenever I had need of one. Recently, however, I decided that it would be useful to have one of my own. Seeing some ex-Ministry AVO CT-160 Valve Testers in nearly as-new condition at a reasonable price at a show, I decided to treat myself.

I've used it on several occasions since with no problems. Just recently though, I wanted to test a boxful of valves including several small batches of the same types. Then, funny things began to happen and the tester condemned a batch of four valves on American 5-pin 'UX' bases as all having open-circuit heaters.

Strange, I thought, and put them on one side to investigate further. Shortly after, another batch of half a dozen valves, also on 5-pin UX bases, were rejected as being heaters O/C. Now I was really suspicious, for I was beginning to recall an occasion at marine radio college some forty years ago, when a lecturer was trying to produce a 'dud' EF50 for use in fault-finding exercises on a Marconi Marine 'Oceanspan' transmitter.

First, he connected the valve's heater across the 24V DC emergency accumulators fitted in the college radio cabin. We could see the healthy orange glow of the heater and cathode via the glass seals surrounding the valve pins, but that poor EF50 showed no signs of wanting to succumb to over-voltage. Eventually, in desperation, the lecturer gave it a quick burst of 240V AC mains, which despatched it in short order!

Now, though I know only too well that you can very quickly ruin a 1.4V or 2V battery valve by accidentally applying HT across the filament pins, a 6V heater seems a rather more robust animal. So what could have happened to burn out those two batches of valves, still in their original boxes, with several appearing to be brand new?

I was poised to get out my multimeter for a continuity check on the valves. It's always been my experience, though, that a large proportion of faults in valved equipment can be quickly found by the application of the senses of sight and smell, and on this occasion I was fairly certain I knew what was wrong. So I resisted the temptation to get all technical and instead removed the valve-holder panel from the CT-160 for the visual inspection. And there it was; despite all the tags being clearly numbered on the valve-holders, and a colour-coded system *à la* resistor colour code being used for the wiring, some dozy assembly operative had managed to transpose the connections to pins 1 and 2 on the 5-pin UX holder. All other wiring was correct.

Obviously, a tester of this type was most unlikely to have been used for any sort of batch-testing in its life in the Services, so maybe nobody ever got suspicious at the occasional CV124 (807) or other 5-pin UX valve that this one threw out. It does make me wonder about the procedures in the production test department of the day at AVO though, for although there were no tell-tale inspector's dabs of red varnish or whatever on each soldered joint, it was apparent from their appearance that they were original and untouched from the day they left the factory!

And those rejected valves? All except one were really in 'as new' condition.

Geoff Arnold

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News & Events

New Publications

A new monthly publication called *Buyers & Sellers Digest* has just arrived on the British radio hobbyist scene. It features display advertisements from many of the usual amateur radio dealers and component suppliers, but its main aim is to provide space for free readers' advertisements of the sort found in *Radio Bygones* and in most of the UK's amateur radio magazines. The difference between those magazines and *Buyers & Sellers Digest*, apart from the fact that it has no editorial content whatsoever, is that the adverts are sorted into almost 150 different classifications of 'For Sale' and 'Wanted', according to the type of items mentioned.

Although *Buyers & Sellers Digest* is intended principally for radio amateurs, short wave listeners and computer users, it will also be of interest to vintage radio enthusiasts, for among the classifications are 'WWII/Military Equipment', 'Collectors Items', 'Keys/Keyers' and 'Publications'.

The May 1991 edition of *Buyers & Sellers Digest* comprises 52 A5 pages and costs £1.25. It is being stocked by a number of UK radio dealers, and is also being circulated through radio clubs and at major radio rallies.

Initial reports indicate encouraging results for advertisers and clients of the *Digest*.

A second publication from the same stable is entitled ECG – 'The New & Used Amateur Radio Equipment Costing Guide'. This is a quarterly pocket-sized book intended to solve the eternal question – what is the current market price for such-and-such a piece of second-hand radio equipment. The price listing is divided by equipment manufacturer and quotes new price, average second-hand price and (where sufficient information is available) the likely range of second-hand prices according to equipment condition.

A further section (without prices) segregates equipment by function/band, etc., and lists the type numbers and salient features of sets produced by each manufacturer under each category.

The 1st Edition of ECG comprises 100 A6 pages, and is priced at £2.99. Distribution arrangements are similar to those for *Buyers & Sellers Digest*.

If you have difficulty in finding a copy of either of these publications, contact the publishers **Technology Partners, PO Box 82, Lytham St Annes, FY8 2EN, telephone 0253 62925**.

New Museum

Readers in Italy will be interested to hear of the opening on Saturday, May 11 of the Museo Della Radiofonia, dedicated to the broadcasting era of the 1920s, '30s and '40s. The museum is located at Via Acilia 242, 00125 ROMA. For further details, telephone 6 6056085.

Can You Help?

Reader Keith Yates, having had a long-dormant interest in vintage radio sparked off by reading *RB*, has recently acquired a Marconiphone 'V2' which he plans to make his first restoration project. He would be interested in any information on this radio, or contact with other owners. His address is Tibblestone Lodge, Ashton Road, Beckford, Tewkesbury, Glos. GL20 7AU.

Let us know about your news and events

Send details to our new address:
9 Wetherby Close
Broadstone
Dorset BH18 8JB

For Your Diary

Come along and meet the *Radio Bygones* team at the following amateur radio rallies, which are always a potential source of equipment and components from bygone days, as well as their usual function as a sales arena for more modern technology. Start and finish times are in general from about 10am (sometimes a little later) to 5pm. Get there early to pick up the bargains! These three rallies are staged largely in marquees and partly on tables *al fresco*, so are to some extent at the mercy of the weather. Experience has shown, though, that the sun shines more often than not, making any of the events a glorious day out!

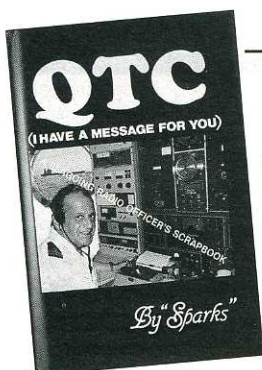
The **Royal Naval Amateur Radio Society Annual Mobile Rally** takes place on Sunday, June 9 at HMS Mercury, near Petersfield, Hants. Attractions for all the family. Ample space for picnicking and parking, including free buses to and from the Rally site from the car park. HMS Mercury is signposted from the A3 between Horndean and Petersfield.

The **Longleat Amateur Radio Rally**, organised by the Bristol RSGB Group, will be held on Sunday, June 30 in the grounds of Longleat House, Warminster, Wilts. Ample parking. One of the most popular events of its kind in the country,

and this year augmented by a craft fair on the same site. Longleat is well signposted from the Warminster bypass, but follow indications to the house, rather than the park.

The **Flight Refuelling Amateur Radio Society 'Hamfest 91'** takes place in the Flight Refuelling Sports and Social Club Grounds, Merley, Wimborne, Dorset on Sunday, August 11. Once again, there are plenty of attractions for the family and ample car parking. The site is adjacent to the A349 Wimborne to Poole road, a short distance from the A31 Wimborne bypass.

Hope to see you at one of these events.



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 '...book brings the history of radio to life by mixing personal anecdotes with background material... A certain nostalgic spirit surrounds the tales told'

POPULAR ELECTRONICS

'Reviewers around the world are calling this the best book ever written about the marine radio officer.'

Doug Stivison NR1A (New Jersey)

'I have a complaint. I can't put the damned thing down! I read it last night on the sofa, then on in bed and gave up around midnight. I read it at breakfast, then took time out to be Net Controller on the Pacific Amateur Radio Guild, where I extolled the virtues of QTC.'

Ken Johnson W6NKE (California)

'Having sat with my eyes glued to the pages of QTC, oblivious to the world around me, I just had to pass the good word about this book on to other radio enthusiasts.'

Kirsti Smith VK9NL, AMATEUR RADIO ACTION (Australia)
 'I am sure that many of us who have sat beneath the ship's radio room clock...will identify with this story. A fascinating book which I can certainly recommend to any reader with seagoing connections.'

Geoff Arnold G3GSR, MORSUM MAGNIFICAT

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Popov; Russian Claim to Fame

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The Radionette Symfoni-3D

Oscillating Crystals

Contents subject to last-minute revision



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by Victor Brand, G3JNB

At last, a simple introduction to the hobby, written specifically for the absolute beginner of any age. This copiously illustrated book shows how to tune into the fascinating world of short-wave radio, how to make a crystal set, and just how to go about becoming a radio amateur.

65 pages; 210 by 145mm; £4.56 incl p&p



RSGB Amateur Radio Call Book

The latest 1991/92 edition of this indispensable reference contains an up-to-date listing of the names and addresses of UK and Republic of Ireland radio amateurs plus a directory containing all sorts of useful information, from country checklists and operating data to RAE centres. Don't be without it!

414 pages; 297 by 210mm; £9.27 incl p&p

Space Radio Handbook

by John Branegan, GM4IHJ

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242 pages; 244 by 183mm; £13.34 incl p&p

- **HOW TO ORDER:** Phone your credit card (Access/Visa) order in on 0707 49855 or send a cheque/PO. Allow up to 28 days for delivery.

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Radio Valves and Tubes – 3

Military ‘Common Valve’ (CV) Equivalents

by Geoff Arnold

In this, the final part of our series on valve and tube type numbering, we come to the military CV system, which first came into use in 1944, and gradually took over from the earlier military systems described in *Radio Bygones* No. 10.

Each CV number has a comprehensive design and test specification associated with it. Such specifications are usually more stringent than the commercial designs on which they are based (but see (b) below), which means that although you can generally use a CV-spec valve in a piece of equipment in place of its commercial equivalent type without loss of performance, you may well not get full performance by substituting a commercial type for its CV-spec equivalent in a military set.

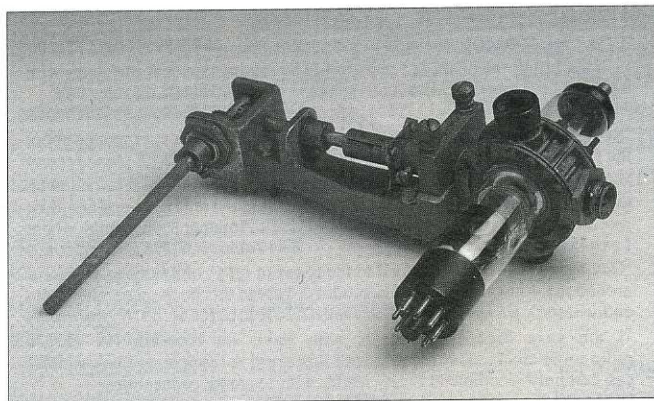
Sometimes, as circuit and valve technology developed with the passing years, an even more closely specified valve was needed, and a new CV number would be issued based on the same commercial equivalent. It is important to understand that although we talk loosely about ‘equivalents’, they are more correctly called comparables; they are not truly direct equivalents, simply because they are tested to different specifications. Sometimes the new CV number and its associated specification would replace the old one in its entirety; sometimes the two would exist in parallel, both based on the same commercial design.

One of the first things which you will notice about the listing is that there are many gaps in the numerical sequence. There are a number of reasons for this, including the following:

1. There were lots of gaps, large and small, left when the original list was put together. Anything from single numbers to groups of as many as 500 consecutive numbers were initially left blank. Some of these were later filled, either for newly developed valves, or as a result of the need to allocate numbers to valves which had been used in equipment designs subsequently taken into military service. When the CV system became firmly established, lists of ‘preferred types’ were issued to encourage equipment designers to stick to valves already on the register wherever possible.
2. Some numbers were allocated to valves which were later declared obsolete.
3. Some numbers were later cancelled or declared ‘in abeyance’.
4. Some numbers were later declared cancelled and the user referred to a different CV number.

In order to make this list as useful as possible, and yet keep it to a manageable size, the following ground-rules were applied in its compilation:

- (a) Where still available, information on CV numbers cancelled under ‘4’ above has been included for ease of reference.
- (b) Many CV numbers do not have a commercial comparable type listed in the register, instead it quotes the number of an experimental prototype from which the valve was developed. Since this information is of little general use, such numbers have been omitted.
- (c) Only a single commercial comparable type number has been quoted for each CV number. You will need to refer to a commercial equivalents list to find, for example, that a CV138 is comparable not only to an EF91, but also a 6AM6, a Z77, a 6F12, an 8D3 and so on!
- (d) Some of the more esoteric devices, such as spark gaps, dummy-load lamps, Geiger-Muller tubes and some neons and



Journeaux Historic Wireless Collection

Reflex klystron type CV67, giving 10mW output at 3298Mc/s, complete with its tuning assembly Stores Ref. 10AB/2919 and clamp bar Ref. 10AB/2920

bits of microwave plumbing, have been omitted, on the grounds that interest in them among readers would be limited.

Finally, the list as printed here represents a distillation of all the information I have been able to lay hands on in official lists, valve manufacturers’ data books, etc. I am sure that there is more information to be had, if only I knew where to find it! If readers care to send me verified data on any CV numbered valves or tubes not mentioned here (or any corrections they may know of) I will compile a supplementary list to be published in a future issue of *Radio Bygones*.

To assist in telling the difference between valves with similar numbers from different manufacturers, an indication of the valve type has been included in the table in the column headed **Sort**. The indicator have the following meanings:

KEY TO ‘SORT’ COLUMN

C Cathode ray tube	R Receiving type
H Photo-tube	S Switch
I Indicator	T Transmitting triode
K Velocity-modulated tube (klystron, etc.)	U Rectifier
M Magnetron	V Regulator & control
P Transmitting tetrode or pentode	X Crystal
	Y Thyatron

Should any reader having a device whose identity and origins have been baffling them, and which bears a CV number not listed here, care to send me details **together with a stamped addressed envelope (or an International Reply Coupon for overseas readers)**, I will endeavour to dig out what information on it that I can from the numerous cross-referenced lists appended to the CV Register.

Geoff Arnold

CV No.	Comp.	Sort	CV No.	Comp.	Sort	CV No.	Comp.	Sort	CV No.	Comp.	Sort
I			CV99	E1373	M	CV260	SP61	R	CV505	MT16	T
CV1	DC51	R				CV261	R10	U	CV509	6V6G	R
CV2	DAG1	Y	100			CV268	E1330	Y	CV510	6V6	R
CV3	E1228	Y	CV105	E1371	R	CV272	KR6/4	K	CV511	6V6GT	R
CV4	E1229	R	CV109	9PK5	K	CV281	X61M	R	CV512	6W7G	R
CV5	GU21spec	U	CV116	KR6/1	K	CV283	6AL5	R	CV513	4J53	M
CV6	E1148	R	CV118	SP61	R	CV284	STV70/20	V	CV514	2J36	M
CV7	E1209	Y	CV121	V1920	U	CV285	VA35	H	CV515	6Y6G	R
CV8	E1248	R	CV122	E1336	T				CV516	3GP1	C
CV9	AL60	R	CV123	E1330	Y	300			CV517	0Z4A	U
CV12	E1191	Y	CV124	807	P	CV302	ECH22	R	CV518	AC/VP1	R
CV13	BT9B	Y	CV127	3B/401J	T	CV303	EF22	R	CV519	PEN4DD	R
CV15	E1266	T	CV128	SU750	U	CV304	EL22	R	CV520	VP2B	R
CV16	S25A	R	CV129	KRN2A	K	CV305	EF51	R	CV522	7B7	R
CV18	2C34	T	CV130	KRN3	K	CV319	E1463	Y	CV523	12Y4	R
CV19	EHT1	U	CV131	EF92	R	CV327	EF52	R	CV524	TT12	P
CV20	V1906	U	CV133	EC90	R	CV344	E1323	T	CV525	12A6	R
CV21	VP41	R	CV135	EY91	U	CV346	EZ22	U	CV526	12A6GT	R
CV22	BT45	Y	CV136	EL91	R	CV347	EBC21	R	CV527	DA60	T
CV23	E1287	M	CV138	EF91	R	CV358	EF37	R	CV528	VA61	H
CV24	HL41	R	CV140	EB91	R	CV367	1N21B	X	CV529	12AH7GT	R
CV25	4242A	T	CV150	PK150	K	CV369	1B35	S	CV530	GT1E	Y
CV26	813	P	CV152	GU21	U	CV379	ACT19	T	CV531	12C8	R
CV27	4357A	T	CV154	E1419	T	CV380	EF54	R	CV532	GU11	U
CV28	ACT9	T	CV155	E1190	T	CV385	CK502	R	CV533	CAT17	T
CV29	E1235	T	CV158	KR3	K	CV386	CK505	R	CV534	12J5	R
CV30	4270A	T	CV161	VS26	H	CV387	CK506	R	CV535	12J5GT	R
CV31	U20	U	CV171	W21 (4-pin)	R	CV391	5B/252M	P	CV536	4120/AA	V
CV32	866/A	U	CV172	E1468	R	CV394	EM34	I	CV537	12SA7	R
CV33	4077A	U	CV175	XSG1.5	R				CV538	12SA7GT	R
CV34	MR10	U	CV176	XP1.5	R				CV539	1B23	S
CV38	E1198	M	CV178	3C27	T				CV540	12SC7	R
CV39	S22AF	K	CV180	KR4	K	400			CV541	8016	U
CV40	E1255	M	CV181	ECC32	R	CV404	FVD7	U	CV542	5J23	M
CV41	E1267	M	CV185	PM202	R	CV405	GS47	H	CV543	12SK7	R
CV42	E1256	M	CV187	U19	U	CV417	6AQ4	R	CV544	12SK7GT	R
CV44	E1155	P	CV188	E1436	V	CV423	25SN7GT	R	CV545	ACS/P3	P
CV45	S130P	V	CV190	DLS10	S	CV424	QOE06/40	P	CV546	12SQ7	R
CV46	8011	T	CV191	E1494	M	CV425	CG1-C	X	CV547	12SQ7GT	R
CV49	HK54	T	CV192	E1481	M	CV426	EY51	U	CV548	LP2	R
CV51	E1320	I				CV428	5B/251M	P	CV549	25A6	R
CV52	E1231	T	200			CV430	29C1	R	CV550	25A6GT	R
CV53	S26A	R	CV200	MZ2-200	T	CV431	85A1	V	CV551	25L6G	R
CV55	E1190	T	CV207	AC/P4	R	CV433	BIC/1E	V	CV552	25L6	R
CV56	E1325	M	CV212	LS594	Y	CV436	E1996	T	CV553	25L6GT	R
CV57	E1271	P	CV214	E1531	M	CV437	KT67	R	CV554	D63	R
CV58	E1273	R	CV215	E1497	R	CV438	G120/1B	V	CV555	25Z5	U
CV63	E1323	T	CV216	0D3/VR150	V	CV443	CK505AX	P	CV556	QP25	R
CV64	E1342	M	CV217	KRN3	K	CV444	MZ1-75	T	CV557	D42	R
CV65	PEN25	R	CV218	KRN3	K	CV445	5J/180E	P	CV558	25Z6	U
CV66	EC54	R	CV219	E1046	T	CV446	3Q/260E	T	CV559	25Z6GT	U
CV69	E1326	M	CV225	ACT17	T	CV447	4078GA	U	CV560	TSP4	P
CV71	Osglim	V	CV228	DV40B	K	CV450	EL38	R	CV561	35L6	R
CV72	V1120	R	CV230	DV55	K	CV452	EBC90	R	CV562	35L6GT	R
CV73	V1120B	R	CV233	DV56	K	CV453	EK90	R	CV563	DA30	T
CV74	V1922	U	CV234	DV56	K	CV454	EF93	R	CV564	35Z3	U
CV75	4313C	Y	CV235	U23	U	CV455	ECC81	R	CV565	35Z3GT	U
CV76	E1359	M	CV237	KR6/2	K	CV491	ECC82	R	CV566	35Z5	U
CV78	E1474	T	CV238	KR6/3	K	CV492	ECC83	R	CV567	35Z5GT	U
CV79	E1379	M	CV240	E1496	T	CV493	EZ90	U	CV568	ECC35	R
CV80	VFO1	K	CV242	CMG25	H	CV496	CG14	H	CV569	3Q/191E	T
CV81	VFO8	K	CV243	4045A	P				CV570	50L6GT	R
CV82	S27A	R	CV244	4046A	P				CV571	50L6GT	R
CV84	3B/102B	T	CV245	4328D	P	500			CV572	6X5G	U
CV87	KRN2	K	CV248	GS16	H	CV500	6T7G	R	CV573	6X5	U
CV88	3A/148J	T	CV249	4019A	R	CV501	EBF32	R	CV574	6X5GT	U
CV89	E1380	M	CV250	CMG25RS	H	CV502	LD210	R	CV575	5U4G	U
CV90	E1368	T	CV257	E1457	T	CV503	5W4GT	U	CV576	1B26	U
CV92	4C27	T	CV259	E1495	T	CV504	6U5/6G5	I	CV577	1B36	S
CV93	V625	T							CV578	6A8G	R
CV94	DS103	R							CV579	6A8	R
									CV580	6A8GT	R
									CV581	6C5G	R

CV No.	Comp.	Sort	CV No.	Comp.	Sort	CV No.	Comp.	Sort	CV No.	Comp.	Sort
CV880	7B5	R	CV958	32J	C	CV1088	832	P	CV1175	AP4	R
CV881	7B5LT	R	CV960	4607	C	CV1090	E1046	T	CV1176	AP4	R
CV882	7B6	R	CV995	6AJ5	R	CV1091	EF50	R	CV1178	DA30	R
CV883	7B8LM	R	CV996	EL32	R	CV1092	EA50	R	CV1179	ML4	R
CV884	7BP7	C	CV997	2J58	M	CV1095	954	R	CV1180	244V	R
CV885	7C5	R	CV998	2000T	T	CV1096	5B/502A	P	CV1181	AC2/Pen	R
CV886	7C5LT	R	CV999	3C22	T	CV1097	ECR60	C	CV1182	H42	R
CV887	7C6	R				CV1098	E960T	T	CV1183	W42	R
CV889	7D8	R				CV1099	X66	R	CV1186	6F6G	R
CV890	7E5	R							CV1187	D41	R
CV891	7E6	R	1000						CV1188	N43	R
CV892	7E7	R	CV1000	4D1	R	1100			CV1189	AC6Pen	R
CV893	7F7	R	CV1018	215SG	R	CV1100	KTW62	R	CV1190	ACP4	R
CV894	7G7	R	CV1019	PM2	R	CV1101	MHLD6	R	CV1191	KTZ41	R
CV895	7H7	R	CV1020	220P	R	CV1102	BL63	R	CV1192	Z62	R
CV896	7K7	R	CV1021	210LF	R	CV1103	Y63	I	CV1193	X65	R
CV897	7J7	R	CV1022	220PA	R	CV1104	PT15	P	CV1194	20A1	R
CV898	7N7	R	CV1023	230XP	R	CV1105	ML6	R	CV1195	KTW63	R
CV899	7Q7	R	CV1025	DET25	T	CV1106	9D2	R	CV1196	AC5PenDD	R
			CV1027	210LF	R	CV1107	15D2	R	CV1197	RL18	R
			CV1028	220VSG	R	CV1108	8D2	R	CV1198	ACP4	R
			CV1030	4060A	T	CV1109	4D1	R	CV1199	NS2	V
900			CV1031	SG250	P	CV1110	S130	V			
CV900	7R7	R	CV1032	220B	R	CV1111	R11	U	1200		
CV901	7Y4	U	CV1034	DET3	T	CV1113	U17	U	CV1200	202	V
CV902	7W7	R	CV1035	QP21	R	CV1114	E1024	P	CV1201	4317	V
CV904	892R	T	CV1037	MH4	R	CV1116	V872	R	CV1202	304	V
CV905	9HP7	C	CV1038	MHL4	R	CV1117	41MTL	R	CV1206	DA60	T
CV906	1602	T	CV1039	R3/UU5	U	CV1119	DDL4	R	CV1207	ES450	T
CV908	12A5	R	CV1040	PX25	R	CV1120	SU2150A	U	CV1208	PM256	R
CV909	12A7	R	CV1041	PM12M	R	CV1121	VGT121	Y	CV1219	MZ1-100	T
CV910	12A8GT	R	CV1042	210LF	R	CV1122	41MXP	R	CV1220	4033A	T
CV911	12B8GT	R	CV1043	210PG	R	CV1123	EF8	R	CV1221	PZ1-75	P
CV913	12DP7	C	CV1044	210DDT	R	CV1124	MS/Pen	R	CV1222	ACT6	T
CV914	12DP8	C	CV1046	PT25H	R	CV1125	MS/Pen V	R	CV1223	DET5	T
CV915	12FP7	C	CV1047	TZ05-20	T	CV1127	Pen46	R	CV1234	VLS532	T
CV916	12H6	R	CV1049	210SPT	R	CV1128	NGT2	Y	CV1235	TY1-50	T
CV917	12J7GT	R	CV1050	HL2	R	CV1128	VGT128	Y	CV1237	PM24D	R
CV918	12K7GT	R	CV1051	PEN220A	R	CV1129	MS/Pen	R	CV1238	PM24D	R
CV919	12SF5	R	CV1052	EL32	R	CV1130	HL23	R	CV1240	PZ1-35	P
CV920	12SF5GT	R	CV1053	EF39	R	CV1134	HVR2	U	CV1246	PM202	R
CV921	12SF7	R	CV1054	EB34	R	CV1136	EF54	R	CV1250	4279A	T
CV922	12SH7	R	CV1055	EBC33	R	CV1137	EC52	R	CV1252	4212E	T
CV924	12SL7GT	R	CV1056	EF36	R	CV1141	NGT1	Y	CV1253	E1161	T
CV925	12SN7GT	R	CV1057	EK32	R	CV1142	NGT3	Y	CV1256	E1232	T
CV927	12Z3	U	CV1058	E960	T	CV1143	NGT4	Y	CV1262	GU1	U
CV929	13SPA	R	CV1059	955	R	CV1144	NGT5	Y	CV1263	RG1-125	U
CV930	14F7	R	CV1060	807	P	CV1145	NGT6	Y	CV1264	U18	U
CV931	15	R	CV1061	2C34	T	CV1146	NGT6A	Y	CV1266	U15	U
CV932	2C40	R	CV1062	TY1-50	T	CV1147	NGT7	Y	CV1267	U4020	U
CV933	4C30	T	CV1064	U12/14	U	CV1148	NGT8	Y	CV1268	5Y3G	U
CV934	4B30	U	CV1065	SP61	R	CV1149	NGT9	Y	CV1280	6L7	R
CV936	24A	R	CV1066	P61	R	CV1151	PM3	R	CV1281	KTW61	R
CV937	25A7GT	R	CV1067	6J5	R	CV1152	PM4DX	R	CV1282	AC/S2Pen	R
CV938	25AC5GT	R	CV1070	7475	V	CV1153	PM254	R	CV1283	SP4	R
CV939	25B6G	R	CV1071	5U4	U	CV1154	PM4DX	R	CV1285	6N7	R
CV940	25B8GT	R	CV1072	GU50	U	CV1156	DEQ	R	CV1286	6L6	R
CV941	HK24	T	CV1073	H63	R	CV1158	PM14	R	CV1287	25L6G	R
CV942	25Y5	U	CV1074	6J7	R	CV1159	PM14	R	CV1288	TY1/50	T
CV943	26	R	CV1075	KT66	R	CV1160	104V	R	CV1296	MU14	U
CV944	27	R	CV1076	TZ40	T	CV1161	104V	R			
CV945	28D7	R	CV1077	EM31	I	CV1163	PD22A	R			
CV946	28D7GT	R	CV1078	2B36	R	CV1164	ACSG	R			
CV947	31	R	CV1079	KT8	P	CV1165	VMS4	R	1300		
CV948	32L7GT	R	CV1080	4307A/AF	P	CV1166	P220	R	CV1300	10D1	R
CV949	33	R	CV1081	4052A	P	CV1167	PM24A	R	CV1301	6H6	R
CV950	4053	C	CV1082	220TH	R	CV1168	PX4	R	CV1302	D42	R
CV951	32A	C	CV1083	210VPT	R	CV1169	VMP4G	R	CV1303	PMIHF	R
CV953	32G	C	CV1084	4407	C	CV1170	D41	R	CV1304	LP2	R
CV955	4409	C	CV1085	4605	C	CV1171	AT4	R	CV1306	HL23DD	R
CV956	4602	C	CV1086	4502	C	CV1174	AC/Pen	R			
CV957	32E	C	CV1087	14L/4410	C						

CV No.	Comp.	Sort	CV No.	Comp.	Sort	CV No.	Comp.	Sort	CV No.	Comp.	Sort
CV1836	4B26	U	CV1920	6LD20	R	CV2159	BR153	T	CV2549	85	R
CV1837	2B7	R	CV1921	U24	U	CV2162	12L01A	C	CV2552	100TH	T
CV1838	QQZ04-15	P	CV1924	TY2-125	T	CV2164	K302	K	CV2553	101F	T
CV1839	6F13	R	CV1926	6G6G	R	CV2174	G240/2D	Y	CV2554	111A	V
CV1841	BS52	S	CV1927	B142	T	CV2175	DG7/5	C	CV2556	117L7GT	R
CV1842	2G	V	CV1928	12BA6	R	CV2179	E2134	P	CV2557	117N7GT	R
CV1844	CS3-V	X	CV1929	6H6G	R	CV2189	V240C/2K	K	CV2558	117Z6GT	U
CV1846	5T4	U	CV1930	6H6	R	CV2190	V233A/1K	K	CV2560	121A	V
CV1847	19H4	R	CV1931	6H6GT	R	CV2191	DG13/2	C	CV2561	122A	V
CV1848	20A2	Y	CV1932	6J5G	R	CV2192	9MW5AX	C	CV2562	164V	R
CV1849	5W4	U	CV1933	6J5	R	CV2193	89D	C	CV2563	204A	T
CV1850	6L19	R	CV1934	6J5GT	R	CV2194	G400/1K	V	CV2565	2050	Y
CV1851	5X4G	U	CV1935	6J7G	R				CV2566	205E	T
CV1852	5X4	U	CV1936	6J7	R				CV2567	205F	T
CV1853	6P25	R	CV1937	6J7GT	R				CV2569	210DET	R
CV1854	5Y3G	U	CV1938	6K6G	R	2200			CV2570	210HF	R
CV1855	UU9	U	CV1940	6K6GT	R	CV2208	G50/1G	V	CV2571	210HL	R
CV1856	5Y3GT	U	CV1941	6K7G	R	CV2212	13D3	R	CV2574	210VPA	R
CV1857	5Y4G	U	CV1942	6K7	R	CV2214	3B/240M	T	CV2576	4C21	T
CV1860	30D5	C	CV1943	6K7GT	R	CV2216	30E8/P1	C	CV2577	212E	T
CV1861	5Z3	U	CV1944	6K8G	R	CV2217	6K25	Y	CV2579	218	U
CV1862	6AQ5	R	CV1945	6K8	R	CV2218	R17	U	CV2580	220C	T
CV1863	5Z4G	U	CV1946	6K8GT	R	CV2224	G1/370K	Y	CV2581	220/OT	R
CV1864	5Z4	U	CV1947	6L6G	R	CV2235	R18	U	CV2582	220VS	R
CV1865	EC81	R	CV1948	6L6	R	CV2237	1AD4	R	CV2584	231D	T
CV1866	M503	M	CV1950	6L7G	R				CV2586	240B	R
CV1867	6A6	R	CV1951	6L7	R				CV2587	242C	T
CV1868	5T01A	C	CV1953	6N6G	R	2300			CV2588	244A	T
CV1869	12T01A	C	CV1954	6N6	R	CV2370	DL92	R	CV2589	RK36	T
CV1870	6A7	R	CV1956	6N7G	R				CV2591	RK38	T
CV1871	K307	K	CV1957	6N7	R				CV2592	256B	Y
CV1873	6AB7	R	CV1958	6N7GT	R				CV2593	257A	T
CV1876	6AC7	R	CV1959	50C5	R	2400			CV2594	258B	U
CV1878	6AD7G	R	CV1960	6R6G	R	CV2492	E88CC	R	CV2595	259A	P
CV1880	7MB1A	C	CV1961	12AU6	R				CV2597	262A/V	T
CV1882	6AG7	R	CV1962	6R7G	R				CV2598	264A	R
CV1885	6B5	R	CV1963	6R7	R				CV2599	264C	T
CV1886	EC80	R	CV1964	6R7GT	R	2500					
CV1887	6B6G	R	CV1966	6SA7	R	CV2500	35Z4GT	U	2600		
CV1889	TYS4/500	T	CV1967	6SA7GT	R	CV2501	40	R	CV2600	267B	U
CV1891	6B7	R	CV1969	6SC7	R	CV2502	41FP	R	CV2601	271A	T
CV1892	2K28	K	CV1970	6SC7GT	R	CV2503	41MH	R	CV2602	272A	T
CV1893	6B8G	R	CV1972	6SF5	R	CV2504	41MHL	R	CV2603	274A	U
CV1894	6B8	R	CV1973	6SF5GT	R	CV2505	41MPG	R	CV2604	275A	T
CV1895	STV70/60	V	CV1974	6S7G	R	CV2506	41MPT	R	CV2605	282A	P
CV1896	6C8G	R	CV1975	6S7	R	CV2508	41STH	R	CV2608	300A	R
CV1897	4J34	M	CV1977	UL41	R	CV2511	420T	R	CV2609	300B	T
CV1898	4J35	M	CV1978	6SG7	R	CV2512	420TDD	R	CV2610	303	V
CV1899	6L18	R	CV1981	6SK7	R	CV2514	43	R	CV2611	304TH	T
			CV1982	6SK7GT	R	CV2524	6AU6	R	CV2612	RK75	P
			CV1985	6SL7GT	R	CV2526	6AV6	R	CV2613	310A	P
1900			CV1988	6SN7GT	R	CV2528	45DS	C	CV2614	311A	P
CV1900	6D6	R	CV1989	SD6	U	CV2529	45IU	U	CV2615	313C	Y
CV1901	6F11	R	CV1990	6SQ7	R	CV2530	45Z5GT	U	CV2616	314A	U
CV1902	6D8G	R	CV1991	6SQ7GT	R	CV2531	46	R	CV2617	323A	Y
CV1903	GL592	T	CV1993	6SS7	R	CV2532	49	R	CV2618	327A	T
CV1904	CAA322	R	CV1995	6ST7G	R	CV2533	50	R	CV2619	328A	P
CV1905	4-65A	P	CV1996	6ST7	R	CV2534	50L6G	R	CV2620	329A	P
CV1906	6E5	I	CV1999	1V	U	CV2535	53	R	CV2621	330B	C
CV1907	CS2-C	X				CV2536	53A	T	CV2622	331A	T
CV1908	6F5G	R	2100			CV2537	55	R	CV2623	332A	P
CV1909	6F5	R	CV2106	DL66	R	CV2538	59	R	CV2624	337A	P
CV1910	6F5GT	R	CV2107	DF66	R	CV2539	61P	T	CV2625	338A	Y
CV1911	6F6G	R	CV2108	9M06A	C	CV2540	63D	C	CV2626	346A	Y
CV1912	6F6	R	CV2115	1B3	U	CV2541	71A	R	CV2627	349A	P
CV1913	GS44X	H	CV2127	6CH6	R	CV2543	73	R	CV2628	349B	P
CV1914	4J31	M	CV2128	ECH81	R	CV2544	78	R	CV2629	350A	P
CV1915	6F7	R	CV2129	5763	P	CV2545	79	R	CV2630	351A	U
CV1916	4J33	M	CV2135	6BR7	R	CV2546	81	U	CV2631	352A	R
CV1917	6F8G	R	CV2136	6BW6	R	CV2547	83V	U	CV2632	354A	Y
CV1919	6F14	R				CV2548	84	U			

CV No.	Comp.	Sort	CV No.	Comp.	Sort	CV No.	Comp.	Sort	CV No.	Comp.	Sort		
CV2633	362A	P	CV2728	29D	C	CV2870	CC3D	R	3500	CV3500	HL210	R	
CV2634	367	U	CV2731	63DS	C	CV2871	CAT6	T		CV3501	HL610	R	
CV2636	375A	U	CV2735	4015A	T	CV2872	CAT9	T		CV3502	HL1320	R	
CV2637	388A	T	CV2743	4033AF	T	CV2874	CK1005	U		CV3503	HLDD1320	R	
CV2638	393A	Y	CV2745	4050AG	C	CV2875	CL4	R		CV3505	HY114B	R	
CV2639	394A	Y	CV2746	4064A	U	CV2878	CRT1	C		CV3506	HY615	R	
CV2640	405BU	U	CV2747	6U5G	I	CV2879	CRT2	C		CV3513	2J32	M	
CV2642	417A	K	CV2749	4081	C	CV2880	CRT 4/1	C		CV3515	KB2	R	
CV2643	2C40	R	CV2751	4096AB	C	CV2887	DAC1	R		CV3516	KK2	R	
CV2644	460BU	U	CV2755	4251AX	T	CV2888	ECH42	R		CV3519	KT30	R	
CV2645	506BU	U	CV2756	4260A	P	CV2889	DD620	R		CV3520	KT31	R	
CV2653	714AY	M	CV2759	4304	T	CV2890	DDT(met)	R		CV3523	6146	P	
CV2654	715A	P	CV2760	4304B	T	CV2891	DE5	R		CV3527	KTW73M	R	
CV2655	715B	P	CV2761	4304BB	T	CV2892	DE5B	R		CV3529	KTZ41	R	
CV2656	724A	S	CV2764	4606	C	CV2895	DET1SW	T		CV3530	KTZ73	R	
CV2657	800	T	CV2765	4673	P	CV2899	DET9	T		CV3531	L2	R	
CV2658	806	T	CV2766	4687	V	2900				CV3532	L21	R	
CV2660	809	T	CV2767	4690	Y		CV2900	DET10		T	CV3533	L22DD	R
CV2661	812	T	CV2768	8003	T		CV2901	EF86		R	CV3534	L30	R
CV2663	815	P	CV2769	9006	R		CV2907	DF1		R	CV3537	L600	T
CV2664	822	T	CV2773	68503mod	U		CV2909	DH73M		R	CV3538	L610	R
CV2665	825	R	CV2774	68504	U		CV2910	DK1		R	CV3541	LS6A	R
CV2666	829B	P	CV2775	68506	U		CV2911	DL2		R	CV3542	LS532	R
CV2668	846	T	CV2776	68510mod	U		CV2912	DL63		R	CV3546	MHD4	R
CV2669	849	T	CV2777	4B28	U		CV2920	E1148(US)		T	CV3552	MPT4K	R
CV2670	849H	T	CV2778	2J21A	M		CV2925	EBF2	R	CV3553	MS4B	R	
CV2671	851	T	CV2779	859	R		CV2926	EBL31	R	CV3554	MPT42	R	
CV2672	852	T	CV2786	26J	C		CV2929	ECH3	R	CV3557	MR300	Y	
CV2673	857B	U	CV2789	ZP455	C		CV2929	ECH3	R	CV3558	MR300/E	Y	
CV2674	863	T	2800				CV2930	ECH33	R	CV3561	MS/PEN	R	
CV2675	864	T		CV2800	A40		R	CV2936	4B22	U	CV3562	MSP41	R
CV2676	865	P		CV2801	A40/N3		C	CV2938	EL33	R	CV3563	MT11SW	T
CV2679	866JR	U		CV2803	A915met		R	CV2940	EL36	R	CV3564	MT12	T
CV2680	868	H		CV2804	A915Amet		R	CV2941	EL50	R	CV3565	ME41	I
CV2683	878/A	U		CV2805	A924		R	CV2944	ESU1500	U	CV3567	MU1	U
CV2685	880	T		CV2806	A924		R	CV2945	ESU75	U	CV3570	MU4250	U
CV2686	889	T		CV2807	AC/2HL		R	CV2946	ESU150	U	CV3571	MVSPen	R
CV2687	889R	T		CV2808	AC/2HLMet		R	CV2947	ESU300	U	CV3572	MVSPenB	R
CV2688	891R	T		CV2808	AC/2Pen		R	CV2949	F123A	T	CV3573	MZ05-20	T
CV2689	893R	T		CV2809	AC/5Pen		R	CV2950	129B	T	CV3574	MZ1-76	T
CV2690	904V	R		CV2811	AC/HL		R	CV2954	FC2A	R	CV3576	15A2	R
CV2691	913	C		CV2812	AC/HLmet	R	CV2955	FC4	R	CV3578	PM22D	R	
CV2692	918	H		CV2813	AC/HLDD	R	CV2956	15D1	R	CV3579	PT5E	P	
CV2693	929	H		CV2815	AC/P	R	CV2957	FG17	Y	CV3581	V1501	T	
CV2694	930	H		CV2817	6L6GA	R	CV2958	FG27A	Y	CV3582	VP4B	R	
CV2695	931	H		CV2818	AC/PT8	P	CV2959	3B21	U	CV3583	5HP1	C	
CV2696	931A	H		CV2819	AC/S	R	CV2960	FP54	P	CV3584	21/2	V	
CV2697	935	H		CV2820	AC/SP1	R	CV2966	EY86	U	CV3587	705A	U	
2700				CV2822	AC/SG	R	CV2967	8020	U	CV3588	706A	M	
	CV2700	957		R	CV2823	AC/SP3	R	CV2969	GT1	Y	CV3589	707A	K
	CV2701	958A		R	CV2824	AC/S Pen	R	CV2973	GU7	U	CV3590	708A	R
	CV2704	7E5/1201		R	CV2825	ACT6	T	CV2975	EL84	R	CV3593	713A	R
	CV2705	1203		R	CV2827	ACT10	T	CV2977	H2	R	CV3594	717A	R
	CV2706	7C4/1203A		R	CV2829	293A	R	CV2978	H12	R	CV3595	721A	S
	CV2707	1231	R	CV2830	AC/TH1	R	CV2979	H30	R	CV3596	722A	Y	
	CV2709	1R4/1294	R	CV2832	AC/VP2	R	CV2981	H410	R	CV3597	726B	K	
	CV2710	3D6.1299	R	CV2833	AF3	R	CV2982	H610	R	CV3599	829A	P	
	CV2711	1500T	T	CV2834	AGT1	Y	CV2983	DL94	R				
	CV2712	1609	R	CV2836	APP4G	R	CV2984	6080	R	3600	CV3600	902	C
	CV2713	1610	P	CV2837	APP4G*	R	CV2985	HD24	R		CV3601	7193	R
	CV2714	1614	P	CV2839	AR300	T	CV2986	HD203A	T		CV3607	NP90	Y
	CV2715	1630	R	CV2845	LS5	R	CV2987	HF100	T		CV3620	P220	R
	CV2716	1655	R	CV2846	LS5B	R	CV2988	HF200	T		CV3621	P410	R
	CV2717	1729	U	CV2860	AZ1	U	CV2989	HK354E	T		CV3622	P610	R
	CV2718	1876	U	CV2861	AZ2	U	CV2991	HL2 met	R		CV3623	PA40	R
	CV2719	1924	C	CV2862	AZ31	U	CV2994	HL23	R		CV3624	PE7B	H
	CV2723	869B	U	CV2864	B21	R	CV2995	HL23DD	R		CV3625	PE8	H
	CV2725	O9	C	CV2865	B30	R	CV2996	HL41DD	R				
	CV2727	26D	C	CV2869	3FP7	C	CV2998	HL133	R				
							CV2999	HL133DD	R				

A Single-valve Loudspeaker Receiver

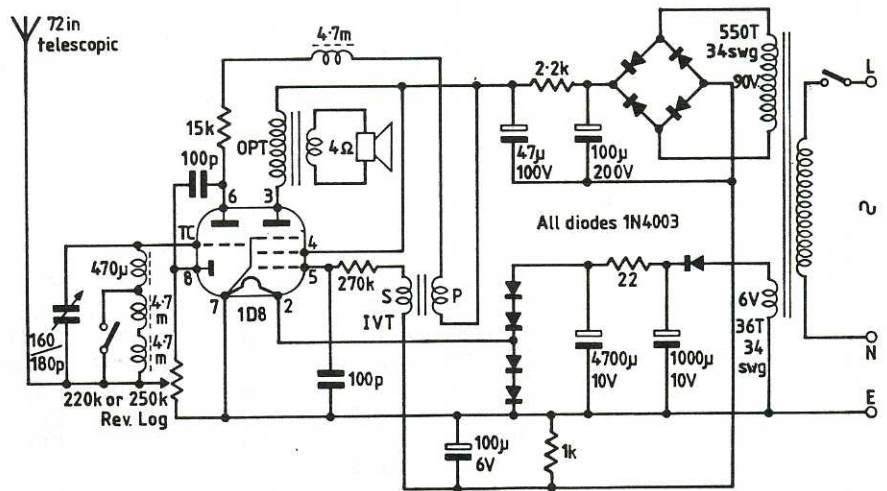
by Sir Douglas Hall, Bt KCMG

Among the many articles published during my nearly twenty years as a regular contributor to the *Radio Constructor* magazine – later called *Radio and Electronics Constructor* – I described a circuit which gave loudspeaker results from a single valve. The article in question was called 'Simple Receiver Circuits for Short Aerials' and was published in September 1963. During 1990 I rebuilt the 2-waveband version with a few small modifications. The updated version used a smaller number of components than the original and, using a 72 inch telescopic aerial, has shown itself capable of receiving six stations on the medium wave-band, and three or four on the long-wave band, in the South Hams area of Devon, at an output suitable for domestic listening.

From the circuit diagram, it will be seen that the incoming signal is applied to the triode section of the valve operating as an RF amplifier. Reaction is obtained by the Colpitts mode. The reaction control also acts as an AF volume control, but as reaction only becomes fully effective at near the maximum setting, the loss of AF gain is nominal. Detection takes place by the diode and the signal is then applied again to the triode which now acts as an AF amplifier. The output from the triode is applied through a step-up inter-valve transformer to the pentode section.

Components

The 1D8 valve, its octal holder and the inter-valve transformer are obtainable from the Vintage Wireless Co. Ltd, Tudor House, Cossham Street, Mangotsfield, Bristol BS17 3EN, telephone 0272 565472. The turns ratio can be anything between 1:3 and 1:6, but the primary must have a large inductance. Some of the transformers sold in the 1950s and '60s had a primary with an inductance of 5H or less and were very poor. A good pre-war example is best.



Circuit diagram of the one-valve receiver including a mains-driven power supply, in which the series string of four silicon diodes functions as a simple voltage stabiliser, providing a nominal 1.4V DC at its centre-tap for the filament of the 1D8.

The triode section of the valve operates as a reflexed RF/AF amplifier

The filter across the secondary of the inter-valve transformer may not prove necessary, or it may be found possible to reduce the value of the capacitor without instability occurring. Alternatively, it may prove necessary to increase it – it all depends on the transformer used. Connections to the secondary should be tried both ways round to find which connections give best results.

A range of 4 ohm loudspeakers is sold by Radio Component Specialists of 337 Whitehorse Road, West Croydon, Surrey, telephone 081-684 1665. The larger the 'speaker the better. This firm can also probably supply a 'small pentode' output transformer. Amongst many suppliers of Siemens chokes may be mentioned Electrovalue, 28 St Jude's Road, Englefield Green, Egham, Surrey TW20 0HB, telephone 0784 433603. Although the original design used home-wound coils, the Siemens chokes are very convenient and work well.

Maplin Electronic Supplies, PO Box No. 3, Rayleigh, Essex SS6 8LR and branches, can supply a Jackson 00

variable capacitor, of which the smaller section is suitable as a tuning capacitor. Or maybe a 'short wave' type of suitable value could be found at the Vintage Wireless Co. Ltd.

Maplin is also among suppliers who stock the necessary electrolytic capacitors. The 72 inch telescopic aerial is available at all Tandy stores.

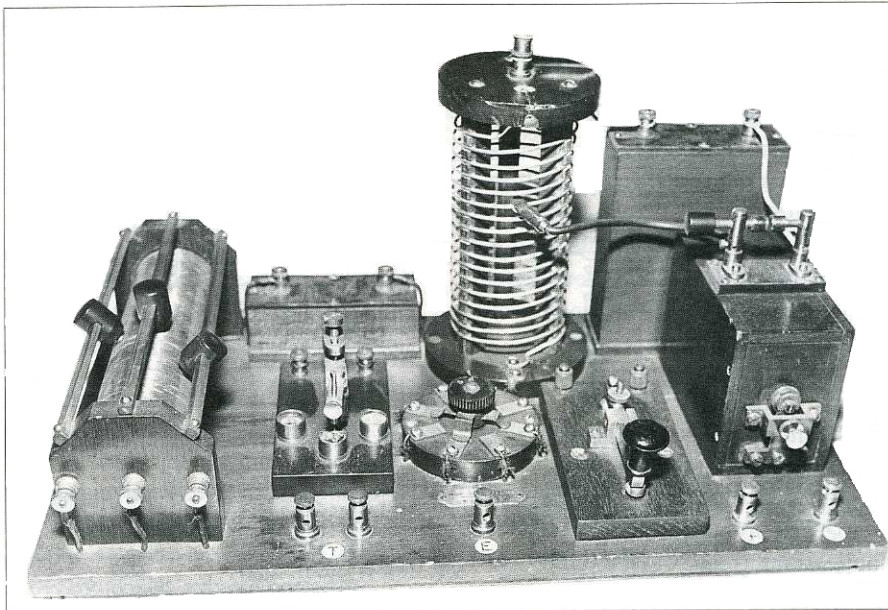
If it is found difficult to obtain a reverse-log control for reaction, a normal log potentiometer may be used, wired so that volume increases with an anti-clockwise movement.

Power Supplies

The original design used batteries. This is clearly impracticable today and a mains power unit is used, based on a design by C. M. Lindars, one-time contributor to *Radio Constructor* and more recently to *Short Wave Magazine*. The mains transformer is home-wound using a 20VA kit supplied by Maplin, secondary winding details being shown in the circuit diagram. **RB**

A Spark of Nostalgia

by Ron Irving G3SYX



Isn't it marvellous what things seem to clutter up family lofts? The lovely old equipment pictured here was kept hanging about in the darkness for many a silent year, the author being happy to rescue it.

According to the late G6DN, Mark, formerly of Blackpool, who took to wireless some years before WWI, this apparatus first saw the light of day in about 1912/1913. It was said that it retailed at a cost of £25.

When rescued it gave me an apologetic look as a silent excuse for not being its former self. In those days I was with the Royal Air Force at Henlow in Bedfordshire. One day I was telling Claude (G2DPQ) and Moss (G3RXW) about it. Small wonder that they invited me to bring it into the workshops for renovation. It was during the summer of 1946 when we set about dismantling it, with a view to repolishing and rewiring the whole job. It took about five hours, obviously using the same components and wire. It worked immediately upon the application of power from a 12 volt car battery.

Guided Tour

It won't be out of order to give the readers a guided tour around this ancient monument, for how many have actually seen such an *'objet d'art'*? Situated on the extreme left is the receiver tuning coil, which is coarse and fine tuned by three sliding contacts. Immediately to the right of this you will notice the crystal detector;

the added refinement being a choice of three different types of crystal. Just to the rear of this is the HF by-pass condenser. The reader will observe two terminals marked 'T' for telephones, the word 'earphones' being a non-existent term in those days.

The transmitter comprises the large vertical helix-coil to the rear of the assembly, immediately to the right of which one can see the condenser which is of fixed capacity; variations of tuning were achieved by the spring-clip which can be attached to any part of the helical inductance. Before this we can see the heart of the transmitter, an induction coil or Tesla coil, as we old 'uns called them. It may be of interest to note that the variable spark gap, mounted on the top of the induction coil, should not be touched whilst the manipulating key is depressed. Eight thousand volts, albeit at extremely low current, does have the habit of making one sweat a little, not to mention the blue lights and the feeling of the aftermath of a Jane Fonda Workout (Fonda making the heart grow absent?) The writer speaks from some experience, but imagine eight kV compared with the potential difference of one human! Need one say more, except that many an unsuspecting soul has been caught out?

Just in front of the induction coil proudly stand the 12 volt input terminals, whilst to the left, the 'manipulating key' sits awaiting the attentions of the operator. Note the rotary switch marked 'S' and 'R'. This indicates Send and Receive. In front of this is the Earth

terminal, for in those far-off days, it was a foolish operator indeed who would go on the air minus a decent earth, which meant the difference between signals and no signals being received.

Where does the aerial connect? On top of the helical coil.

Damped Waves

The set radiated damped or 'diminished' waves, not at all the type of thing the modern radio amateur is accustomed to. It may surprise many to know that it was possible to crudely modulate a spark transmitter by introducing a carbon microphone in a transformer circuit in a series with the helix and the aerial. The result was crude almost to the point of disgust, but it worked, particularly when the spark gap was finely tuned, or adjusted.

Minimum Gap

The weather had some effect upon the performance of spark transmitters. If it was a dry day, the spark gap often had to be minimally adjusted, but on a damp day, gaps of about an eighth of an inch were possible, humidity being conducive to conduction. Therefore one could have quite a little bonfire in the gap. In the days of spark transmissions, Morse code was at its height, and the nightly bleat of this fine apparatus was heard along the east coast and well into Lincolnshire. Strange as it may seem, and despite a relatively silent æther, careful tuning and detector

manipulation had to be carried out, for signals became very weak with distance and these sets operated on the long wave.

During the 1920s, the inception of broadcasting and high-gain valved receivers sounded the death-knell of spark telegraphy, legislation being passed to outlaw these fine sets because of their wide-band characteristics which allowed much interference with broadcasting and other services. Yet for special applications, spark transmitters still remained in marine work, for use in lifeboats, and as emergency transmitters on some ships.

Simplicity

The circuit diagram is a simple arrangement comprising an inductively tuned crystal receiver used in conjunction with the most basic of spark transmitters. Relatively speaking, the mode switching is the only complex part of the diagram.

The transmitter output is a mere ten watts, being indicative of truly amateur equipment. When using the detector, there is a choice of three dissimilar

crystals. There is no steel 'cat's whisker', but instead a contact crystal which is vertically mounted and secured in place of contact with a small screw. This idea

'meths'. Unfortunately, the poor operator soon felt extremely drowsy after inhaling the spirit passing over the gap, and this practice fell into disuse for obvious reasons.

Legislation

As already mentioned, the obsolescence of the use of spark telegraphy hit the world in 1927, at the International Radio Telegraph Convention held in Washington, USA. It was ruled that:

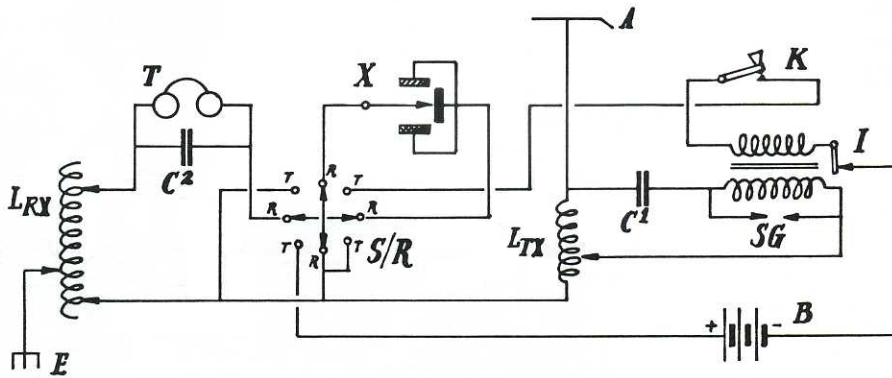
(a) The use of damped wave-trains, known as Type 'B' waves, on frequencies below

375kc/s, would be prohibited with effect from 1 January 1930.

(b) No new spark installations were to be fitted into a land-based or fixed station, whilst shore stations were forbidden to use such systems from 1 January 1935.

(c) No new spark transmitters were to be installed in ships or aircraft from 1 January 1930, except for units which consumed less than 300 watts when using full power. This had to be measured at an audio frequency.

(d) The use of spark transmission was to be completely forbidden from 1 January 1940. Ships' installations



Circuit diagram of the spark transmitter/crystal receiver. 'X' is the triple crystal detector assembly, 'I' is the induction coil with its interrupter contacts and 'SG' is the plain spark gap. Changeover between transmission and reception is controlled by the send/receive switch 'S/R'

was reputed to offer a more permanent effect during receiving, as it was not subject to loss of signal during vibration.

Nautical Tale

Here's an amusing little tale of spark sets in the Royal Navy. A good friend, the late G3RFG (Stan), who was formerly a Signals Petty Officer RN, used to regale us with stories of being drunk on watch. This was not deliberate, but rather as a result of the old spark gaps being cooled by methylated spirits; conduction was also enhanced by using

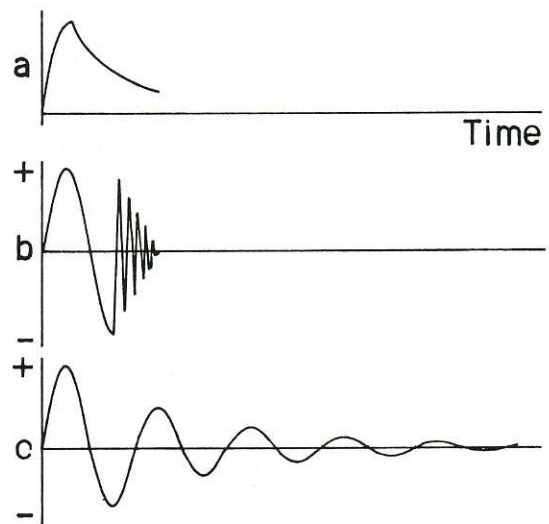
Resonant Frequency

Without entering into complicated mathematics, the functioning of the spark transmitter can be simply described. Upon pressing the key, the induction coil functions, causing a spark to overcome the resistance of the gap, which has been pre-set for current operating conditions and the frequency of the note. This was a 'rule of thumb' practicality.

The high voltage, being across the gap, would charge the fixed condenser which had a high capacity. The charge on the condenser plates $Q = CV$, resulted in stored energy being $\frac{1}{2}CV^2$ joules; the condenser having a low reactance ($X_c = 1/2\pi fC$). The condenser discharged into the inductance which had a high reactance ($X_L = 2\pi fL$). When the value $2\pi f$ is reached, where the two reactances are equal and opposite, i.e., zero reactance, the circuit is said to be in resonance.

That is, $2\pi f_R L = 1/2\pi f_R C$, then $4\pi^2 f_R^2 LC = 1$, therefore $f_R = 1/2\pi\sqrt{LC}$, the series-tuned circuit being at resonance.

Referring to the drawing, (a) shows the exponential charge and discharge of the condenser C1, (b) indicates one spark per cycle of the tuned circuit, (c) portrays the resultant spark trains or damped waves.



were given some grace, possibly due to envisaged future hostilities?

Damping

The operation of the spark transmitter was beset with disadvantages. For example, excessive use of the set resulted in the trembler contacts on the induction coil becoming welded due to heat and pitting. Then there were the many types of loss during operation. These were: damping due to ohmic resistance; damping due to spark gap

resistance, i.e., the effects of the air in conditions of dryness or humidity; more damping, due to eddy currents induced in adjacent conductors; even more damping, arising from condenser losses and dielectric losses in surrounding dielectrics; and finally, damping resulting from the energy being radiated away from the aerial!

Marconi Centenary

During the Marconi Centenary, the writer was invited to take the apparatus

to the premises of the IEE at Savoy Place in London. In those days, the key was missing from the set, but Pat Hawker (G3VA) kindly brought along his 1914 model, multi-contact key.

Many of the older members of the IEE were enthralled by the apparatus, which was set up in the same room as Marconi's original equipment. The application of power did rather upset the TV demonstration in the next room, but interest seemed to overcome any worries which might have been expressed!

RB

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Radios 1154, 1155, 52, R210. Ex-army teleprinters. Any books on military radios. Clark seventy-foot mast. Phone John on Portsmouth (0705) 250463.

Military Communications Equipment. Any or unusual. British R1155A or T1154. Special forces sets. All shipping and expenses paid. **For Sale** Scott 800B chassis, ps and speaker. Charles DiCecca KA1GON, 501 Mystic Valley Pkwy, Medford, Mass. 02155, USA. Phone 617-396-9354.

Any bound volumes of *The Wireless World*. I have just Vol. 24: 2nd January 1929 to 26th June 1929. M. T. Littlewood, 10 Springfield Avenue, Honley, Huddersfield. Tel: 0484 662824.

Back and dial for Murphy AD94, short/medium wave. W. G. Scase, 8 Springfield Road, Taverham, Norfolk NR8 6QT. Phone 0603 868986.

HRO, Eddystone, R1155 or other vintage communications receivers, also 22 Set. Service Manuals for 19 Set and R1155. Tim Price G4YBU, 4 Purberry Grove, Ewell, Surrey KT17 1LU. Phone 081-393 9691.

Photocopy of instructions on back cover of 1937 'Wayfarer'. Trumpet for Burndept Ethovox loudspeaker Type 750 (see *Radio Radio*, Fig. 828). S625 bases. Bob Smallbone, 30 The Croft, Bognor Regis, West Sussex PO21 5TH.

Command Receivers BC-453, BC-454, BC-455, BC-946 with either 'A' or 'B' suffixes. Any Command receiver in the 'ARC' series. Control boxes, racks, drive shafts, and adaptors for local tuning together with plug-in front panel control units FT-260-A. Any hardware associated with Command sets of interest - WHY? K. W. Perfect G3FIK, Littleton House, Pipe Ridware, Rugeley, Staffs WS15 3QL. Phone 088 922 319, Fax 088 922 291.

Data books for CT160 valve tester. Data on Uher Universalgerät 5000 recorder. Good Collaro Transcriptor forward/reverse operation deck or recorder. M. Shepherd, 66 Westerland Avenue, Canvey Island, Essex SS8 8JS.

FOR SALE

German Army receivers, Torn EB, Emil and KW Anton, also valves P2000, P800. **Wanted**, brass Morse keys and bugs. Offers E. Kaleveld DX0XJ/PA0XE, telephone Germany 4183-2880 evenings.

Otis-King Calculator Type 'K' in leather pouch; mint condition with instructions and original box. Firm written offers to Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.

Collector disposing vintage communications receivers: BRT-400E, SP-600, HRO, AR-88D, BC-348, BC1147A, APR-4Y, RL-85, Collins. Transformers: constant voltage, isolating, auto, variable. Assortment valves. Dennis (ex-G3LIN), 247 Sandy Lane, Hindley, Wigan. Phone 0942 55948.

Meteor anemometer No. 4, perfect condition, polished wood case. £30. Doran DC potentiometer, perfect, polished wood case. £30. Phone Ben on Kidderminster (0562) 743253.

Ex-government receivers, both working and complete with separate power supplies. Unmodified PCR2, also R1155, £15.00 each. Buyer inspects and collects. Phone Eric G3TJC on Bradford (0274) 582781.

INDEX OF VALVES

SCHEDULE I.

THREE ELECTRODE VALVES.

AUGUST, 1919.

Signals Experimental Establishment. Pamphlet No. 18.

INDEX OF VALVES.

Valves as scheduled herein are in use in the Royal Navy, the Army, and the Royal Air Force. They are divided into certain classes or geometrical types, and a photograph is given of the most used specimen of each type.

The first column of the schedule gives the number by which each particular valve is referred to in this pamphlet.

The second column gives the geometrical or bulb type together with the figure number for reference.

The third column gives the official title of each valve. Columns 4, 5 and 6 state in which arm of the service the valve is in use, and.

The seventh column indicates the number of the Chart or curves of characteristics of the valve.

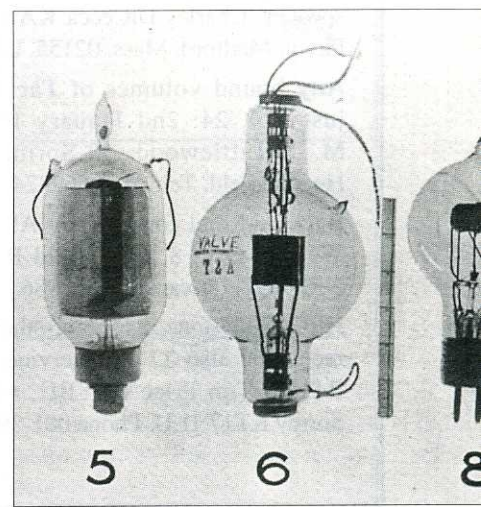
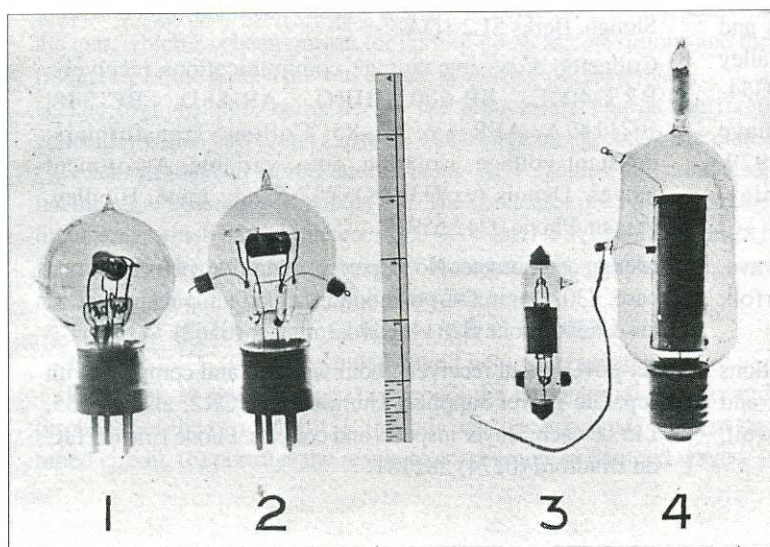
Spaces have been left for additions to be added by hand as occasions arise.

NOTE.—The words "Bulb Type" in second column refer to the geometrical appearance only, and have no reference to electrical or mechanical details or characteristics, thus A, B, R are all of the French type.

Valve No.	Bulb Type and Photo Fig. No.	Valve Name.	Service.			Characteristics. See Figs.
			R.N.	Army.	R.A.F.	
1	French, Fig. 1	French	—	Army	R.A.F.	1, 2, 3, 4.
2	" "	R	—	Army	R.A.F.	1, 2, 3, 4,
3	" "	B	—	Army	R.A.F.	8, 9, 10.
3A	" "	B ₂	—	Army	—	10A.
4	" "	R (with wings)....	—	—	R.A.F.	1, 2, 3, 4.
5	" "	A	—	—	R.A.F.	14.
6	" "	A ₂	—	—	R.A.F.	15, 16.
* 7	R horned 2	French horned valve (low capacity)	—	Army	—	—
8	Q 3	Q Marconi, called R3 in Navy	R.N.	Army	R.A.F.	6, 7.
9	Q 3	V24 Marconi (low capacity)	—	Army	R.A.F.	—
* 10	N 4	N Marconi	—	Army	—	—
* 11	T 5	T	—	Army	R.A.F.	—
12	T2B 6	T2B	R.N.	Army	R.A.F.	13.
13	" 6	T1	R.N.	—	—	—
14	" 6	T3	R.N.	—	—	—
15	" 6	T4	R.N.	—	—	—
16	R4 7	R2	R.N.	—	—	19, 20.
17	" 7	R4	R.N.	—	—	21, 22.
18	150-watt 8	150-watt	—	—	R.A.F.	17.
19	" 8	500-watt	—	—	R.A.F.	18.
20	U1 9	U1	R.N.	—	—	—
21	U2 9	U2	R.N.	—	—	—
22	U3 10	U3	—	Army	—	23.
* 23	" 11	Erect (Marconi)	—	Army	—	—

* These valves may only be used in old pattern sets, and are little used.

This extract from the Signals Experimental Establishment Index of Valves, August 1919, is reproduced by kind permission of the Royal Signals Museum Library



SOME CONSTANTS OF THE VALVES.

NOTES.

TABLE II. VALVES FOR RECEPTION.

No.	Valve.	Fil. Volts.	Fil. Current.	H.T. Volts.	H.T. Current.	Vacuum.
1	French	4	Amps. 0.67	80	m.a. 2.5	Hard.
2, 4	"R"	4	0.67	80	2.5	Hard.
7	French (low capacity)	4	0.67	80	2.5	Hard.
3	B	4	0.67	80	0.4	Hard.
8	Q	6	0.50	200	0.5	Hard.
10	N	4	2.3	50	?	Soft.
9	V24	6	0.80	24	0.6	Hardish.
16	R ₂	3.7	1.2	25	0.5	Soft.
17	R ₄	3.7	1.2	50	0.6	Hardish.

TABLE III. TRANSMISSION VALVES.

No.	Valve.	Fil. Volts.	Fil. Current.	Max. H.T.D.C. Volts.	Fil. Emission.	"Rating."
1	French	5.5	Amps. 0.81	330	m.a. 60	Watts. 7
3	B	6.0	0.86	600	50	27.0
3A	B ₂	7.0	1.5	1,000	100	50
11	T	6.0	4.00	7,000	?	?
12	T ₂ B	10.5	3.55	1,500	340	250
5	A	6.0	0.86	400	70	27
6	A ₂	6.0	0.86	400	70	27
18	150-watt	10.6	3.4	1,200	250	150
19	500-watt	12.0	6.25	2,000	500	500
13	T ₁	14.5	4.5	700	320	150
14	T ₃	17.5	5.2	2,000	340	250
15	T ₄	17.5	5.2	3,000	340	400

TABLE IV. GIVES PARTICULARS OF THE TWO-ELECTRODE VALVES.

No.	Valve.	Volts Fil.	Fil. Current.	Fil. Emission.	Rating.	H.T. Volts for Saturation.
20	U1	14.5	Amps. 4.5	m.a. 330	Watts. 150	300
21	U2	18.0	6.2	550	?	?
22	U3	6	1.5	100	27	270
23	Erect	6	5.0	?	?	?

RATING.

The rating in watts is the maximum permissible value of the product of the current through the valve and the voltage between anode and filament. When the product of the voltage and the current is equal to the given rating the valve can be worked continuously for ten minutes under these conditions without damage to the anode or to the vacuum. (See also Columns 5, 6, 7, Table II.)

CHARACTERISTICS.

R.—The characteristics of receiving valves are given over only a small range of grid volts. Figs. 1, 2, 3, 4 apply equally to French, R (Army), R (R.A.F.), and French horned valves, as the geometry of these valves is the same.

B.—This is a very hard valve, the grid helix is twice as close as that of the R, otherwise the geometry of the valve is the same.

Q.—The Q valve has a fine mesh grid and requires a fairly big anode voltage for most efficient working.

N.—The N valve is a "soft" valve, and is much more "sensitive" than a hard valve, but, like all soft valves, it requires skill in adjusting for maximum efficiency.

FRENCH HORNED.

V24.—These valves are constructed so that the anode and grid leads pass out through the sides of the bulb. This avoids the crowding together of the four leads usually passing through the base of a valve, and reduces the electrical capacity of the valve. The V24 is similar in shape to the Q valve, but has a more open grid than the French. The "grid filament capacity" of the ordinary French, the horned French and the V24 are respectively 12, 6, and 8 cms.

T.—This is a close grid transmitting valve. High voltages can be used on it efficiently, in spite of the fact that the vacuum is not absolutely hard.

T₂B, T₁T₃, 150 and 500 watt.—Valves 12, 18, 19, 13 and 14 are high power open-grid transmitting valves.

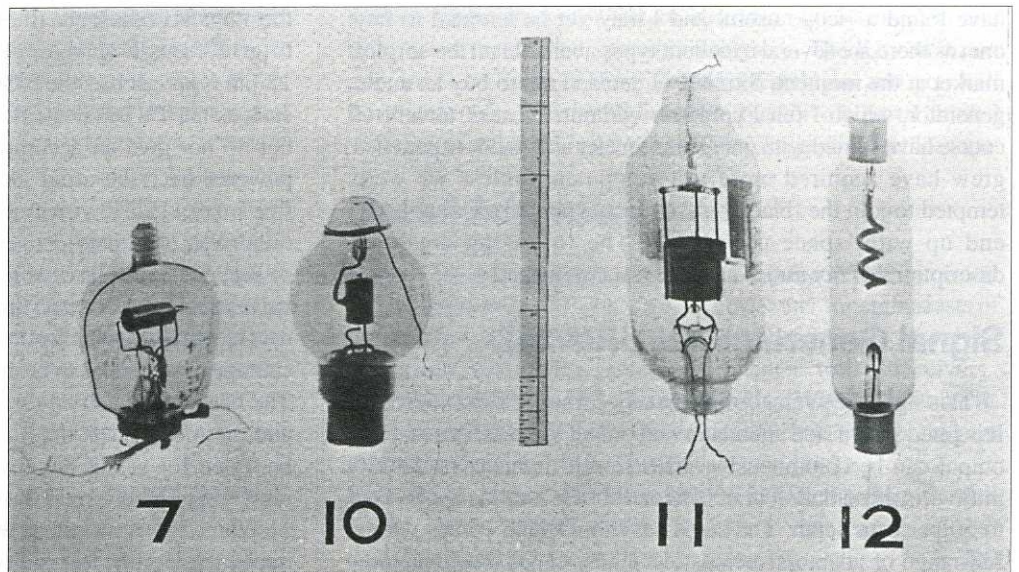
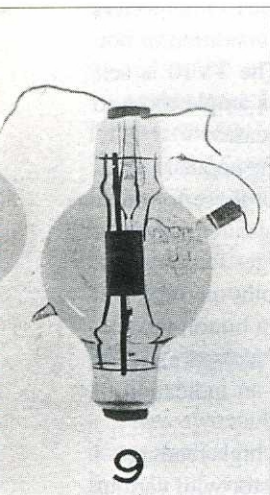
A, A₂.—These are very hard valves, very similar to the French in geometry. The A₂ has a more open grid than the A.

R₂.—The R₂ is a soft valve like the N, but it is manufactured in such a way that the vacuum is almost constant.

R₄.—This valve is not quite so hard as the French.

U₃.—Fig. 23 shows the anode current through valve U₃, No. 22, with different anode voltages.

Figures 1 to 23, the valve characteristic curves, are not reproduced here



American Test Equipment of the '50s and '60s

by Peter A. Hopwood G3UKH

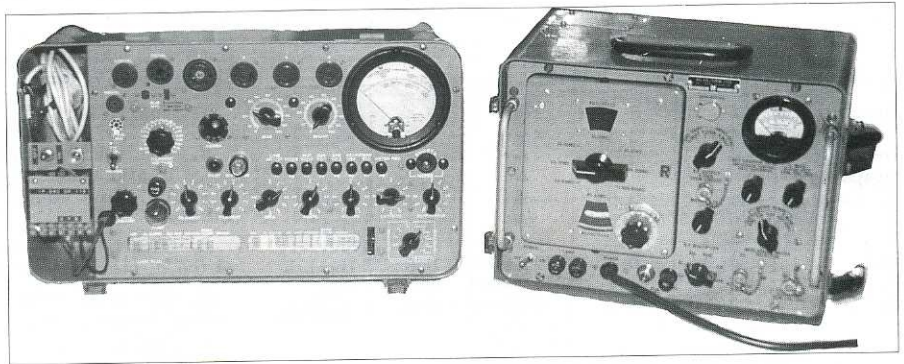
As regular readers of *Radio Bygones* will know, my interest in radio lies mainly with American equipment, in particular the products of National and Collins Radio Companies, and in various US Signal Corps transmitters and receivers. In keeping with my interest I have built up a range of test equipment that originates from the US Armed Forces. They were all built in the late 1950s and '60s and continued in use until recently.

All the items I am going to describe were bought in the UK in the last three years. I do not wish to decry similar British test equipment as used by our forces but there is a significant difference. In the UK, firms submit equipment to compete for government contracts. These may be existing commercial designs or newly made equipment built around the specifications. In the USA however, the Signal Corps for example, would ask firms to tender to build a piece of equipment, of possibly their own (i.e., the Signal Corps) design, which would have a very strict set of specifications. As is well known, in the Cold War of the 1950s and '60s, Uncle Sam was able to spend far more on defence than the UK, so a vast array of test equipment (as well as communications equipment in general) was produced that was built to a very high standard, as laid down in the contracts. The American equivalent of the excellent AVO Model 8 meter is thus housed in a cast metal case and is generally a far more robust meter, being specifically designed for forces' use.

I do all my own servicing of my radio equipment and have been involved in several complete rebuilds of various sets. The items of test equipment I own have been chosen around the requirement to accomplish these tasks. I decided not to buy an oscilloscope as I felt a valve voltmeter would do for the majority of the work. There have been some times recently when I would have found a 'scope useful and I may yet be tempted to buy one, as there are several excellent types available on the surplus market at the moment. Similarly I decided not to buy an audio generator, which I felt I could do without. Most of us will of course have started with only a multimeter and as our experience grew have acquired more test equipment, unless we were tempted to join the 'black box' cult, so who knows what I will end up with, space permitting! The following are brief descriptions of my major items of test equipment.

Signal Generator AN/URM/25D

This signal generator covers the range from 10kHz to 50MHz. It is fitted with a step attenuator and output voltmeter so that the output can be continuously varied from 0.1 microvolt to 100 millivolts. Modulation at 400Hz or 1000Hz may be applied up to 50 per cent depth. The set is easy to use and comes with a full range of adaptors such as test leads, impedance matching



TV10 Valve Tester and URM/25D Signal Generator

units, fixed attenuators and antenna simulators, all using BNC sockets.

Accurate frequency calibration is by interpolation of the log scale using an internal crystal calibrator. This is perhaps a little more complicated to carry out than using the calibration book of the BC221 but I have never found a need to accurately set the instrument at any other than the crystal check points. I find the great benefit of the 25D over the BC221 is the calibrated output level, which allows you to check the performance of a receiver for example against the manufacturer's specifications.

The only criticism I have heard about the 25D is that the step attenuator can be troublesome. It is easy to burn out the high tolerance resistors, but this can only be done if you accidentally try to inject a signal into say a receiver at a point where DC voltage is present and you don't use an adaptor with a blocking capacitor. It is not a hard job to dismantle the attenuator but it could prove difficult to get replacement resistors so be warned! Like most US equipment the 25D needs about 115V AC and is housed in a grey metal case, the adaptors are fitted in the lid.

Tube Tester TV10

This instrument is capable of accurately testing and measuring the mutual conductance (the ratio of the change of anode current to grid voltage change, or g_m) of all valves other than the 12-pin types such as the 6JS6C line output valves. Other testers such as the TV7 indicate if a valve is in good condition or not, but do not give an accurate reading of g_m . The TV10 is self powered from the usual 115 volts, but there is ample room to fit a small 115/240 volt transformer inside the case.

A roller chart provides settings for most of the popular valves of the '50s and '60s. It is not hard to work out those for older valves such as 6D6, etc., not listed. The settings are made by a row of switches, which allow the correct voltages for the grids, cathodes and anodes to be applied to the right pins on the valve. The bias and any shunt resistance is then set, a button pushed, and the meter reads the mutual conductance. Valves can also be tested for gas in the envelope, shorts and an indication of remaining life left in the valve.

When I got my set, it was giving far too high readings. I tracked this down to a faulty wire-wound resistor with various

tappings. I temporarily wired three variable resistors in place of the broken one and adjusted them to give the correct voltages as laid down in the technical manual. I then measured their resistances and replaced them with three fixed resistances, a quite laborious job but now it's done it should stay within specifications.

I don't know how I managed to service the more complicated sets such as the R-390A and S-Line without a valve tester. Substitution of a good valve is all very well, but you must ensure that the valve substituted is in fact good. Except in AF circuits, to compare properly you must align each stage a valve is substituted into before any improvement can be gauged. Also, replacing one valve at a time will only show a small improvement, if the valve replaced was say 75 per cent of its rated output and this improvement perhaps could not be measured. However replacing several valves, as indicated on the valve tester as being slightly below specification, can result in a marked improvement. You therefore need to know which tubes are below rated output. The TV10 is not large and is meant to be portable. Be prepared however to get numerous requests from your friends to have their valves tested if you get one!

Valve Voltmeter TS505

This is a very versatile instrument, the brief specifications of which are as follows: DC Volts in nine ranges from 0–0.25 volts up to 1000 volts; AC Volts in seven ranges up to 250 volts and Resistance in seven ranges up to R x 1 megohm. By using an RF probe supplied with the meter, RF up to 500MHz can be measured on the DC range. The circuit uses seven valves and runs off 115 volts AC. Prior to buying the TS505 I had used a communications receiver having a good S-meter to provide a means of comparing signal levels, but a proper VTVM is a must for anyone involved in servicing both receivers and transmitters, particularly when measuring stage gain and AVC voltages.

I had a lot of bother getting my TS505 working correctly, with most ranges well out of specification. Some resistors had gone high but fortunately all the accurate wire-wound ones were spot on. Some of the valves in the balanced circuits were unmatched, and at this time I did not have my valve tester.

I have been told that when they were in service at US Air Force bases, these instruments were switched on for 24 hours a day, every day of the year. They were probably put up for sale when a six-month service was due, or a fault developed, so it's not surprising that there could be problems. I eventually got mine back to the tolerances laid down in the Technical Manual, and it has proved to be a superb piece of equipment. It has separate leads for measurements of DC, AC and resistance, and a large meter.

At this stage I should mention that for each of the items so far described it is essential to obtain a copy of the appropriate Technical Manual. They cover theory, operation and fault finding. As far as my own station is concerned an advantage of using US test equipment is that the Technical Manual for the R-390A receiver shows various testing set-ups using all of the above equipment.

Multimeters

I have two multimeters, Models PSM6 and PSM37 They both cover similar ranges as follows: DC and AC in seven ranges from 0–0.5 volts to 0–1000 volts. The DC ranges at either



Test-meters TS505 and PSM6

1k Ω /volt or 20k Ω /volt. Six ranges of resistance from R x 1 to R x 100k. The mA current range is similar to the DC/AC range.

In the lid of both units are test prods, a shunt allowing the meter to measure current in the ranges 0–2.5 amps and 10 amps, a prod extending the range to 5000 volts and an adaptor with a 'phono' plug for measuring audio output. The PSM6 uses one 12 volt and one 1.45 volt battery. A twelve volt lighter battery works well, and an AA type just past its best can be used instead of the 1.45V battery. The PSM37 uses four 1.5V AA types. The PSM6 is housed in a cast metal case and has a large meter.

My PSM37, while having similar specifications is a much newer meter and is housed in a high-impact yellow plastic case with a black satin panel. Overload protection and a low current path for measuring resistance in transistor and IC circuits is provided. These meters when available can be bought for sums comparable with the AVO Model 8 meters and like the AVO are worth investing in.

There are several other items of US test equipment available, which I don't own, but which come up for sale regularly and may be of interest to readers. Some are designed for testing particular sets, other items are of a general nature. Prices naturally reflect the use one can make of the item in question rather than the original cost to the US government. Some of the items currently available are audio generators, oscilloscopes of various types, transistor testers, distortion analysers, VU and noise level meters and spectrum analysers. The list can go on and on. Get a copy of the Fair Radio Catalogue and you will have some idea of what is available but for my part I think I will stick with what I have, but I might just get that oscilloscope.

Useful Addresses

Hollow State Newsletter, c/o Dallas Lankford, 903 Sherwood Drive, Ruston LA 71270, USA. A newsletter for enthusiasts of the hollow state rather than solid state, i.e., lovers of valved equipment. Has articles on test equipment as well as receivers.

Bob Wright, 247 Sandy Lane, Hindley, Wigan WN2 4ER, telephone 0942 55948. Occasionally has meters, signal generators, etc., for sale as well as accessories.

Fair Radio Sales, PO Box 1105, 1016 E. Eureka Street, Lima, Ohio 45802, USA. Stocks a vast range of test equipment and is prepared to ship to the UK.

RB

A World's First

The Frinton-on-Sea Wireless School

by D. A. J. Ward

Wireless communication came into existence when, in 1896, the latest discoveries in physical science of that day were applied by an energetic inventor, Guglielmo Marconi, to the realisation of a dream of transmitting messages through space without the use of an intervening conductor. Progress was unexpectedly rapid. The Marconi Company was formed in 1897 and a technique developed which was naturally ahead of any experimental construction to demonstrating principles as employed at the universities or elsewhere. Empirical theory based on experience also made its appearance. The frequent application of electromagnetic principles under circumstances which had never been met with before, created an art which had to be taught to the new recruits to the industry before they could be entrusted with any erection and installation work themselves.

The first three years of the Marconi Company saw a number of scattered coast stations established, several men fitting and operating ships' sets, experimental work on a small scale at some of the coast stations and on a very large scale at others. A group of young men all working with energy and enthusiasm and a small works in full production – the whole forming a loosely knit and therefore thoroughly flexible organisation. New recruits to the staff looked to the more senior men to give them the knowledge which had not yet become incorporated in the university syllabus.

Training

It was soon realised that a haphazard training of this kind was not very satisfactory. The men immediately in touch with the experimental work which was being carried on were well off in this respect, but those men on shift duty or at isolated coast stations, for instance, were not so fortunate. In those early days, however, there were more jobs than men to carry them out, so that this disparity in training was partly discounted by

shifting the men from one job to another every month or so. As the organisation continued to grow, however, the men remained for longer periods in out-of-the-way stations without transfer, and it became evident that centralised instruction for new recruits in the technique of wireless telegraphy had become a necessity.

On 25 April 1900 the Marconi International Marine Communication Company Limited was formed. Its aim was to develop reliable two-way compact wireless systems for ship to ship, and ship to shore communication.

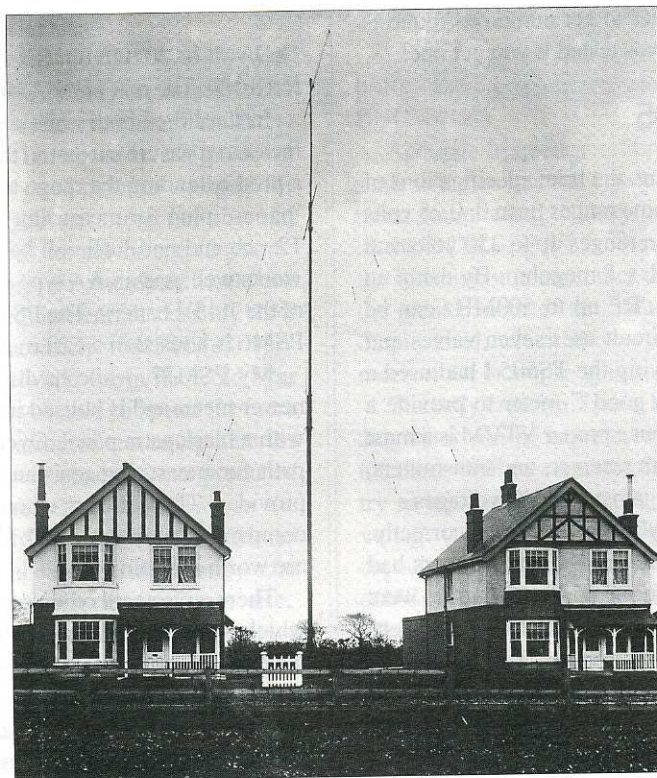
A residential school for the training of the probationer engineers was opened at Frinton-on-Sea on the Essex coast in September 1901. This was the first Wireless Telegraph Training College in the world, and it established a precedent in industrial technical training institutions.

The school occupied the building in the left of the photograph shown here, the other housed the school's resident students. A 120ft sectioned wooden mast stood between the two.

The majority of the students' time at the Frinton Wireless Telegraph Training College would have been concerned

with the use, maintenance and repair of the transmitting and receiving equipment. It is thought that the station's local test transmissions were usually to a small (possibly portable) station located somewhere in Pole Barn Lane some 500 yards away. However the school's large mast would have enabled the students to easily work with the main Marconi site in Hall Street, Chelmsford and with coastal stations at Dovercourt near Harwich and at North Foreland. Just why Marconi came to Frinton is unclear, although a brief look at any map of this stretch of coast shows it to be readily accessible, with clear sea paths to North Foreland and the Kent coast.

In more recent times, a telegraph training college was understood to mean an institution where men receive instruction to enable them to qualify for the Post Office licence to operate apparatus between ship and shore stations, but at the date of



The Frinton-on-Sea Wireless School in its heyday

Photograph by kind permission of GEC – Marconi Limited

which we speak, marine operators, as a recognised body, did not exist and the Frinton School concentrated on the instruction of engineers. It was residential. The students were selected men from the universities and technical colleges. They were placed under the charge of a senior engineer for technical instruction, but in common with students engaged at universities on post-graduate work they were allowed all the freedom necessary for independent study and self-expression in experimental research.

Resources

The first Engineer in Charge was T. Bowden, whose experience with the Marconi Company dated back to 1898. The work carried out at Frinton covered: experimental studies of tuned and coupled circuits employing Leyden Jar transmitting condensers, and experimental work on HF transformers of the Tesla Oscillation Coil type; Morse sending and Morse inker tape reception; instruction in the erection of stepped 150ft masts and experience in the laying of earth plates. Coherer testing was carried out between the School at Frinton and the North Foreland Experimental Station, coherer reception being then at its peak as Marconi had recently received signals on the ss *Philadelphia* at a distance of 2000 miles from Poldhu, Cornwall.

Testing equipment for HF measurements was almost entirely restricted to the use of hot-wire ammeters and a point spark-gap for the determination of transmitter tuning, and the strength of signals at a distance for the testing of receiving equipment. For text books the students were not badly off, using Maxwell's *Electromagnetic Theory*, Hertz's *Electric Waves*, and J. J. Thompson's *Electricity and Magnetism*, supplemented by S. P. Thompson's and Fleming's books on general electrical theory, electric machines and transformers. Also, careful study was made of all Marconi Patent specifications.

Several of the students of the year 1902 subsequently filled higher positions with the Marconi Company and its associated organisations at home and abroad, and the names of many of them are on the Veterans' Roll.

Closure

Frinton was closed in 1904 and the school was transferred to the Hall Street Works in Chelmsford. For a time students were absorbed directly into the personnel of the general research, development and testing staffs. It was a difficult commercial period for wireless. The magnetic detector had replaced the coherer, small power sets were available for ships; the shipping companies recognised the value of wireless but were not prepared to pay for its installation. The British government passed the first Wireless Telegraphy Act making the operation of a wireless service subject to a Post Office licence. Transatlantic wireless communication was a fact but not

a commercial success. The Fleming Valve was a new, but not a very sensitive detector and no one had yet realised its latent possibilities.

The Frinton mast was dismantled in 1904, but the large concrete base was not removed until the 1940s and pieces of the extensive buried earth mat of stranded wires are still being found in the garden today. The building has not changed much, apart from the loss of a chimney and some mock Tudor cladding. The appearance of a new housing estate both behind and in front of the buildings has reduced the size of the original site somewhat, and of course a garage and television aerial are part of the new age.

The Frinton Wireless School surprisingly was not situated on the sea front, but some half a mile inland on Upper Third

Avenue and remains to this day as a quiet private residence – now called 'Marconia'.

The Plaque

On 28 April 1988 an official plaque commemorating the historical significance of the house, was unveiled by Sir Robert Telford, Life President of the Marconi Company. The ceremony took place in the presence of Fred Good, Chairman of Tendring District Council who provided the plaque, and Dudley Ward, owner-occupier of the house since 1946.

RB



The plaque which now marks the site of the world's first wireless school

Where is it? - No. 6

Our best crop of entries so far, almost all of them correctly identifying the photo as showing the BBC Brookmans Park transmitter hall around 1930! The winning entry drawn out of the Editor's hat came from John Power of Dennistoun, Glasgow, who wins a one-year subscription to *Radio Bygones*. Another puzzle in our next issue.

Things We Have Seen

The commander using the tuning knobs as a convenient step when climbing out of the turret. *Don't do it*; you might slip and graze your knee. The operator tapping the meter with a 5/8" spanner because it didn't show any HT volts. *Don't do it*; it's apt to damage the spanner and anyhow perhaps a fuse is blown.

From Wireless Set No. 19 - Working Instructions, published by the War Office

The Mysterious A. J. Alan

Leslie Harrison Lambert G2ST

By Pat Hawker

The 17 December 1941 issue of *The Times* announced the death of 'Mr L. H. Lambert who under the name of "A. J. Alan" was a popular story-teller of the BBC', and published an obituary that concealed more than it revealed: 'By the death of "A. J. Alan" at a Norwich nursing home on Saturday (December 13) broadcasting has lost one of its most popular story-tellers, and one – possibly the only one – who maintained his anonymity until the end. He was Mr Leslie Harrison Lambert, a civil servant of Notting Hill, London; and around his personality and stories the BBC had created an air of mystery, which was at the express desire of Mr Lambert. His quiet, clear diction; the interest of his stories; the delightful relief of the incredible anti-climax, made "A. J. Alan" distinctive as an entertainer.'

The Times continued 'He broadcast at most five times a year... the last occasion was on 21 March 1940. Mr Lambert was also an experienced amateur radio transmitter; and by reputation an authority on good eating and rare wines.'

RSGB Member

Nothing of the customary personal, family or career details – an obituary of the mysterious A. J. Alan rather than that of Leslie Lambert. John Clarricoats G6CL as editor of the RSGB's journal added: 'It will come as a surprise to many members to learn that "A. J. Alan" was an experienced amateur transmitter... and was a member of the Society many years ago. Although we have no record of his transmitting activities he held the callsign G2ST right up to the outbreak of war. As a raconteur he had no equal. His mystery stories earned for him the appreciation of a vast unseen audience... The fact that he was a radio amateur may explain the reason for his outstanding microphone technique [1].

Clarry's final remark was clearly speculative – there is still, almost 50 years later, no evidence that Leslie Lambert ever made any amateur 'phone contacts, though it seems likely that he was an active amateur-experimenter in the days before the first world war when experimental licences with three-letter callsigns (one letter always being an X) were issued.

What neither *The Times* nor the RSGB apparently knew was that from at least 1915 (and possibly from about 1910), Leslie Lambert had been engaged in secret Signals Intelligence, working during the First World War for the Admiralty's 'Room 40' and then until his death, for the Foreign Office's 'Government Code & Cipher School' (GC&CS) an innocuous-sounding name that provided cover for British cryptography and code-breaking, first at Queen's Anne Gate (1922–26) and then at 54 Broadway (1926–39) a building that housed also the Special Intelligence Service (SIS) both under the control of 'C' (Admiral 'Quex' Sinclair the Chief of the Secret Service; and finally, until his terminal illness, at Bletchley Park credited with

being 'the most secret place' in Britain throughout the Second World War.

Lambert's almost life-long connection with radio interception and signals intelligence only began to come into public domain some 16 years after his death when in 1955 Admiral Sir William James published his *The Eyes of the Navy* – a biographical study of Admiral Sir Reginald ('Blinker') Hall. Admiral Hall became Director of Naval Intelligence in 1914 and established a code-breaking centre in Room 40 at the Admiralty, where German Naval ciphers and Diplomatic codes were regularly broken, including the famous Zimmermann telegram often credited with bringing the USA into WWI.

Lambert's *alter ego* as a broadcaster began in 1924 when as a 40 year-old, elegant military-looking man, he walked into BBC Savoy Hill and asked to see Rex Palmer whom he knew as a near neighbour. The night before, a speaker on 2LO had suggested that the ancient art of story-telling had been lost. Lambert told Rex Palmer that he had written some stories that he would like to read on the wireless: 'I think I can show that story-telling is not dead.' Rex Palmer arranged for him to have an audition and promptly booked him.

Kenelm Foss in a 1954 introduction to *The Best of A. J. Alan* wrote 'On January 31, 1924 with broadcasting of a short story *My Adventure in Jermyn Street* there for the first time crept over the air a pernickety, shy, languid, somewhat emasculate 'posh' voice of the kind with which we are now only too familiar in radio-announcers. Its owner had something novel and original to sell and it is not too much to say that, owing to the instant public acceptance of his delightful entertainment... (he)... was the initiator of the 'BBC accent'. This curious hybrid neither the King's English of George V or the unaccented Queen's English of Elizabeth II but a class-conscious, mincing travesty of correct diction was precisely suited to A. J. Alan's material. Those diffident hesitations of his were in reality artfully contrived stage-pauses, for dramatic or humorous effect... his radio-personality a façade to hide a much more exuberant and artistic personality than his Whitehall-inhibited self.' Kenelm Foss, when that was written, had no idea that Lambert's sense of timing and an artfully contrived stage-personality must have been gained during five long years as a professional entertainer.

Mystery Man

Asa Briggs (Lord Briggs) in his classic history of British broadcasting considered him 'one of the most striking first "creations of radio"... More clearly than anyone else "Alan" realised that radio offered completely new possibilities of communication. He realised also that radio could make a broadcaster into "a mystery man", a topic of universal conversation.'

In 1952 Maurice Gorham noted: 'A. J. Alan surrounded himself in mystery; his real name was kept secret even inside

the BBC. His stories, each carefully written and rehearsed to give the impression of an entirely spontaneous anecdote, were a masterly combination of the matter-of-fact with the unexpected, the ordinary with the bizarre. But his great success was in giving the impression that however strange or however ordinary they might be, all these experiences had really happened to him and it was his mastery of the microphone that enabled him to do that.' [2] In fact, many of his stories were woven around incidents that had happened to him or to his friends – though much polished and converted into fiction that ensured that listeners, hooked by his first few sentences, stayed with him to the usually anti-climatic ending.

A. J. Alan was immediately recognised by both those whose profession was broadcasting and by listeners as a new and unique talent, the first 'truly professional broadcaster' who created and retained a style finely honed to the intimacy of the microphone; an entertaining chat rather than the formal lectures that so many of the early talks on the wireless resembled. I recall, as a teenage schoolboy, how I looked forward to his next appearance – and was seldom disappointed. Through the loud-speaker one was taken into a world of odd, inexplicable happenings, some with a paranormal element, some bordering on the criminal, some reflecting the middle classes' rather racial, xenophobic attitudes of John Buchan and Bulldog Drummond but served up with the wit and anticlimatic twists of those masters of the printed short story: H. H. Munro ('Saki') and Guy du Maupassant. He created a 'personality', that pre-dated the anti-heroes of later decades, a character prepared to 'take a chance' yet projecting a slightly raffish, ex-public-school, ex-officer ethos with connections to Scotland Yard and the secret world.

Pseudonym

Listeners recognised that 'A. J. Alan' was a pseudonym, his photograph was never published – and it was not until after his early career as a conjurer became known that some of his early publicity photographs were traced and published, for example in *The Listener* (25 August 1977) in connection with Tony Bilbow's programme *Man of Mystery* which pulled together a

number of details of Lambert's life, based in part on the research of a retired BBC engineer, Norman Duret.

Some believed he surrounded himself in mystery in order to exploit the public's acute curiosity; a number of other radio broadcasters (remember 'The Streetsinger'?) followed his example but were soon identified as professional artists. Rumours abounded – one that circulated in Broadcasting House

was that he was a Royal Personage! To a very few, he was understood to be a very senior official in the Foreign Office (as a 'Wireless expert' in GC&CS his salary in peacetime was well under £1000 and when he died his estate was proved at £1134 gross). He never admitted, even to friends, that in his early twenties he had been a professional entertainer available for 'dinner parties at home, concerts, etc.', offering his services as a 'prestidigitateur' (i.e., nimble fingered sleight of hand) for 'from fifteen minutes to an hour and a half or more as required' – one of a string of entertainers run by Alfred Heys who, from premises in the City and at 26 Old Bond Street in the West End, operated as a 'music publisher, theatre ticket agent, piano, organ and musical instrument maker'.

Royal Performer

Between 1904 and 1909, Leslie Lambert performed at many fashionable children's parties including several at Marlborough House before Queen Alexandra, the Princess of Wales (later Queen Mary) and the Royal family. A notice in *The Sketch* (12 December 1906) quoted on one of Lambert's hand-

ills commented: 'Mr Leslie Lambert was educated at Rugby. Six years ago, he became interested in sleight of hand, and began to practise incessantly. Two years ago he accepted his first professional engagement and since then he has met with much success. At the end of last season he had the honour of appearing before the Princess of Wales and other members of the Royal Family.'

He became a vice-president of the Magic Circle and added to his list of Royal performances. But then in 1909 he suddenly resigned from the Magic Circle and appeared no more as a 'prestidigitateur'. Had it not been for his Marlborough House performances and a remarkable coincidence of a Royal gatecrasher, the link between his two careers might never

LESLIE LAMBERT,



Prestidigitateur.

DINNER PARTIES.
AT HOMES, © ©
CONCERTS, ETC..
© ATTENDED. ©

The Entertainment may be of any length from fifteen minutes to an hour and a half or more, as required.

LESLIE LAMBERT has had the honour of performing at Marlborough House, and elsewhere, before—

HER MAJESTY QUEEN ALEXANDRA (on two occasions).
H.R.H. THE PRINCE OF WALES.

H.R.H. THE PRINCESS OF WALES (on three occasions).

H.R.H. PRINCESS VICTORIA
(on two occasions).

H.R.H. PRINCESS CHRISTIAN.

H.R.H. PRINCESS HENRY OF
BATTENBERG (on four occasions).

H.R.H. The DOWAGER DUCHESS
OF SAXE-COBURG.

H.R.H. PRINCESS VICTORIA OF
SCHLESWIG-HOLSTEIN
(on two occasions).

H.R.H. PRINCESS BEATRICE OF
SAXE-COBURG.

H.S.H. PRINCE FRANCIS OF
TECK (on three occasions).

H.H. THE PRIME MINISTER OF
NEPAL.

A FEW OPINIONS.

The Sketch, Dec. 12th, 1906.—Mr. Leslie Lambert was educated at Rugby. Six years ago he became interested in sleight of hand, and began to practise incessantly. Two years ago he accepted his first professional engagement, and since then he has met with much success. At the end of last season he had the honour of appearing before the Princess of Wales and other members of the Royal Family.

Madame Melba encloses her cheque . . . and she wishes me to thank you for your charming entertainment, which she and her friends very much enjoyed.

I shall always be happy to testify to the great pleasure you gave . . . at my house to H.R.H. The Princess of Wales, her children, and others, who all expressed themselves as greatly entertained by your excellent and unique performance.—George Drummond, Esq., 14, Belgrave Square, S.W.

CONCERT DIRECTION,
ALFRED HAYS.

have been made public in the 1955 book by Sir William James who revealed that in 1915 Lambert was at the secret radio intercept station at Hunstanton, Norfolk. This was the first of the network of receiving and D/F stations set up by Commander R. Bayntum Hippersley (HLX, later G2CW), a prominent Somerset Landowner after he and Russell Clarke (THX) had demonstrated to the Admiralty that, as experimental amateurs, they could receive transmissions to and from German naval vessels at ranges much greater than had been supposed. Captain H. J. Round of Marconi's was put in charge of installing newly developed D/F equipment. Hippersley, Clarke and Lambert began to intercept the German traffic which was soon being 'read' by the cryptanalysts of Room 40 at the Admiralty as a major source of Naval Intelligence.

James describes how at Hunstanton, Clarke and Hippersley 'were shortly joined by Leslie Lambert, another wireless amateur, and it was fortunate that he was on watch when Queen Alexandra unexpectedly appeared one day. Sentries had been posted, but her Majesty (by now Queen Mother) had somehow evaded them. Lambert, who had recently been at Marlborough House giving conjuring entertainment recognised the Royal visitor, and so all was well; but if one of the naval ratings had found the Queen it might have been very awkward. The strain soon began to tell, and a reinforcement of GPO wireless operators was sent.' For 'the duration' Lambert was commissioned into the Royal Navy but there remains an unsolved mystery as to just how he came to join the Hunstanton team and just what he had been doing between 1909 and 1914, following his resignation as a vice-president of the Magic Circle.

Radio Security Service

A speculative but possible answer arises from the fact that it was in 1909, largely as a result of vastly exaggerated warnings of widespread German espionage in Britain given with much publicity by the popular novelist William Le Queux (post-war amateur 2QZ) that a new Secret Service Bureau was set up, soon divided into domestic counter-intelligence (forerunner of M15) and foreign intelligence (forerunner of M16/SIS) sections. Le Queux even then believed that in the event of war, German spies would use wireless telegraphy. It seems plausible that Lambert was an early recruit in an embryonic Radio Security Service. A further clue comes from one of his stories (often a skilful mixture of fact and fantasy). This was *The Voice*, broadcast about 1925 soon after the opening of the Daventry (5XX) long-wave transmitter, which began: 'To begin with, I ought perhaps to confess that for the last sixteen years I have been rather deeply involved in the science of wireless telegraphy' – this would date his 'involvement' in radio to 1909 – although whether this was purely as an 'amateur' is uncertain.

What we **do** know is that Lambert stayed in the secret world of signals intelligence after Room 40 was converted into GC&CS under the Foreign Office, not as a cryptographer but as a 'wireless expert' and administrator. He soon took out an experimental licence, 2ST, when licences became available after 1920, by which time he had settled in London, first as a paying-guest of, but soon as the husband of a comfortably-off widow, May Hunniford, some 15 years his senior, who on the death of her first husband had come to live in a large house in Notting Hill, with a Danish cook-housekeeper.

Even here I stumbled across a curious 'mistake'. The 1924 *Wireless Annual for Amateurs and Experimentors* listed 2ST as

'L. Lambert, 46 Church Road, Holland Park, London.' I soon discovered that there is no Church Road in Holland Park, Notting Hill or Kensington (where there is a Church Street). 2ST was not listed in the 1925 or 1926 annuals. Eventually I traced his address (from 1920 until his death in 1941 and then for May Lambert until about 1945) as 46 Clarendon Road, close to Notting Hill tube station. A printing mistake or part of the smoke screen that Lambert put round his private life? 2ST was not found in any of the 'Calls Heard' listings in *Wireless World* in the early 'twenties.

Then again, what was the connection of the Lamberts with the village of Potter Heigham in Norfolk? It seems likely that May Lambert lived there during the London bombing or when her husband fell ill while at Bletchley Park, since Potter Heigham was given as his home by Kenelm Foss at the time of his death in a nearby Norwich nursing home. In the inter-war years, the couple appear to have had a holiday home in Devon where several of his stories are set. Yet one of his early stories *My Adventure in Norfolk* tells how 'I'd come to Potter Heigham by train, and been driven on – the coincidence is such that there must surely have been a long-standing connection with this Norfolk village whether through his or her family. Both seem to have died without any close relatives and after the death of May Lambert the copyright of the A. J. Alan stories (which will expire in December 1991) passed to the Danish housekeeper-companion.

In *The Voice*, A. J. Alan uses his knowledge of direction-finding in an attempt to trace some mysterious transmissions: 'It almost looked as though some amateur transmitter was putting out gramophone records on a wave we couldn't get down to... This time I went prepared. I took, among other things, an experimental direction-finding set which I borrowed – never mind who from'. In this case fact was to imitate fiction. In the early 1930s, Leslie Lambert, in his GC&CS capacity, in association with Commander Kenworthy (who ran the Foreign Office/Home Office intercept station at Camberwell Grove, South London), is credited with tracing the first known case of a Russian clandestine transmitter being operated in the UK. Nigel West (Rupert Allison) tells the story: 'In 1930, Commander Kenworthy reported an illicit Comintern circuit operating between a site just outside Moscow and a terraced house in a suburb of London... Evidently, Kenworthy and Leslie Lambert combined their resources to trace the exact location of the clandestine transmitter, while Tiltman (a GC&CS career cryptographer) solved the cipher. The only explanation for the apparent lack of overt police action in the case is presumably that it suited the Security Service (and indeed, GC&CS) to allow transmission to continue uninterrupted. Their motives can only be guessed at [3].

A Model of Regularity

Dr R. V. Jones, who headed British Scientific Intelligence during WWII, was inducted into the work of Bletchley Park a few weeks after the outbreak of the initially 'phoney' war: 'Courtley Shaw looked after me... and introduced me to some outstandingly interesting colleagues. At our first lunch he whispered to me "See that chap opposite you – he's A. J. Alan." This was the marvellous raconteur who used to fascinate BBC listeners... The most surprising thing about him was that, in contrast to the outrageously unconventional stories that he told, he himself was a model of regularity. At 11.30 precisely he

would leave for a drink, usually with Oliver Strachey a (leading) cryptographer, and return to work with the same punctuality. All his days were run on a monotonously regular timetable.' [4]

Bletchley Park, despite the outstanding success in breaking into German high-level hand and machine ciphers, was notable for its internal squabbles – between the career cryptographers and the new Young Turks from the universities. A Room 40/GC&CS Cryptographer William F. Clarke has left a memoir describing how he was constantly trying to settle differences between 'Dilly' Knox and Frank Birch: 'Dilly was a genius in cryptography as well as other matters but he was very temperamental and had to be handled tactfully... when clashes occurred I was called in to restore peace and ward off the resignations he threatened. He died soon after and his death is one of the many for which the high-ups at BP were responsible, another was Leslie Lambert, alias A. J. Alan. Both were sick men and no consideration was shown them. This was characteristic in the years before the war.' [5]

There is a striking dichotomy between the entertaining, raffish, London-club-man, character of the A. J. Alan stories and the careful, painstaking, introvert, talented but in declining health, Leslie Lambert anxious to conceal his early career as a professional entertainer and his administrative role in GC&CS. At Broadcasting House in the 1930s he was treated by young producers with all the respect due to a 'star' performer. Ronnie Waldman recalled in the 1977 Radio 4 broadcast that he would arrive in dinner jacket with monocle and a brief case from which he would take some sheets of cardboard, an India-rubber eraser, a steel tape-measure, a stop-watch, a hip-flask and a box of matches, all of which he would lay carefully on the studio table. The pieces of cardboard were to put the script on so that the paper wouldn't rustle. The steel tape-measure was because he had been told that the perfect distance for his voice from the microphone was 18 inches, and he would measure himself precisely to 18 inches. The India-rubber was to make alterations to the script. The stop-watch was to time himself.

We rehearsed the story (*Wottie* in 1938) three times and each time it ran 19 minutes and 23 seconds: we transmitted it (on domestic and external services) four times live and each time it ran 19 minutes and 23 seconds, an utter perfectionist... The hip-flask contained brandy and A. J. was the only man I knew

who was allowed to bring drink into the building, he gave himself a little swig before transmission. The candle and box of matches were because once during a broadcast the lights in the studio had failed, so he always took the precaution of lighting the candle immediately before transmission. His technique was immaculate. He was undoubtedly one of the best story-tellers I have heard. He had the technique of being able to write delightful, inconsequential but totally gripping stories in a way that nobody else has had either before or since, and he had the quality of voice which transmitted them perfectly.

References and Sources

Today there remain only a few BBC recordings of his later broadcasts (most were before recordings were practical). These are catalogued at the British Museum National Sound Archive in Kensington but my attempts to arrange a listening session were unsuccessful. However I have been able to refresh my memory of the 1977 Radio 4 broadcast presented by Tony Bilbow which includes a recording of A. J. Alan reading his *Wottie* story. During his lifetime two volumes of his stories were published: *Good Evening Everyone*, Hutchinson & Co, 1928 3rd edition; and *A. J. Alan's Second Book*, Hutchinson and Co, 1933. After his death there appeared *The Best of A. J. Alan*, Selected by Kenelm Foss, Richards Press, 1954.

Although now long out of print I was able to borrow these three books from the BBC Library (through the IBA Library). The *Listener* article of 25 August 1977 'The Mysterious A. J. Alan and the vanishing radio trick' based on the Radio 4 programme *Man of Mystery*, provides much information on his early career as a conjuror but fails to associate GC&CS with secret code breaking and signals intelligence. Other specific references are:

1. 'Silent Keys' *The T & R Bulletin*, January 1942.
2. *Broadcasting & Television since 1900*, by Maurice Gorham, Andrew Dakers Ltd., 1952.
3. *GCHQ – The Secret Wireless War 1900-86*, by Nigel West, Weidenfeld & Nicolson, 1986.
4. *Most Secret War*, by R V Jones, Hamish Hamilton, 1978.
5. 'Bletchley Park 1941-45', article in *Cryptologica*, April 1988, quoting memoirs of W. F. Clarke, Churchill Archives Centre CLKE3.

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Early Microphones

by Alan Douglas

The only design capable of transmitting enough energy to overcome losses in transmission, was the variable resistance carbon granule microphone. Astonishingly crude and highly unstable, this system persisted until the advent of amplifiers. We are dealing here with broadcasting, and this involves music as well as speech. But development and application take a long time, and some early transmissions actually used the standard, solid-back Post Office microphone.

In previous devices, the carbon granules were held lightly on a serrated carbon disc, prevented from 'packing' (as the device must be held vertically) by tufts of cotton wool or silk, breaking up the granule mass. A carbon diaphragm compacted the granules so that they were under slight pressure. The later Post Office design provided a polished carbon backplate and the diaphragm was of a different design. It is a property of carbon that the resistance between two carbon surfaces varies approximately in inverse ratio to the pressure between them. All carbon devices require a polarising voltage of between 4 and 10 volts, which of course produces some 'hiss'. They are very liable to shock excitation, are non-directional and cannot be calibrated. A step-up transformer can couple them to any type of amplifier.

Reisz

Although the Sykes-Round microphone follows naturally at this time, it is better to keep carbon granule types together. A notable improvement particularly in frequency response and reduction of background noise, was the Reisz instrument. Here, the current traverses the granules from side to side, the diaphragm is non-conductive and the container (of marble) is non-resonant and fairly shock resistant. By carefully grading the size of granules, a fairly even response was obtained, and altogether a marked improvement on any other simple carbon types. **Figure 1** shows Winston Churchill using a Reisz microphone at the BBC in 1928.

Western Electric

A great improvement came about in the Western Electric stretched diaphragm double button carbon mic (see *RB* No. 8, page 19). The diaphragm is held between two carbon buttons so that a push-pull action is obtained. This gives greater linearity and reduces carbon hiss. The output is very small but readily amplified as there must be a transformer to feed the current in. The Western Electric Transmitter at Birmingham used these and condenser mics and I used one in the Glasgow studios in 1923.

Sykes-Round

However, the BBC continued the search for high quality reproduction, and the outcome was the very novel moving coil

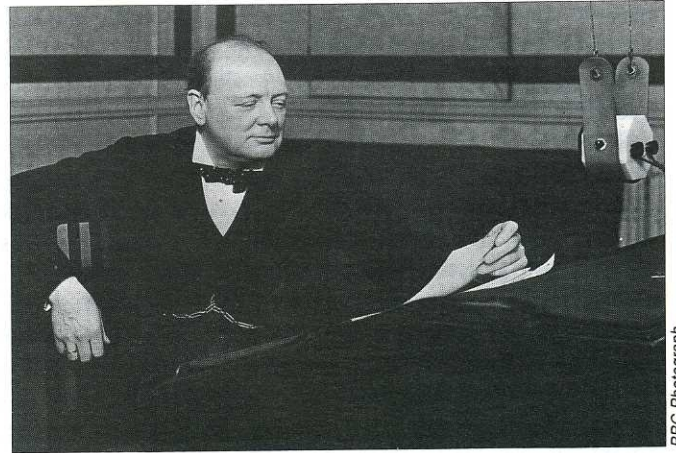


Fig. 1 - Winston Churchill using a Reisz microphone at the Savoy Hill studios in April 1928

microphone of Sykes and Round (**Fig. 2**). Heath Robinson would have felt at home here, for it was such an improbable construction! Yet it worked very well and was certainly a step forward, if only because – like the condenser mic – it had a silent background. A large and powerful electro-magnet creates a strong magnetic field between the outer ring pole and the centre one. In this field is suspended an extremely light pancake type of coil, free to move within the pole-piece gap. The coil is made from 48 SWG silk-covered aluminium wire, and is ingeniously wound turn upon turn in a disc winder as in **Fig. 3**. The gap is just equal to the wire diameter and the wire itself is drawn through a bath of molten wax. One turn thus lies on top of the previous one, the wax solidifies, and the whole forms a strong but very light pancake. But how to support it?

The first idea was to glue little tufts of cotton wool to the end of the exciting coil, then attach the coil with blobs of Vaseline. But as the studio got hot, the Vaseline melted, and the coil rubbed on the centre pole. The answer was to use rubber solution. The instrument was very insensitive and easily disturbed by draughts, etc., as of course, the coil was the diaphragm. It was kept in a wire-mesh cage, as in **Fig. 4** which shows the cast of a Tommy Handley review rehearsing in 1926. I actually had a copy made and when I gave a couple of talks on behalf of the BBC at the Hull Wireless exhibition in 1926, a BBC engineer kindly gave me one of the aluminium voice coils. One really had to shout at the creature!

Condenser Microphones

The BBC was never very fond of condenser mics, although they were standard practice in the USA and most gramophone companies were now using them. As I said before, this device was invented in 1920 and greatly improved by the Western Electric Co. Their construction and polarising arrangements are

BBC Photograph

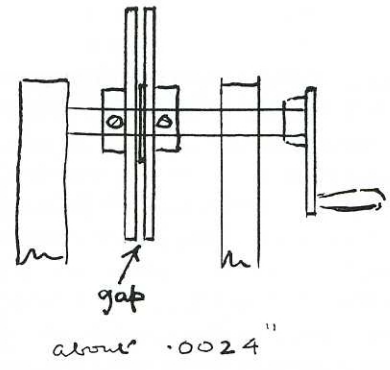
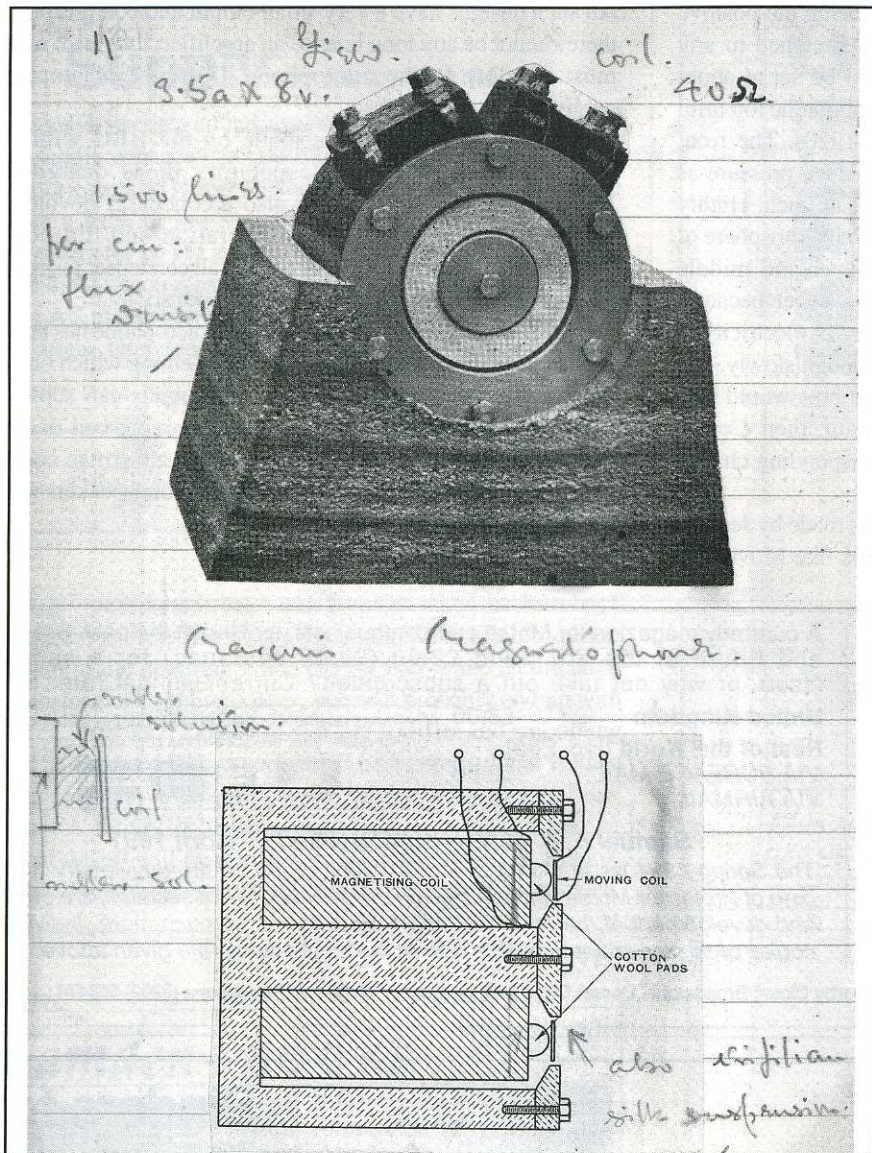


Fig. 2 (left) - A page from the author's notebook showing the appearance and construction of the Sykes-Round microphone

Fig. 3 (above) - The special winder used to produce the 'pancake' voice-coil of the Sykes-Round microphone



Fig. 4 - Tommy Handley and the cast of the How's That Revue addressing a Sykes-Round microphone in its 'cage' at the Savoy Hill studios in November 1926

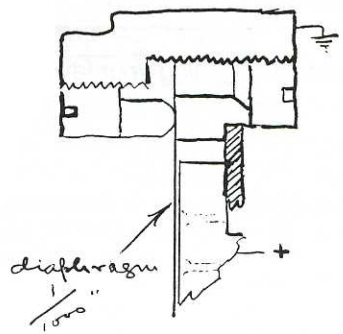
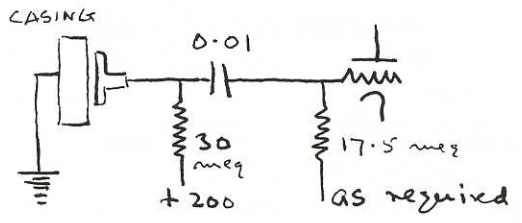


Fig. 5 - Diaphragm mounting method (above) and polarising circuit (below) for the Western Electric ES619 electrostatic microphone



shown in Fig. 5, this is the ES 619 type. Unlike earlier designs, their case is earthed, the insulated backplate being the positive element. The Duralumin diaphragm can be stretched to any extent, usually the resonant frequency would be set at about 5kc/s though it could go higher. But that was about the top limit for music recording or broadcasting in the 1920s. The front surface of the backplate was perforated to reduce pressure as the gap was no more than one thousandth of an inch. Highly polished, the steel backplate was immersed in an atmosphere of nitrogen. Whilst very satisfactory in the upper and middle registers, the lower notes tended to become weaker because, unless the resistor R is very large, the quantity of electricity Q stored in the microphone would leak away, though slowly. But there is a limit to the value of R , and 30 megohms would take you down to about 40c/s. If Q were constant, then $C=Q/V$ so impinging sound waves will cause a corresponding change in V to be communicated to the amplifier.

A more robust design of condenser mic was made by Jenkins and Adair, used later in inimicable conditions like Movietone

News, etc. I lent one to the British Sound Recording Association. All such designs have a very small output and being capacitive, there cannot be any long lines to an amplifier; thus such a device must be close to the microphone. Current consumption is negligible.

Some experiments were made by the BBC with slack diaphragm microphones, especially those designed by P. G. A. H. Voight, who was also a condenser devotee; but they were rather uncertain in operation and did not like temperature changes. Today, of course, all condenser instruments are electrets of very wide frequency response.

One must always remember that any microphone has no sense of discrimination, it cannot disregard something which one does not want to hear, as the ear does. So sounds can sometimes appear rather unreal. I do not mention moving coil or ribbon microphones as they came along later; but a German company was using ribbon microphones and ribbon loudspeakers in 1927 for motion picture recording.

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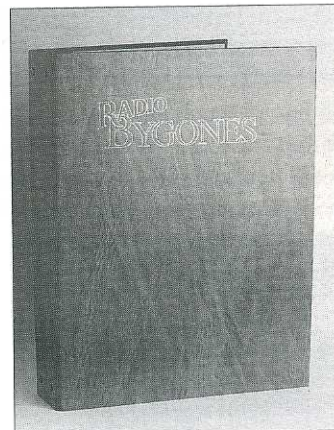
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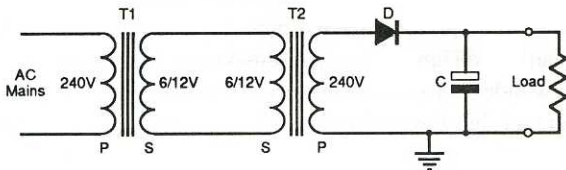


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HT Supply *by Richard Q. Marris*

Classic valve wireless enthusiasts will, from time to time, require an HT supply voltage of around 100 volts DC at a few milliamps. HT batteries are no longer available, and are expensive to make up from a bank of low voltage cells wired in series. Suitable transformers for an HT AC power unit may be difficult to find.

One thing which is readily available is the cheap and cheerful surplus AC mains transformer of maybe 6 or 12 volts output at a few amps, intended to power a low voltage semiconductor circuit.



Two of these low voltage transformers wired back-to-back (or is it front-to-front?) will produce a suitable rectifiable voltage as shown in the diagram. Allowing for half-wave rectification and transformer coupling losses, you will probably end up with just over 100V DC. Details of suitable rectifier and smoothing should be obtained from a textbook. Use a conventional voltage doubler circuit to double the output voltage.

The VA rating for the two transformers (which should be identical types) will enable you to work out the HT milliamps available. Suitable mains switching and fuses should be included.

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Civilian Restoration

I was very interested in the article in April/May *Radio Bygones* on the restoration of the wartime civilian receiver. I must however question the finish to the cabinet achieved by Mr Waddingham, as these sets were designed to be made in wartime with a minimum of raw materials and labour. I very much doubt if any were originally produced with polished cabinets.

In 1950, the company I was working for in London purchased some three to four hundred of these sets. They were new but had been in a fire and were consequently badly smoke damaged. The apprentices were put to work stripping the sets down to the basic cabinet shells. These were scrubbed with hot soapy water and soda, then sandpapered all over. When thoroughly dry, the sets were rubbed down with linseed oil, producing a finish indistinguishable from new. The speaker fabric was replaced, long-wave coils were fitted, and the shop then sold the sets at £10 each.

A number of sets with cabinets too bad to repair were used by us engineers as car radios. By removing the rectifier and mains transformer the chassis could be fitted into a much smaller case, with a separate cabinet for the speaker. The sets were powered by ex-RAF rotary generators giving 6.3V plus 250V, which we housed in the boot of the vehicle.

**Bill Journeaux
Poole**

A Fitting Epitaph?

It is true that a vast amount of argument centres around Morse code (*see page 1, RB No. 10*), but at Samuel Morse's 200th anniversary it is unfortunate to speak of Morse detractors opposed to devotees or haters opposed to lovers.

The debate, I submit, is between those (devoted to code or not) who think a Morse Test should be continued as a deterrent to aspiring amateur HF 'phone operators and those who think it should not, which really has nothing to do with the merits of Morse code or of its exponents.

I suggest that the anniversary could very suitably be celebrated by removal of the test requirement for 'phone operation, so that in future people will have no reason to come to hate the name Morse.

**Alex L. Dick (Sandy GM0IRZ)
Dundee**

Sandy and I have been arguing over this one for many years, since long before he sat and passed his Morse test and became a GM-zero.

I think it is a great shame that he did not discover when he finally came to grips with the dreaded code, what so many others have discovered, that it is a fascinating and absorbing mode. Far from being a deterrent or a barrier, it is a passport to new horizons. – Ed.

Symbols?

I was intrigued by the question in the April/May issue of *RB* regarding the origins of *L* as a symbol for inductance. It sounds like the sort of question that has probably been answered before, but I can't recall having seen a discussion on the subject. I looked in a few indexes to various electrical journals before the turn of the century, but *L* was simply used as a matter of course, never with any explanation.

The farthest back that I could trace it, with the resources at hand, is Clerk Maxwell. He uses *L* and *M* for various purposes all through his book, apparently because they were available and not already assigned to something else, but eventually he does adopt them for self-inductance and mutual inductance.

I don't know if these instances also appeared in the first edition, but assuming they were, and knowing how much authority Clerk Maxwell's book had, it seems quite likely that others followed his lead.

In the course of searching for *L*, I did come across some useful information on the adoption of *I* for current. You didn't mention that, but it seems equally obscure as *L* for inductance. Apparently it just happened, in a democratic sort of way, although eventually some committee must have adopted it officially.

Thanks for an interesting evening's entertainment.

**Alan S. Douglas
Pocasset, Mass.**

Why Q?

Like Ian Gurton (*RB No. 10*), I was told in the 'fifties that *Q* was a measure of the goodness of a coil, Hence *Q* stood for quality.

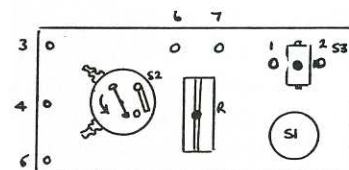
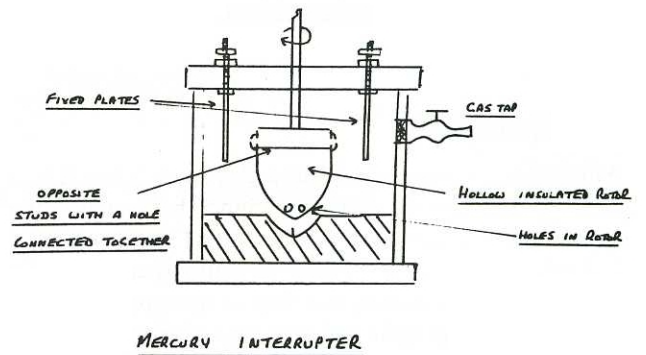
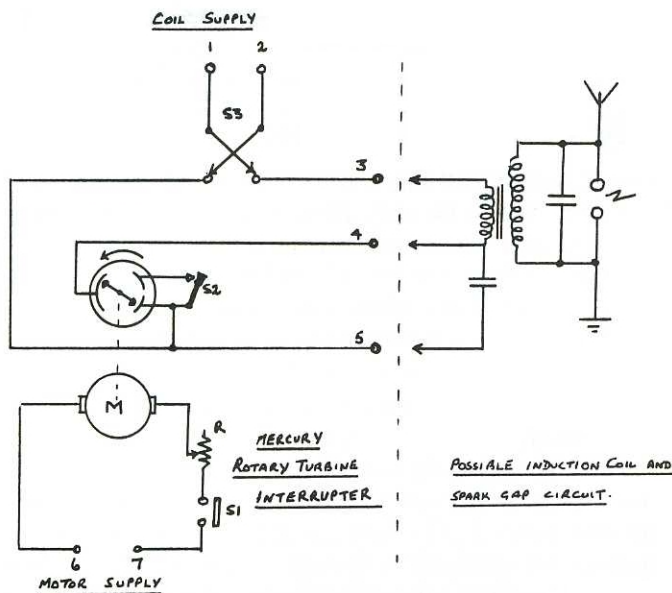
An article in *Clocks*, June 1985, analyses the errors in a mechanical oscillator and uses the term *Q*. The writer of this article gives typical *Q* values as: a wristwatch spring balance resonator, 100; chronometer balance, 500–1000; regulator pendulum, 10 000; quartz crystal, 100 000–1 000 000; an atomic clock, 100 000 000. He also says that the term is used in many fields of engineering and physics.

**Gerald Stancey G3MCK
Staines**

R-390A Restoration

I have found that the ideal way of restoring control knobs on the Collins R-390A to the pristine condition of the set shown on the front cover of *RB No. 4* is to paint them first with Halfords' satin black, then hand paint with satin polyurethane.

**Peter A. Hopwood
Newcastle-upon-Tyne**



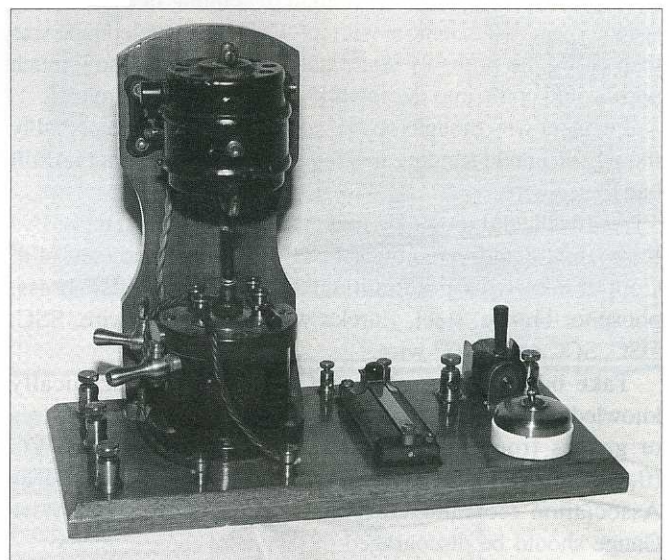
Turbine Interrupter

I was interested to read Stan Crabtree's article in *RB* No. 9, in particular the reference to Mr Farrow's early apparatus, illustrated in Fig. 3. This has helped me to identify a piece of equipment given to me as a 'mystery object'. I had worked it out to be some kind of rotary spark gap, but the similarity to Mr Farrow's Turbine Interrupter made me think again.

The apparatus I have consists of an electric motor coupled to a rotor in a sealed container. It has two projecting metal points, electrically connected together, and each point has a hole in it leading to the inside of the rotor. The rotor is cone shaped, and hollow with holes in the bottom. Its shape fits a depression in the bottom of the chamber, and there appears to be some evidence of molten metal present. As it rotates, the rotor's points come close to two fixed electrodes, one of which can be electrically halved in length by means of a switch on top of the container. The thing that has puzzled me is the presence of two gas type taps in the side of the container, with a fine gauze filter on the inside. The motor speed can be regulated by the variable resistance, and switch S3 (see sketch) is a commutator reversing type on-off switch.

The only clue I had was that someone had pencilled 'COIL' against terminals 3 and 4, and 'CONDENSER' against terminals 4 and 5. Seeing it described as a turbine interrupter made me think that perhaps it was used to interrupt the primary current to the induction coil, but I couldn't see how a low voltage circuit could jump the gap.

I had already looked through many textbooks on the subject, but found nothing really similar. At last, though, I have found a reference to something that might be an explanation. In *Establishment for the Wireless Telegraphy Manual* Vol. 1 (1912), page 196, there is a description of the Mercury Interrupter. This is a device to replace the more familiar trembler type of interrupter on an induction coil, to obtain a higher rate of interruption and hence more groups of damped oscillations in a given time. I quote: 'The Mercury Interrupter consists essentially of a jet of mercury which is caused to impinge upon a series of metal tongues projecting from the rim of a revolving cylinder. The revolution is produced by means of a small electric motor, which also performs the pumping operation necessary to produce the jet of mercury. Whenever the jet of mercury is



playing upon the tongue of the revolving cylinder the circuit is closed, but when the tongue moves to one side the jet squirts past without touching it and the current is stopped. To prevent the mercury becoming rapidly oxidised, the whole process must take place under oil, alcohol, or, better still, in an atmosphere of coal gas...

So here at last is a possible answer to the gas taps! It also makes it possible to make a guess at the circuit used, and makes some sense of the 'Coil' and 'Condenser' markings. I haven't yet put any mercury in my apparatus to see if it works, but I can see that centrifugal force would lift the mercury through the holes in the bottom of the rotor, up the inside of the cone, and out of the holes in the metal points.

As a point of interest, the book referred to also gives an explanation as to why the commutating reversing switch is often used in the primary circuit of induction coils. It says that it is advantageous when using the hammer type make-and-break and direct current to reverse the direction of the primary current from time to time, as by this means the wear of the platinum contacts is more uniform. It also says that a coil usually works slightly better with the commutating switch in one position than in the other.

David Rudram
Worthing

Wire-less

What a strange arrangement our English language is. It must be very confusing for the average foreigner. For example, we lift up the telephone and dial a number – ‘Are you there?’ we ask. A double question, but sensibly we only expect an answer in the affirmative – certainly not ‘Not at the moment!’ Stranger still, at the birth of radio and later television, we referred to it all as the wireless. A misnomer if ever there was one.

Going back to the 1920s, the comedian Harry Tate in an early vaudeville sketch was asked ‘What’s all the wire for?’ He testily replied ‘Wireless you fool!’ In fact ‘wireless’ as we knew it then required and used more wire than one could imagine. Miles of it – all sorts and sizes, covered and uncovered. Bare wire, copper wire. The authorities devised a set of tables to be adhered to – the Standard Wire Gauge or SWG for short.

When the great Marconi thought of sending or transmitting speech over vast distances without wires, as the telephone was then doing, he probably could not have envisaged how much wire would come into the so-called, new-fangled ‘wireless’.

I wonder who thought up the word. Quite rightly he probably thought ‘I intend sending messages without wires’ but he still had to use wire.

As I walked through the materials stores in my days at Pye Radio, I was confronted by racks of wire – reels and reels of it. Copper wire was predominant but there was also brass, phosphor-bronze, steel, Eureka wire, enamelled wire, SSC, DSC, SCC and DCC* wire.

Take bare copper wire, or Cu wire as the technically knowledgeable know it. There were about 24 different sizes or gauges from 10 SWG (0.128in diameter) to 49 SWG (0.0012in dia.) Later, the British Engineering Standards Association recommended that the use of Standard Wire Gauge should be discouraged in favour of the decimal sizes. *(Later still, of course, it all changed yet again, this time to millimetres – Ed.)*

So, to make up your wireless set you must have wire for coils, for resistors and potentiometers, for loudspeaker windings, for transformers, for chokes, and most definitely, out of doors, for aerial and earth.

I remember in 1936, my dear wife and I took a trip through Alexandra Palace while they were busy equipping it for television, and being told by the engineers there to ‘mind the wires!’ There was certainly plenty of it about everywhere. **RE**

*WIRE COVERING DESCRIPTIONS

SSC – Single Silk Covered: Copper wire covered with a single lap-wound layer of silk threads.

DSC – Double silk covered: SSC wire to which a second layer of silk threads has been added, lap-wound in the opposite direction.

SCC – Single Cotton Covered: As for SSC but using cotton threads.

DCC – Double Cotton Covered: As for DSC but using cotton threads.

My Friend George

George, as I will call him, lived near me when I was around 11 years old, back in the early 1930s. Physically, he was not an imposing man, being small and somewhat deformed, but I marvelled at his vast technical knowledge and experience. For instance, he knew everything about motor cars. He also knew all about wireless and helped me build a crystal set. Later he helped me build a two-valve set, giving me many of the necessary parts, including a magnificent BTH horn ‘speaker which stood about two feet high.

At his home, he had an exciting collection of technological marvels. One which enthralled me was a wireless set that picked up short waves. It was extremely difficult to tune but on one occasion we succeeded in hearing a station which was 3000 miles away in America and had the magical name of ‘W2XAD Schenectady’. Even more enthralling was a machine which, by means of a flickering light and a rotating drum covered with little mirrors, projected moving pictures onto a narrow paper screen about nine inches high. The pictures were not very distinct and, if George didn’t get the drum speed exactly right, they drifted up or down the screen. Nevertheless, considering that these pictures were being brought to us by wireless waves from a room 40 miles away in London, I thought that they were absolutely wonderful.

Down in his cellar George had an ingenious contrivance for reducing his electricity bills. Basically it consisted of a length of insulated wire with a pin soldered to each end. The pins were pushed through the insulation of the power cables at suitable points so that the wire bypassed the shilling-in-the-slot meter and provided free electricity when the shilling ran out. As a safeguard against being surprised by an unexpected visit from the Electricity Company, he had a system of strings and pulleys which removed the bypass and pulled it out of sight when the cellar door was opened.

In spite of this safeguard, George’s invention was discovered one day by an observant meter reader. George had to appear in court and, being unable to pay the resultant fine, served a short spell in jail. Not long after that he moved away and I never saw him any more – somewhat to the relief of my mother, who thought George was a rogue and not really the sort of person with whom her son should be associating.

Rogue or not, George was instrumental in arousing my interest in radio and starting me off on a wonderful hobby – for which I shall always be grateful. On the other hand, I sometimes think that he cheated me out of considerable fame and fortune. One day, early in our friendship, I remember him explaining how the diode valve was functionally similar to the crystal detector but that, by adding a third electrode, one could make it amplify signals. Intrigued by this, I asked him if one could add a third electrode to a crystal and make that amplify. George smiled at my stupidity and said ‘No, of course not’. I bowed to his superior knowledge and never pursued the matter any further. As a result, it was left to two Americans, years later, to get all the glory for inventing the transistor. **LK**

A German valve tester, Type RPG.1, with holders for valves with European Standard 5-pin bases, and a variety of side-contact bases including the Wehrmacht 6-pin type (see *RB* No. 7, page 6)

MUSEUM PIECES

CPM



PJM

All-Wave Oscillator Type M.2S manufactured by Wm. F. Brown Radio Ltd of Brierley Hill. It uses two valves; an AC/S2 in the RF oscillator, and an anonymous triode AF amplifier/modulator. The front panel layout was obviously not drawn up with this particular case in mind, as the front flange overlaps some of the control labels! The 'Indigraph' dial incorporates a worm-drive which can be engaged or disengaged at will, providing extremely fine slow-motion tuning

A very familiar instrument from World War II, the British Army Wavemeter Class D, No. 1, Mk II. This heterodyne wavemeter was small and lightweight, powered from an external 6V supply, and covered 1.9 to 8Mc/s in two bands



JHWC

MUSEUM PIECES



Less well known, the Wavemeter Class D, No. 2 superseded the Class D, No. 1 in 1945. It runs from AC mains or an external 12V DC supply and covers the range 1.2 to 19.2Mc/s in four bands, operating either as a heterodyne or an absorption wavemeter. The calibration tables, rather than being printed on paper pages, are anodised onto thin aluminium sheets. Anything but small and lightweight, at 61lb the Class D, No. 2 doubles as a most effective doorstop!