TRACING TIMEBASE FAULTS

Practical Television 1/3

AND TELEVISION TIMES

FEBRUARY, 1958

EDITOR: F.J. CAMM

CONTENTS

MULTI-CHANNEL TUNER INSTALLATION
MEASURING V.H.F.
TV COMES OF AGE
SIMPLIFIED SERVICING
SCANNING AND SYNCHRONISATION
FLYWHEEL SYNC. AND A.G.C.
YOUR PROBLEMS SOLVED

TOP QUALITY FULLY GUARANTEED VALVES

ALL GOODS LISTED ARE ACTUALLY IN STOCK

EXPRESS SERVICE!!!
C.O.D. ORDERS RECEIVED BY 3.30 P.M. EITHER BY LETTER, PHONE OR WIRE, DESPATCHED THE SAME AFTERNOON. ALL ORDERS RECEIVED BY FIRST POST DESPATCHED SAME DAY.

FOR ONLY 6d. EXTRA PER ORDER WE WILL INSURE YOUR VALVES AGAINST DAMAGE IN TRANSIT. ALL UNINSURED PARCELS AT CUSTOMER'S RISK.

IA3	3/-	6AQ5	7/6	6K7GT	6/-	10LD3	8/6	30L1	12/6	CK523	6/6	ECC32	10/6	EZ35	6/6	PCC85	12/6	UAF42	10/6
IA5	6/-	6AT6	8/6	6K8G	8/-	10P13	17/6	30P4	15/-	CV63	10/6	ECC33	8/6	EZ40	8/-	PCF80	14/-	UB41	12/7
IA7	15/-	6AU6	10/6	6K8GT/G		11E3	15/-	30P12	13/6	CV85	12/6	ECC35	8/6	EZ41	10/6	PCF82	12/6	UBC41	8/6
ID6	10/6	6B4G	6/6		11/-	12A6	6/6	31	7/6	CV271	10/6	ECC81	8/6	EZ80	9/6	PCL82	12/6	UBF80	9/6
IH5	11/-	6B7	10/6	6L6G	9/6	12AH7	8/-	33A/158M		CV428	30/-	ECC82	7/6	EZ81	10/-	PEN40DD		UBF89	10/6
IL4	6/6	6B8G	4/6	6L7M	8/-	12AH8	10/6		30/-	DI	3/-	ECC83	9/-	GZ30	10/6		25/-	UCC85	10/6
ILD5	5/-	6B8M	5/-	6L18	13/-	12AT6	10/6	35.51	12/6	D42	10/6	ECC84	10/-	GZ32	12/6	PEN45	19/6	UCH42	11/-
ILN5	5/-	6BA6	7/6	6N7	8/-	12AT7	8/6	35A5	11/-	D63	5/-	ECC85	9/6	GZ34	14/-	PEN46	7/6	UCH81	11/6
IN5	11/-	6BE6	7/6	6Q7G	10/-	12AU7	7/6	35L6GT	10/-	D77	6/6	ECC91	5/6	H30	5/-	PL82	10/-	UCL82	13/6
IR5	8/6	6BJ6	8/-	6Q7GT	11/-	12AX7	9/-	35W4	8/6	DAC32	11/-	ECF80	13/6	H63	12/6	PL83	11/6	UF41	9/-
IS5	8/-	6BR7	11/6	6R7G	10/-	12BA6	9/-	35Z3	10/6	DAF91	8/-	ECF82	13/6	HABC80		PM2B	12/6	UF80	10/6
IT4	7/-	6BW6	8/6	6SA7GT	8/6	12BE6	10/-	35Z4GT	8/-	DAF96	10/-	ECH35	9/6		13/6	PM12	4/-	UF85	10/6
IU5	7/-	6BW7	14/-	6SG7GT	8/-	12E1	30/-	35Z5GT	9/-	DF33	11/-	ECH42	10/-	HK90	10/-	PM12M	6/6	UF89	10/6
2A3	12/6	6BX6	14/-	6SH7	6/-	12J5GT	4/6	41MTL	8/-	DF91	7/-	ECH81	-	HL23	10/6	PY80	9/-	UL41	11/-
2A7	10/6	6C4	7/-	6SJ7	8/-	12J7GT	10/6	50C5	12/6	DF96	10/-	ECL80	14/-	HL41	12/6	PY81	9/-	UL46	15/-
2C26	4/-	6C5	6/6	6SK7GT	8/-	12K7GT	7/6	50L6GT	9/6	DH63	10/-	ECL82	14/-	HL133DD		PY82	9/-	UL84	11/6
2D13C	7/6	6C6	6/6	6SL7GT	8/-	12K8GT		61BT	15/-	DH76	7/6	EF36	6/-		12/6	PY83	9/6	UY41	8/6
2X2	4/6	6C8	12/6	6SN7GT	7/6		14/-	61SPT	15/-	DH77	8/6	EF37A	9/-	HVR2	20/-	QP21	7/-	UY85	10/6
3A4	7/-	6C9	12/6	6SS7	8/-	12Q7GT	7/6	72	4/6	DK32	15/-	EF39	6/-	HVR2A	6/-	QP25	15/-	V1507	5/-
3A5	12/6	6C10	12/6	6U4GT	14/-	12SA7	8/6	77	8/-	DK91	8/6	EF40	15/-	KL35	8/6	QS150/15		VLS492A	£3
3B7	8/6	6CH6	7/6	6U5G	7/6	12SC7	8/6	78	8/6	DK92	12/6	EF41	9/6	KT2	5/-		10/6	VMP4G	15/-
3D6	5/-	6D6	6/6	6U7	8/6	12SG7	8/6	80	9/-	DK96	10/-	EF42	12/6	KT33C	10/-	QVO4/7		VP2(7)	12/6
3Q4	9/-	6E5	12/6	6V6G	7/-	12SH7	8/6	83V	12/6	DL2	15/-	EF50(A)	7/-	KT44	15/-		15/-	VP4(7)	15/-
3Q5GT	9/6	6F1	15/-	6V6GT	8/-	12SJ7	8/6	85A2	15/-	DL33	9/6	EF50(E)	5/-	KT63	7/-	R12	12/6	VP13C	7/-
3S4	8/-	6F6G	7/-	6X4	7/-	12SK7	8/6	150B2	15/-	DL92	8/-	EF54	5/-	KTW61	8/-	SD6	12/7	VP41	7/6
3V4	9/-	6F6GT	8/-	6X5GT	6/6	12SQ7	8/6	807	7/6	DL94	9/-	EF73	10/6	KTW62	8/-	SP4(7)	15/-	VR150/30	9/-
5U4	8/6	6F8	12/6	6Z4/84	12/6	12SR7	8/6	956	3/-	DL96	10/-	EF80	14/-	KTW63	8/-	SP41	3/6	VT61A	5/-
5V4	12/6	6F12	9/-	6Z5	12/6	12Y4	10/6	1223	7/-	DLS10	10/6	EF85	9/-	KTZ41	6/6	SP42	12/6	VT501	5/-
5X4	12/6	6F13	13/-	6/30L2	12/6	14R7	10/6	4033L	12/6	DM70	8/6	EF86	14/6	KTZ63	10/6	SP61	3/6	W76	7/6
5Y3G	8/-	6F16	9/6	7A7	12/6	14S7	14/-	5763	12/6	EA50	2/-	EF89	10/-	L63	6/-	5U61	12/6	X61	12/6
5Y3GT	8/6	6F17	12/6	7B7	8/-	19AQ5	11/-	7193	5/-	EA76	9/6	EF91	9/-	LN152	14/-	TP22	15/-	X65	12/6
5Y4	12/6	6F32	10/6	7C5	8/-	19H1	10/-	7475	7/6	EABC80	9/-	EF92	7/-	LZ319	14/-	U16	12/-	X66	12/6
5Z3	12/6	6F33	7/6	7C6	8/-	20D1	16/-	9002	5/6	EAC91	7/6	EL32	5/6	MH4	7/-	U18/20	12/6	X79	12/6
5Z4G	10/6	6FH7	8/-	7H7	8/-	20L1	13/6	9003	5/6	EAF42	10/6	EL41	11/-	MHL4	7/6	U22	8/-	XD(1.5)	6/6
5Z4GT	12/6	6G6	6/6	7Q7	9/-	25L6GT	10/-	9006	6/-	EB34	2/6	EL42	11/-	MHLD6	12/6	U25	13/6	XFW10	6/6
6A8	10/-	6H6GT/G		7S7	10/6	25Y5	10/6	AC6PEN	7/6	EB41	8/6	EL81	15/-	ML4	12/6	U31	10/-	XFY12	6/6
6AB7	8/-		3/-	7V7	8/6	25Y5G	10/-	AC/HL/		EB91	6/6	EL84	10/6	ML6	6/6	U43	12/6	XH(1.5)	6/6
6AB8	14/-	6H6M	3/6	7Y4	8/-	25Z4G	10/-	DDD	15/-	EBC33	7/6	EL91	5/-	MU14	10/-	U50	8/-	XSG(1.5)	6/6
6AC7	6/6	6J5G	5/-	8D2	3/6	25Z5	10/6	AC P4	8/-	EBC41	10/-	EM34	10/-	OA10	12/6	U52	8/6	Y63	7/6
6AG5	6/6	6J5GTG	5/6	8D3	9/-	25Z6G	10/-	AP4	7/6	EBF80	10/-	EM80	10/6	OA70	5/-	U76	8/-	Z63	10.6
6AG7	12/6	6J5GTM	6/-	9D2	4/-	28D7	7/-	ATP4	4/-	EBF89	9/6			OA71	5/-	U78	7/-		
6AJ8	9/-	6J6	5/6	10C1	15/-	30	7/6	AZ31	12/6	EC52	5/6	EY51		OC72	30/-	U251	15/-	Z66	20/-
6AK5	6/-	6J7G	6/-	10F1	15/-	30C1	14/-	BL63	7/6	EC54	6/-	(Small)	12/6	P61	3/6	U404	10/6	Z77	9/-
6AL5	6/6	6J7GT	10/6	10F9	11/6	30F5	14/-	CK505	6/6	EC70	12/6	EY51		PABC80	15/-	UABC80		Z719	14/-
6AM6	9/-	6K7G	5/-	10F18	12/6	30FL1	12/6	CK506	6/6	ECC31	15/-	(Large)	12/6	PCC84	10/-		10/6	Z729	14/6

ALL VALVES NEW, BOXED, TAX PAID, AND SUBJECT TO MAKERS' GUARANTEE. FIRST GRADE GOODS ONLY, NO SECONDS OR REJECTS. GOODS ARE ONLY SOLD SUBJECT TO OUR TERMS OF BUSINESS, OBTAINABLE FREE ON REQUEST. CATALOGUE OF OVER 1,000 DIFFERENT VALVES 3d.

TERMS OF BUSINESS :—CASH WITN ORDER OR C.O.D. ONLY. ORDERS VALUE £3 OR MORE SENT POST/PACKING FREE. ORDERS BELOW £3 PLEASE ADD 6d. PER VALVE. C.O.D. ORDERS :—MINIMUM FEE, INCLUDING POST AND PACKING, 3/-. WE ARE OPEN FOR PERSONAL SHOPPERS. MON.-FRI. 8.30-5.30. SATS. 8.30-1 p.m.

When comparing our prices, remember just what we offer. Bentley valves are not only "GUARANTEED NEW AND BOXED," and "GUARANTEED TESTED AT TIME OF DESPATCH," Bentley valves are NEW, BOXED, AND SUBJECT TO THE MAKERS' STANDARD GUARANTEE AS WELL. Only our enormous turnover enables us to select the products of the world's finest manufacturers at lowest prices and pass the benefits on to YOU.

BENTLEY ACOUSTIC CORPORATION LTD.

THE VALVE SPECIALISTS

38 CHALCOT ROAD, LONDON, N.W.1

PRImrose 9090

PLEASE ENQUIRE FOR ANY VALVE NOT LISTED. 3d. STAMP, PLEASE.

Practical Television

& TELEVISION TIMES

Editor : F. J. CAMM

Vol. 8 No. 91 | EVERY MONTH | FEBRUARY, 1958

Editorial and Advertisement Offices :
PRACTICAL TELEVISION
George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Phone : Temple Bar 4363.
Telegrams : Newnes, Rand, London.
Registered at the G.P.O. for transmission by Canadian Magazine Post.

SUBSCRIPTION RATES

including postage for one year

Inland - - 19s. per annum
Abroad - - 17s. 6d. per annum
Canada - - - 16s. per annum

CONTENTS :

	Page
Televiews	305
TV Comes of Age	306
Switched TV/FM Receiver...	311
Simplified TV Servicing ...	313
Granada Chelsea	315
Measurement of V.H.F. ...	318
Servicing Television Receivers. Ultra VT917 and WT917	323
Scanning and Synchronisation	325
Flywheel Sync and A.G.C....	328
Telenews	333
Underneath the Dipole ...	337
Correspondence	341
News from the Trade ...	342
Your Problems Solved ...	345

TELEVIEWS

TWENTY-FIVE YEARS OF TV

THIS year sees the twenty-fifth anniversary of the first television programme ever to be broadcast, and the BBC quite rightly celebrated the event by special programmes, outlining what has taken place in the past twenty-five years and spotlighting the important developments. This country has always been backward in proclaiming its achievements from the housetops, and the impression might be gained from the clamorous publicity of nations such as America, Russia and Germany, that we are always behind the times. The plain fact is that this country has pioneered most of the important inventions, discoveries and scientific achievements ; to mention but a few, the telephone, radio, radar, the pneumatic tyre, the motor car, the bicycle, watches and clocks, printing, ceramics and pottery, machine tools, and mass production methods. A complete list would be of formidable dimensions, and it is time that we offset the cheap-jack publicity of other nations by blowing our own trumpet. It is undeniable that this country pioneered television. No other country can produce rebutting evidence. It was Baird who first drew attention to the possibilities with his crude disc machine, and imperfect though it was, pictures were radiated from a national transmitter, which led up to the development by others of the high definition television system which we use today. We did indeed set the pattern to the world and we hope that every nation will acknowledge that it owes its television service to Great Britain. TV developments in the offing such as colour television and even stereoscopic television will be due to Englishmen.

"RADIO-CONTROLLED MODELS"

WE have just published at 12s. 6d., by post 13s. 6d., a new handbook entitled "Radio-controlled Models." It explains how to build a single-valve super generative receiver, a two-valve transmitter, a six-valve superhet, a single-valve crystal controlled transmitter, radio control for model aircraft, actuators, audio control, steering control gear, how to make a radio-controlled model battleship and model aircraft and very completely covers the whole field of this fascinating new hobby.

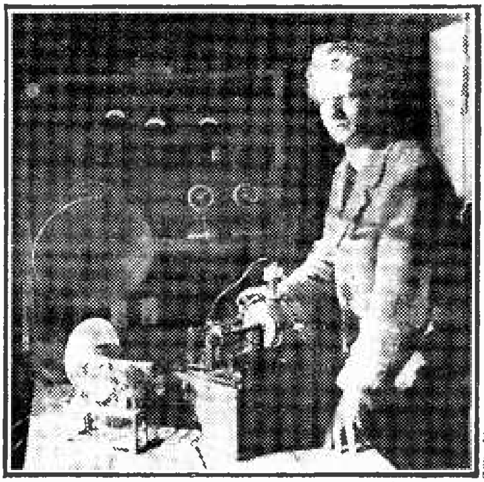
THE PRACTICAL HOUSEHOLDER EXHIBITION

THE great PRACTICAL HOUSEHOLDER EXHIBITION sponsored by our companion journal opens at the Empress Hall, Earls Court, London, on February 19th and closes on March 1st. It will be open every day from 11 a.m. until 9.30 p.m. on weekdays and 10 a.m. to 10 p.m. on Saturdays. The entrance fee is 2s. 6d. Nearly 100 manufacturers will display their goods and give advice and demonstrations. Every "do-it-yourself" enthusiast should visit this magnificent show.—F. J. C.

Our next issue, dated March, will be published on February 21st.

TV COMES OF AGE

AN ACCOUNT OF THE DEVELOPMENT OF TV DURING THE PAST 21 YEARS



J. L. Baird with his TV recorder. This was, of course, with the early low-definition system.

The Pre-war Years

AT 3.30 on the afternoon of Monday, November 2, 1936, the first regular television programme of the BBC went on the air. It was both short and unpretentious, and consisted of formal speeches by the chairman of the BBC, the Postmaster-General, the chairman of the Television Advisory Committee, and representatives of the Baird and Marconi-E.M.I. companies, followed by two variety turns and a news film. A photograph taken of the opening ceremony shows the distinguished speakers seated behind a row of bent-metal canteen tables along the front of which had been fastened a piece of fabric to give the illusion of a more solid structure. The programme, which ran for about half an hour, was televised by the Baird system, and then, after a brief interval, speakers and performers moved to the adjoining studio where the programme was repeated before the Marconi-E.M.I. cameras. The order of using the two systems had been decided by the toss of a coin.

It is likely that the programme was seen by only a very few people since there were only about 300 television sets then in private hands. But it was a beginning, and put Britain ahead of the rest of the world in bringing television to the people.

The official opening was the climax of nearly two years of feverish preparation following the publication of the Selsdon Committee Report of 1935—preparations which were in no small measure complicated by the existence of so many major interests, among them the Government, Parliament, the Television Advisory Committee, the BBC, the Baird and Marconi-E.M.I. companies and the radio industry. Yet, even the rapid progress which was being made was not fast enough for the public, supported by the press.

Initial Problems

In fact, considering the complexity of some of the problems, the various parties moved with commendable speed. The report was laid before Parliament on January 31, 1935; the first meeting of the Television Advisory Committee, which the report proposed setting up, met on February 5; in the same month the BBC appointed a Director of Television while by August both interested companies had placed orders for high-definition broadcasting apparatus.

The BBC was not directly concerned with some of the major questions. It fell to a sub-committee of the Television Advisory Committee to choose a site for the new station, and it was they who finally selected Alexandra Palace. Nor did the BBC interfere with the companies' specifications for their broadcasting apparatus, beyond attempting to discover diplomatically—and unsuccessfully—whether some measure of agreement on a standard could be reached by the two rivals, which would facilitate the ultimate choice between them.

Even so, the BBC had big problems of its own. To the engineering staff, in particular, it was clear that very considerable technical progress would have to be made before a service could be looked upon as definitely and firmly established. There was also the unanswerable question whether the public could be induced in sufficient numbers to purchase highly expensive receivers to watch short transmissions in this very imperfect medium.

The London Television Station, Alexandra Palace

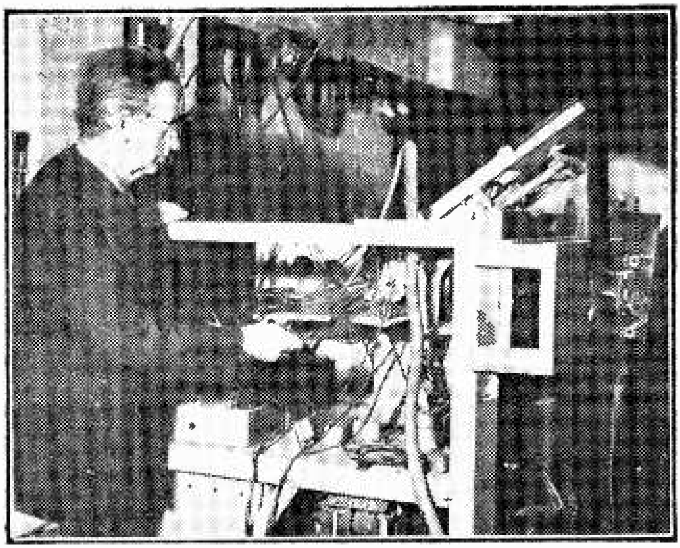
Alexandra Palace, the home of the new television station, was already well known to Londoners. Built upon the heights of Muswell Hill, it had been designed as North London's answer to the Crystal Palace as an exhibition centre. Its site is magnificent; architecturally, it has nothing to commend it.

Superficially, the new BBC station at Alexandra Palace did not differ very much in 1936 from the building as we know it to-day. The portion of the palace in which the station was established was leased from the palace trustees, and consisted of an area of approximately 30,000 square feet, and a further area of 25,000 square feet was also taken to permit of future development. The main premises acquired consisted originally of a number of large rooms arranged in two suites, one on the ground floor and the other on the first floor immediately above, but by making minor structural alterations, it was possible to accommodate the transmitters on the ground floor with the control rooms immediately above them, with the studios adjacent to the control rooms. The south-east tower—the most striking feature of the station—was converted into offices, and upon the top of it the aerial (reaching to 300 feet above ground level and 606 feet above sea level) was built. To begin with there were two studios, each 70 ft. × 30 ft.

Transmitting Equipment

Here to begin with was housed the equipment of both the rival companies, much of which was markedly different from that in use to-day.

The Baird apparatus was complicated both in structure and use. For televising cinema film it relied upon the Nipkow disk—a metal disk, pivoted at its centre and drilled with a series of holes on a spiral path which, revolving at high speed, permitted the scanning of the objective—whilst for studio work there were the "indirect film" and the "spotlight" methods. In the former the scene was photographed on cinema film, and then rapidly developed and scanned while still wet by a Nipkow disk through the side of a glass tank. This process necessitated a continuous delay of about one minute, and in order to synchronise the accompanying sound, the latter had to be recorded on the film beside the pictures. The alternative method of direct television, but one only suitable for close-ups, consisted in the scanning of the person or object by a moving spot of light, the reflected light being allowed to fall on to photo-electric cells. This latter method had the added disadvantage that it was necessary to keep the rest of the studio in almost total darkness while the spotlight was in use. Bairds were also working upon a form of electron tube, but at this stage only experimental apparatus was available, and not much use of it was made in the transmission of actual programmes.



J. L. Baird demonstrating his stereoscopic TV system in 1941. This was the first demonstration of stereo TV in the world.

The Marconi-E.M.I. Company's apparatus depended on the use of the electron tube, which they named the "Emitron." This camera possessed great flexibility in operation, and proved successful for outside transmissions as well as for studio work, and was the forerunner of the present television camera.

The Baird Company chose a system of 240 lines and 25 pictures a second with sequential scanning as likely to give definition acceptable to the public and allow the design of a simple—and relatively cheap—receiver. The Marconi-E.M.I. Company, however, considered a higher standard essential, and chose 405 lines and 25 picture scannings a second, with 50 frames a second interlaced.

The Pre-war Staff

The first Director was Gerald Cock. Mr. Cock, who was then about 40, had previously been head of the BBC's Outside Broadcasting Department. A varied career before joining the Corporation had included mining in Mexico.

Administration was in the charge of Leonard Schuster (the former executive officer of the Outside Broadcasting Department), and programme organisation was the responsibility of Cecil Madden.

(The staff in 1936 was very small; it rose steadily until by the end of 1938 it numbered 462.)

The First Try-out: Radiolympia 1936

Pace and tension—which have never been long absent from television work—were clearly noticeable in those early days.

"In August, 1936," says Cecil Madden, who is still an executive of the BBC Television Service, "Gerald Cock assembled us all in Broadcasting House and allotted to us our jobs. I was to be in charge of programmes. He said we were all starting from scratch, the whole thing was completely new to us, so we'd have to have plenty of time to learn all about everything; what a camera could do, how to light the sets, how to tackle a thousand practical problems. Fortunately, there was no hurry. We wouldn't be expected to do a programme for three or four months away. Well, this sounded fair enough, so out we went, bundled into cars, and rushed off for our first visit to Alexandra Palace. The first thing I did was to go up to the room which was to be my office: a small, bare room, with one chair, a desolate empty desk and a telephone. As I walked in the 'phone began to ring. I picked it up and out came the voice of Gerald Cock. 'Wash out everything I said about plenty of time. I've agreed to start the service from Radiolympia. That means the first programme in ten days' time'."

This Olympia show, which opened on August 26, 1936, was the first opportunity that the public was given of seeing television. The interest shown was unbounded. No fewer than seven of Britain's leading radio manufacturers had receiving sets on show, and the transmissions were seen by 100,000 visitors during the week of the show.

In addition to excerpts from films and open-air programmes from the grounds of Alexandra Palace, the BBC broadcast twice daily a variety show, "Here's Looking at You," produced by Cecil Madden.

From the purely technical point of view the demonstrations were less successful, as both systems had bad breakdowns at times and there was a great deal of flicker, justifying the BBC's warning that the public should not expect too much. The try-out was, however, valuable to the BBC in showing the public reaction to its programmes.

The Reception Area

Very soon after the opening the BBC received information on reception which fully justified its most sanguine hopes. Before the service was put into operation it was believed that the reception area of an ultra-short-wave station would be very small, and indeed that range could not extend beyond the horizon. It was, moreover, thought that there would be severe screening from tall buildings and hills and there might be large areas where no reception would be possible. It was found, however, that reception was not restricted in this way, although, of course, some screening did take place. There proved to be generally no difficulty in obtaining reception in suburban and country districts within thirty miles radius of the transmitter, and there were many instances of good reception being obtained at much greater distances. Regular reception was recorded at 50 miles, while good pictures were obtained at a distance of 200 miles.

The Service in Operation

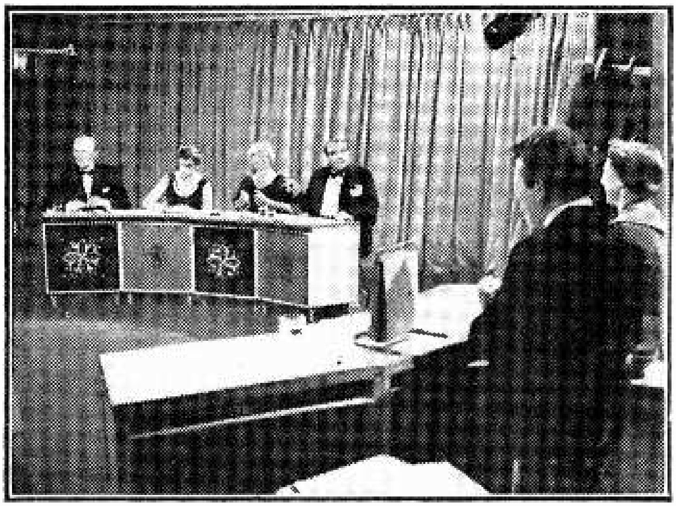
From November 2, 1936, until early in February, 1937, the programmes were broadcast in alternate weeks by the two systems. This sufficed for a fair trial and convinced the Television Advisory Council of the superiority of the Marconi-E.M.I. system. The Council, therefore, decided that as from February 5, 1937, the latter system alone should be used.

Following the formal opening on the afternoon of November 2, 1936, the BBC launched immediately upon its regular pattern of television broadcasting. The service set out to provide an afternoon and evening programme, each of one hour, with a morning demonstration film show of one hour for the benefit of the trade. In the early days the evening programme was substantially the same as that broadcast in the afternoon. There was no Sunday programme until April, 1938, when an evening show was provided.

Taken as a whole, the television service contrived remarkably well, within the limits of its resources and the facilities of the period, to balance its programmes. Magazine features, sport, cabaret, plays, light and serious music, puppets, demonstrations, fashion parades, variety, ballet and ballroom dancing, children's theatre and newsreels were all well represented.

Outside Broadcasts at Work

It was, however, in its outside broadcasts that the BBC gained its greatest and most enduring triumphs. It was fortunate that within a few months of the opening service equipment was available to permit the televising of the Coronation procession of King George VI from a point at Hyde Park Corner.



One of the most popular BBC Television programmes—"What's My Line ?"

From this point until the Olympia show of August-September, 1938, the television service continued to make only slow, if steady, progress. In spite of public interest—as shown by the fact that more than 250,000 people visited the television exhibition at South Kensington between June and September, 1937—and in spite of a very considerable fall in the price of television sets (in February, 1937, the prices of some sets fell from 95 guineas to 60 guineas), the number of viewers remained small, and it is likely that at the opening of Radiolympia in 1938 not more than 4,000 sets had been sold to the public.

Some New Problems

But the very assurance of popular success brought fresh problems in its train.

The question of extending the service beyond London had long been discussed. The BBC, the Post Office and the Radio Manufacturers' Association were anxious to proceed as quickly as possible, and by July, 1938, a twin coaxial cable had been laid between London and Birmingham with a view to providing a service to a potential audience of four millions, and plans were under consideration for the extension of the service to Manchester and Newcastle. There were, however, important matters, both technical and financial, to be solved before a national service could become a reality.

On the technical side the siting of the new stations (in view of television's restricted range) called for the most careful thought, and the choice between highly expensive coaxial cable and the less reliable wireless link, as a means of connecting the chain, had not finally been settled.

Over 4,000 viewers sent in completed forms to a television questionnaire prepared by the BBC at this time. It was found that 91 per cent. of these forms had come in from those who owned television sets for entertainment only, and not for business. The replies suggested that at that date plays and variety programmes direct from the theatres, news reels, "Picture Page" and light entertainment generally were the most popular. Outside broadcasts of sporting and other events came next, followed by full-length plays, cartoon films, demonstrations and talks. The popularity of studio drama was a remarkable feature, and the preference for full-length rather than short plays. Another interesting sidelight on viewers' preferences was that while 44 per cent. expressed a neutral opinion about men or women announcers, the remainder showed an overwhelming preference for women—in marked contrast to the sound audience at that date.

The War Years—and After

By 1939, BBC television had already reached a high standard: programmes had made great progress both in content and presentation, and the numbers of receivers in use had climbed above 20,000. But at this point, quite suddenly, between 11 and 12 in the morning on September 1, 1939, with the imminence of war, the service was closed down, because it was realised that in the event of an air attack upon London the transmitter at Alexandra Palace would prove a useful guide to enemy planes. At the time of the close-down a Walt Disney Mickey Mouse film was being shown for the benefit of visitors to Radiolympia. The last regular programme had been broadcast on the previous evening.

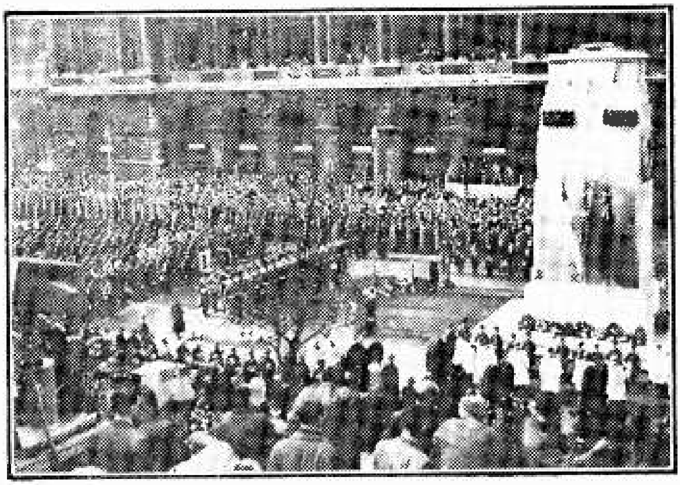
In all, the BBC's television service was off the air for nearly seven years, and during that time the station at Alexandra Palace was put in the hands of half-a-dozen maintenance men, while the transmitters were taken over by the Royal Air Force for its own use.

The pre-war television staff were transferred to other work of national importance.

During these years it was impossible to maintain any organised television engineering research, and although radiolocation itself owed much to earlier research in television, little information and no discovery of a fundamental character for the benefit of television came out of the tremendous progress made in related branches of wartime research.

However, the war years were not entirely lost. Very serious consideration was given at that time to the preparation of plans for the re-opening and development of the service when circumstances made that possible.

After the war the BBC took stock. Alexandra Palace had escaped serious damage. The transmitters were intact and the studios had escaped damage although some of the equipment had gone. The outside broadcasting units had been dismantled and the mast at Highgate which had been used for receiving outside broadcasts had blown down, causing so much damage that the local council refused to have it put back. The wardrobe had suffered some losses but sufficient remained for the needs of the service. More important still the scenery was intact, for in those days of shortages it would never have been possible to get enough timber and canvas to replace it. Gerald Cock was now in the U.S.; Maurice Gorham was appointed the new head.



An annual impressive O.B. is the Armistice Day service from the Cenotaph.

The Reopening of the Service

Zero hour for the reopening of the service was 3 p.m. on June 7, 1946. This date had been deliberately chosen after the announcement that the Victory Parade was to take place on June 8. The BBC was resolved to make this its first big outside broadcast, and hoped that it would give post-war television the same fillip that the Coronation of 1937 had given. To that end the reopening ceremony by the Postmaster-General was fixed for the day before.

With this much fixed, the preparations and rehearsals acquired a new meaning and urgency. It also brought to the fore certain matters which needed urgent attention. The television cable linking Alexandra Palace with places in the West End had not been used since 1939, and nobody knew how it would work; the Highgate relay-mast had gone and arrangements had to be made quickly for the construction of a receiving aerial at the station itself, and for shielding it from interference by the outgoing signal; and finally the outside broadcasting apparatus itself had to be fitted and tested. Everything was satisfactorily arranged and by the day before the parade good pictures were received from the camera position opposite the Royal saluting base in The Mall. The reopening ceremony, too, passed off more smoothly than anyone had dared to hope.

The parade on June 8 was hailed by the press as a very great triumph for the BBC.

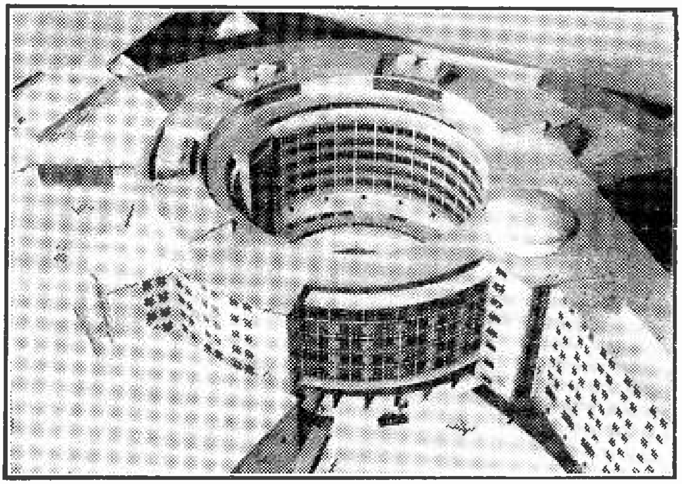
The Service Gets into its Stride

The number of sets in the hands of the public in June, 1946, was only seven and a half thousand, the amount of studio space was still no greater than it had been before the war, and the service still did not extend beyond the London area. In spite of restrictions on capital and the shortage of materials, the need for prompt action was urgent. The growth of television, and particularly the threat that programmes would be shown in cinemas, had also thoroughly alarmed commercial interests with the result that the BBC was now barred from the televising of a number of sporting events and the use of commercial newsreels. This was quickly followed by a ban on television appearances of artists under contract to three of the major theatre groups, and this, in turn, by demands for higher fees for artists who agreed to appear.

Extension of Coverage

In reopening the service in June, 1946, the Postmaster-General was able to announce the first station outside London would be at Birmingham, and that urgent consideration was already being given to the difficult problems involved in extending the service to the provinces generally. In a little over three months agreement had been reached between the Corporation and the Post Office for the servicing of a station at Sutton Coldfield, which would serve the Birmingham area. The station, which had approximately twice the power of the London station, and brought about six million people within its range, was opened in December, 1949. Meanwhile, another forward stride had been taken in the choice of Holme Moss, near Huddersfield, for a north of England station, in the prospecting of a site for a station in the south of Scotland and in the preliminary reconnaissance for a West Country transmitter.

By August, 1952, the BBC service had achieved nation-wide coverage and had brought television within reach of over three-quarters of the population through the stations at Sutton Coldfield (covering the Midlands), Holme Moss (north of England), Kirk o' Shotts (central Scotland) and Wenvoe (South Wales and parts of the west of England). The fifth high-power station, at Crystal Palace, was not available until 1956, but in the meantime London and the Home Counties were served by the original transmitter at Alexandra Palace.

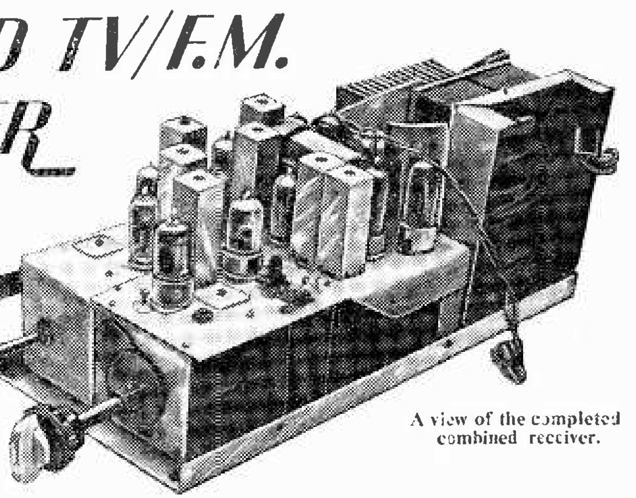


An architect's impression of the White City TV Centre.

The New Television Centre

Behind these developments loomed the still greater plan for a new Television Centre, the first of its kind anywhere in the world. The question of providing such a centre adequate for the ever-growing demands of television had grown very urgent since the resumption of the service. Broadly, what was wanted was a site which would be large enough to accommodate those central activities which could not be grouped on or around the Broadcasting House site. It quickly became obvious that few convenient sites of the size required existed in London, but in January, 1947, the Corporation learned that it might be possible to acquire the whole, or a large part, of a 25-acre plot at Shepherd's Bush, on what was generally known as the White City site. On inspection, this appeared to offer almost all that could be hoped for. After an initial setback, when it appeared that the site would be acquired for housing, the L.C.C. agreed, in March, 1949, to raise no objection to the Corporation's purpose, and to permit the BBC to build on 13 acres of the site. This was a much smaller area than originally envisaged, and the BBC had accordingly to re-examine its plan to accommodate all the BBC's headquarters services for sound and television in not more than two groups of buildings. At the same time it was decided to give urgent priority to the development of the White City site, and to build, for a start, on between 7 and 8 acres, leaving the remainder unplanned until the first development was nearing completion. The contract requires the construction of the first operational unit by the end of 1959 with a view to its being in service in 1960.

A SWITCHED TV/F.M. RECEIVER



A view of the completed combined receiver.

A COMBINED TV AND BAND II SOUND RECEIVER

By R. Shatwell

(*Continued from page 263, January issue.*)

IF adjustment of C15 will not bring in vision L19 needs the turns closing. Insertion of the iron dust end of the "wand" will verify this. If the brass core brings in the signal the coil needs further opening of the turns. The signal established, however faintly, move the aerial hook to V1 pin 3 (C8) and C15 may now require *slight* further adjustment. Check L13 with the wand and adjust as necessary. Move aerial to L1 (V1 pin 6) and check L13 and C15 again before adjusting L7 if necessary. Connect the aerial to its normal input and adjust L1. T1 acts as a fine adjustment to L1. In all the above procedure do not waste time if adjusting spacing of turns does not suffice, but wind another coil with a turn more or less as the wand indicates. It must be emphasised here that to line up the Band III channel without the Band II and I coils connected is not recommended as the whole set-up will change with the connection of these. If a second Band III channel is available, turn to this and check with the wand on L19 to decide whether the link needs lengthening or not. (The insertion of the wand will, of course, bring the first channel in on the new position if inserted too far.) It is now advisable to check with phones on the vision channel to ensure that this is also receiving the vision signal but this should be automatically correct as only by tuning the oscillator lower than the signal can vision be lost, and the frequency difference is so great that this is not a likely error.

Band II is now aligned and should not present any great difficulty if a reasonable signal is available. If necessary the procedure as for Band III can be followed, tuning by the dust cores. Since the coils are incremental, insertion of the tuning wand in the Band III coils can still be used to give an indication of the need for more or less inductance. Only L21 tunes sharply. L9-15 has a definite peak, but L3 is very flatly tuned. On positions 5 and 6 the oscillator link may need adjustment to avoid the need for moving of the fine tuner between stations. This was achieved with a slightly humped link of 26 s.w.g. at the back of the wafer in each position. Tuning is fairly critical if the TV aerial is being used, but is broad with the increased input provided by a V.H.F. dipole correctly mounted, of 2ft 6in. each arm.

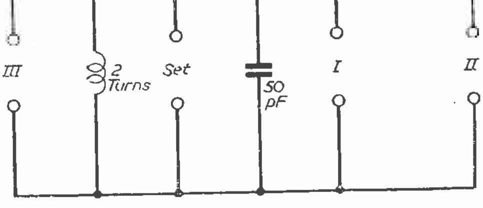


Fig. 16.– A suitable Triplexer circuit for the receiver.

Band I is now aligned and will not normally provide any problem. If the coils will peak on the sound signal nothing further need be done at this stage. Brass cores can be used if necessary. Channel 2 coils have been used by the author and the remaining coil data checked by the generator and will be found to be within easy adjustment range. Final adjustment of these should be carried out on a picture.

In the final adjustment to the trimming of the oscillator to enable direct switching to be made throughout it must be realised that C15 sets Band III but affects I and II as well. L21 is the *second* adjustment, and affects Bands I and II and L24 is the final adjustment. This means switching through Band I to make the second adjustment and back for the final one. Any further adjustments must be made on a picture, and normally is to the Band I channel and C1 only.

If a grid modulated set of the Supervisor type is available this can be used by removing the set aerial, turning contrast and sensitivity down, and linking the tube grid to C57 output. *Again make sure neither chassis is live to earth before starting.* Link the two chassis with another lead. With both switched on the receiver should provide a picture, but the brilliance will be controlled at the set. This procedure is not to be used on sets where the circuitry is not known to provide a similar output and D.C. restoration system as the Supervisor and in these cases the timebases should be made up and a complete set assembled before a picture check can be made.

Assuming a picture established on the set turn to the weakest channel and adjust contrast for a reasonable picture. If this is a Band III channel adjust C1 for maximum gain and then close to this for minimum signal/noise ratio. Turn to the other channel and if too strong switch off and insert a variable resistance between the fixed contact on wafer 5 and use this to balance the picture. The V.H.F. channels can normally be left at full gain. The variable control can be left or replaced by a fixed resister of the correct value. If the signal is so great that it cannot be balanced by this means an alternative circuit is possible, the earthy end of R46 (contrast) being disconnected from chassis and linked to the moving contact of wafer 5 so that the balancing acts on R.F. and I.F. stages.

There are one or two points upon which it may be profitable to experiment to improve Band III results. Incremental tuning by nature introduces losses due to the sheer dead weight of the shorted coils at the higher frequencies and a heavy gauge wire from the moving contact lug here to the centre spigot of V2 and to the coil link across the wafer may increase the signal. Also a 3000pF ceramic from this contact to the corresponding contact on wafer 3 (i.e., parallel with C7) may improve gain. The aerial input connection may also prove more effective if the primary is earthed rather than taken to the secondary. It is also preferable to make all adjustments to get maximum performance with separate aerials if possible, combining these later, but it is often difficult to manage this, as at least two separate leads are then needed. One further effect was noticed when channels 2 and 9 were involved and may be the subject of experiment. If channel 2 (Band I) was peaked on L12, L18 the channel 9 signal suffered slightly, whereas unscrewing the core slightly, whilst having little effect on Channel 2 (which has normally ample gain) increased the Band III signal considerably, removing grain and cleaning up jagged verticals. This may be peculiar to the particular combination of channels as there is a harmonic relationship in this case. The author has not been able to check on other channels.

Triplexer

This is easily made up on the spare switch wafer, now useless for other purposes. The basic diplexer has been described in these pages previously and is not at all critical in construction, having negligible insertion loss. 18 s.w.g. wire is suitable for the inductances, which are ¼in. dia. self supporting, spaced diameter of wire. Ceramic tubular condensers are preferable and Fig. 16 gives the circuit. The F.M. aerial is fed via a series resonant circuit and was found to be best connected to the Band I input.

Alignment on Signal

In spite of alignment data, the author invariably lines up on the test card for final satisfaction and if this is preferred the following procedure is to be followed in the order given.

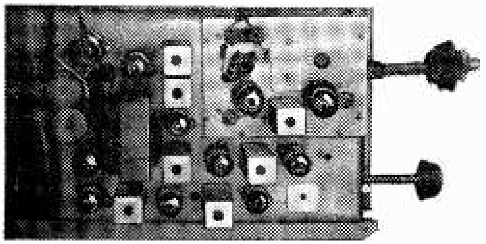
1.—T2. T3. L26. T8—maximum brilliance, adjust contrast to prevent flaring—ignore definition.

2.—T2. T3. T7. PR1.—Peak on 2.5 Mc/s bars T7 sec., max. sound rejection. T8. max. 1.5 Mc/s bars. L26. max. L.F. as indicated by long white areas.

3.—T3—Back to max. brilliance.

Finally L26 and T3 are adjusted to remove "streaking" and "smearing" of large areas of black or white. T3 may need taking slightly towards 1 Mc/s bars. L26 will remove "pulling on whites." Contrast and brilliance controls will need adjustment throughout the procedure, as will focus.

The correct tuning point is always that of maximum sound output, but on normal pro-



A plan view of the complete receiver

gramme material this is not always obvious, and it is easier to tune to the point just short of sound breakthrough, which should coincide with approximately half maximum picture strength. With care in lining up, the 3 Mc/s bars should be visible and the 2.5 Mc/s bars should be crisp black and white. A further point is that the F.M. transformer T6 should be aligned on position 5, as obviously the wiring to the switch does mean that only in one position is alignment exact. The variation introduced by one switch change is not material, but that by two changes would result in some distortion.

The set is suitable for use with the standard type sync. circuits and timebases as used in the Supervisor, Teleking and the circuits sponsored by Brimar and Mullard and assembled in an upright position about the tube neck, with the focus magnet in the centre, a compact, side-controlled set is easily made up.

No sound or vision limiters are fitted. A spare diode in the 6AL5 is available if conditions make a limiter essential, although the author is favourably located and prefers the occasional spot to the cutting of highlights often attendant upon vision limiters. If a sound limiter is necessary a crystal circuit can be inserted on the input to wafer 7. This will prevent its operation on F.M., where it is not required.

A.M. suppression on the F.M. channel is good. Ignition interference from a car outside the house disappears when on tune, as does a bad case of vacuum cleaner interference. In normal listening no intereference has been noticed at any time, a welcome change from the heterodyne, timebase, mains borne, and sundry other whistles, crackles and bangs of the broadcast band.

SIMPLIFIED TV SERVICING

5.—SETS WITH FLYWHEEL AND AUTO-SYNC

(Continued from page 256, January issue)

ALTHOUGH the circuit diagrams of these sets appear very complicated, they are not necessarily so. If care is taken to separate the circuits concerned, they will be found to be no more difficult to service than any other portion of the set. Practically all fringe area sets have these types of sync circuits, and trouble which may occur through faulty components will cause lack of frame and line hold. In the case of the line timebase, this lack of hold may be due to the line timebase being triggered by noise pulses reaching the timebase generator just before the line synchronising pulse. This will produce ragged vertical edges to the picture. A typical flywheel sync circuit is shown in Fig. 18. In this circuit positive pulses are applied to anode of V1 and negative pulses to cathode of V2, causing both valves to conduct until a charge nearly equal to the pulse amplitudes is built up across the coupling capacitors: the valves will then cut off. The conduction current flows through the coupling resistors, and if the values of the resistors and condensers are balanced at potential at the input at the moment of conduction will appear at point A. If the conduction occurs at the exact time of the synchronising pulse, then the potential at point A will coincide with the mean potential of the input waveform. Should however, the gating pulses arrive early they will coincide with the section of the waveform that is more positive than the mean level and the output potential to the oscillator will be positive. This will cause the speed to fall and the gating pulses will once more coincide with the input pulses. Now the values of resistors and capacitors in this circuit are very critical, and should faults arise they must be checked first. For instance, in the circuit shown, C1 and R1 are chosen in value to give a time constant that is the nearest approximation to the ideal waveform. R4 and C2 have a time constant equal to several lines. R5 and C3 are a critical time constant damping circuit to prevent oscillation of the horizontal timing caused by the vertical synchronising pulse interval. The resistors can be checked for value, but I advise replacement of capacitors if suspect. Keep to the values given in service diagram. Fig. 19 shows another type of flywheel synchronising circuit. Here V1 is a phase splitter. The action is the same as in the previous circuit. Here also all values are critical and should be suspect if trouble is experienced.

> **OUR COVER SUBJECT**
>
> *The illustration on our cover this month depicts a common fault which can be due to poor sync, interaction between the two timebases, or faults in the flywheel and auto-sync section. Previous articles in this series have dealt with various timebase faults, and this article deals with the flywheel and auto-sync circuits. Next month the series will be concluded with notes on the cathode-ray tube.*

A circuit diagram for Auto-Sync is given in Fig 20. Here differentiated line sync pulses in antiphase are derived from the transformer in the anode circuit of V1, the sync amplifier. These pulses are balanced about earth by the centre tap of the secondary and applied to the discriminator diodes via capacitors C1, C2. A saw-tooth waveform from the horizontal scan output transformer is applied to the discriminator *via C4, R4*.

At the junction of R1 R2 the discriminator diodes produce a control voltage whose amplitude depends upon the relative phases of the

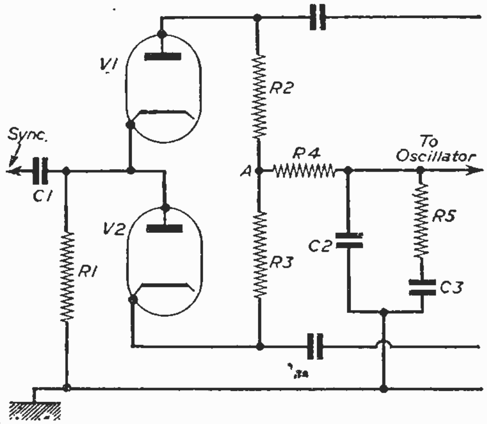


Fig. 18.—A typical flywheel sync circuit.

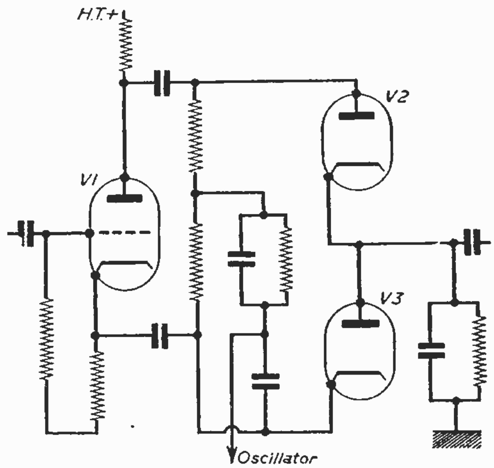


Fig. 19.—An alternative arrangement to Fig. 18.

sync pulses and the reference wave form. This voltage is filtered by R3 C3 and applied to the grid of the horizontal oscillator. A good check on this type of circuit is to see what effect the horizontal hold control has. If the discriminator circuit is working correctly, there will be little effect from this control as the descriminator has taken charge. Here again in this circuit

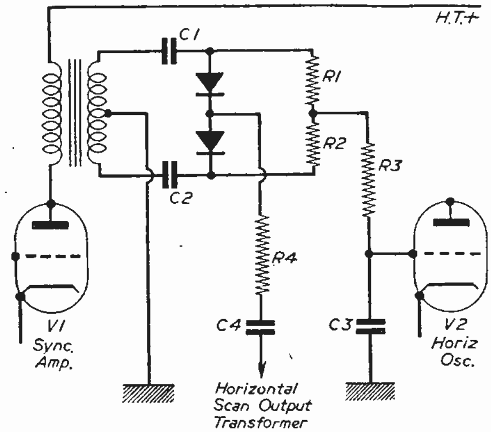


Fig. 20.—An auto-sync circuit.

should faults arise, check up on component values and also on the two discriminator diodes. Should it be necessary to replace these, be careful the polarity is correct. The smoothing circuit R3 C3 is important and trouble here will cause bad line tearing.

Faults Due to Incorrect Adjustment of Controls

It has been the writer's experience that many complaints of poor reception have been due to incorrect adjustment of controls and not due to faulty valves or components. A few instances will be given.

Flyback Lines Showing

In most cases due to incorrect adjustment of vertical hold control, although too much brightness can also bring them out.

Black Jagged Lines Across Picture

In most cases this is an indication of slight line slip. Readjust line or horizontal hold control.

Bent Verticals at Top of Picture

Again slight adjustment of line hold control will in most cases clear this.

Shadows in Corner/s of Picture

Generally due to incorrect centering of picture or scan coils.

Negative Picture

Can be due to too strong a signal input or a mis-setting of the ion trap.

Ringing

This is often due to too much contrast being used.

Excessive Interference

This is often due to a poor aerial system or mismatching of the aerial to the set. The placement of the aerial is a point of great importance, especially in towns where interference is likely to be heavy.

Poor Focusing

In many cases due to incorrect positioning of focus magnet.

Checking on Control Settings

It is advisable to set up controls on the BBC test card if possible. The picture value here is standard and all controls can be checked on it.

Distorted Picture

This is sometimes due to static charges due to humidity. Will generally clear itself within a quarter of an hour.

Blurred Picture

Often due to the vision interference limiter being too far advanced, thus cutting down vision signals.

R.F. Interference

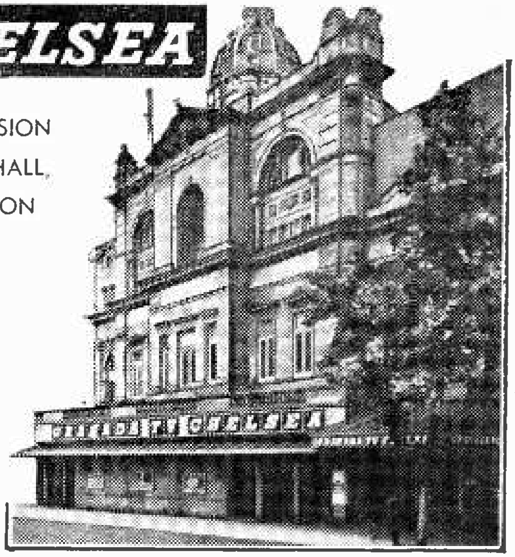
This is a type of lacework pattern on screen. Moving or re-orientation of aerial may be necessary or a wave trap fitted at the frequency of the interference, if known.

Final Words on Fault Location

The cathode-ray tube can assist you a great deal in locating the part of the receiver that is faulty. Careful analysis of the picture can save much time and money by telling you where the fault is likely to be.

(To be continued)

GRANADA TV CHELSEA



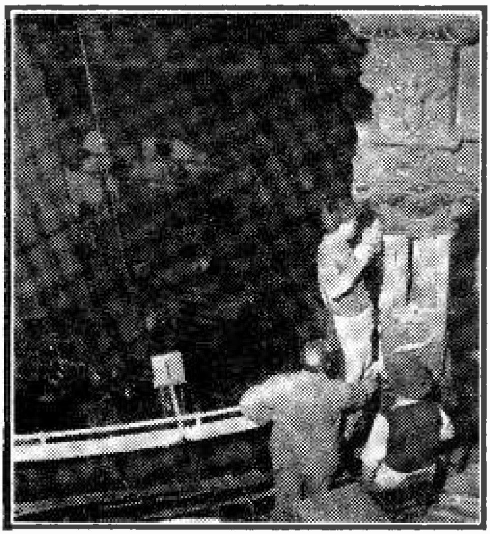
SOME INTERESTING DETAILS OF THE CONVERSION OF THE OLD CHELSEA PALACE MUSIC HALL, NOW USED BY THE GRANADA ORGANISATION

WHEN it was announced a couple of years ago that Sydney Bernstein's Granada group of entertainment enterprises were venturing into television, it was expected that something original, bold and adventurous would develop—in premises as well as in programmes. It did. The Granada Television Centre in Manchester quickly arose and has turned out to be one of the best-planned television headquarters in Britain. Its design allowed for extensions and additions to stage space to be made as required, without destroying the balance of the original compact layout. Long-term planning was preferred to improvisation and expedients. The extensions are, in fact, already in hand.

Policy Change?

Surprise was, therefore, my first reaction to the news that Granada was going to turn the old Chelsea Palace music hall into a television theatre. First, it seemed to be a deviation from Granada's original policy of centralisation, and, secondly, it seemed to be following the paths of the BBC and the other I.T.A. programme contractors, which have occupied and converted quite a number of London and provincial theatres.

True, Granada had used the Chelsea Palace and other theatres for occasional outside broadcasts—but now they were converting it for television use exclusively.



Modifications being made to the front of the gallery, to fit Monitor screens.

The Old Music Hall

Chelsea Palace was one of the London Syndicate music halls, built about fifty years ago and "booked" in conjunction with Brixton Empress (now a Granada cinema), Walthamstow Palace (closed, but in very good condition), Metropolitan Theatre, Edgware Road (still going strongly), Tottenham Palace (now a cinema) and Watford Palace (now running rep.). All of these halls, excepting Watford, now belong to the Granada organisation, which runs an important cinema circuit, a few West End and other theatres, promotes films and live plays and is interested in almost every branch of the entertainment business.

The "Stage" year book for 1912 informs us that the Chelsea Palace "bars" Battersea Palace; Grand, Clapham; Granville, Walham Green and Empire, Shepherd's Bush. That means that artistes booked at Chelsea Palace were not permitted to accept "dates" at the other named theatres, within a certain period of time before or after appearing at Chelsea. So far as the Granville, Walham Green—now owned by Rediffusion and closed at the moment—and Shepherd's Bush Empire (now belonging to the BBC) are concerned, we should not be surprised if the tradition of the barring clause for star acts was not reintroduced.

Stars

Big star names have been a feature of the shows so far put out from the Granada Theatre, Chelsea—particularly in "Chelsea at Nine"—and there is no doubt that this London outpost of the Manchester television organisation has been set up mainly to enable London and international stars to be used without having to take them up to Manchester.

Auditorium

Many years ago I had visited the Chelsea Palace and remembered its auditorium and stage facilities. It was a well-appointed music hall with a good frontage on Kings Road, Chelsea, and a seating capacity of 1,624 persons. I expected to see many changes when I took my seat for one of the television shows. The audience is now restricted to circle and gallery, which accommodate 669. From the circle there is an excellent view of the enlarged stage, which has been made level and extended over the old orchestra pit and the first few rows of stalls. The old stage area of 2,373 sq. ft. has thus been increased by an apron stage in front of the proscenium of 820 sq. ft. for camera tracking, the total stage area now being 3,193 sq. ft. Several large television monitor sets and a number of small loudspeakers are strategically placed in various parts of the auditorium, so that everyone can see and hear what is being transmitted, including the commercials during the breaks in the programme.

Stage Lighting

Major changes have taken place behind the footlights (which no longer exist) and on the ground floor. The old pit bar is now a maintenance workshop, the carpenters and paint shops are below the stage and the old band room has been turned into a dressing room. The old gallery bar is now a wardrobe.

The lighting arrangements have been extensively changed. As a music hall, the total lighting load was 50 kVA. This has now been increased to 150 kVA, with 20 kW available in direct current for arcs. That famous old museum piece the liquid dimmer pot switchboard has been superseded by a Strand Grand-master switchboard and a modern saturable reactor dimmer board. This gives a total of 60 dimmable circuits so arranged that lighting plots may be pre-set and brought up as required. The lights used are almost wholly Mole Richardson incandescent units, both spots and floods.

Television Equipment

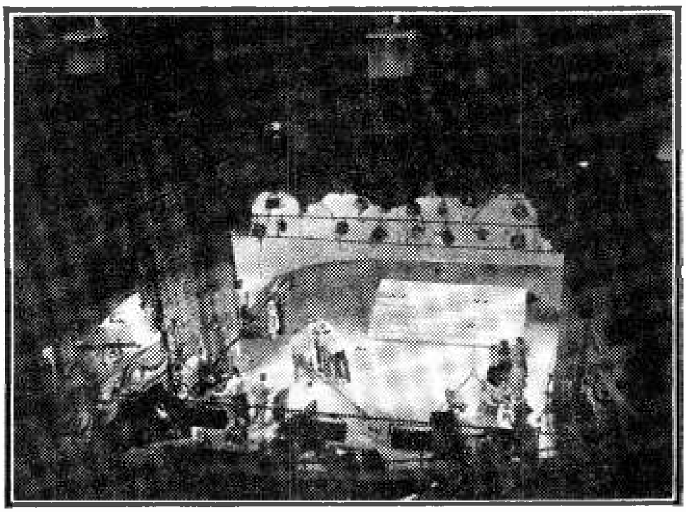
Pye 3in. Image Orthicon cameras are used, three being operational and one spare, with a fifth retained for maintenance rota. Houston pedestal camera dollies and a camera crane are used. Sound channels are by Pye, with an assortment of different types of moving coil and ribbon microphones of various makes. There is no telecine or slide equipment. A high quality cable route is utilised (not coaxial) to the Museum Telephone Exchange, for connecting vision, sound and control circuits with Granada's Manchester headquarters and also the I.T.A. network.

The Television Staff at Chelsea

There is now a permanent staff of over 70 at the Granada, Chelsea, and the production departments have spilled over into eight additional offices at No. 5 Chelsea Manor Street, close by. The engineering staff includes Mr. T. A. H. Marshall (engineer-in-charge), Mr. R. Cumner (supervisory engineer), Mr. M. Roberts (senior sound engineer) and Mr. J. Rackett (senior vision engineer). The house manager is Mr. D. Williams and a frequent visitor is Mr. Simon Kershaw, the general manager of the Manchester headquarters of Granada, and Mr. R. Hammans, chief engineer of Granada Television Network. As is usual with every Granada establishment, it has the very personal attention of Mr. Sydney Bernstein, whose interest in the smallest details of organisation, presentation and facilities is famous. I suspect that the smart grey-shirted "uniforms" of the camera and floor crews are his inspiration, just as impressive in their way as the immaculate appearance of the front-of-the-house staff and the spick-and-span brightness of paint, plaster and brass of the traditional variety theatre decor.

The Conversion

Chelsea Palace was converted from a music hall into a permanent television theatre in little more than three weeks. Work still goes on with modifications and improvements, but so do daily rehearsals and frequent transmissions. The nine dressing rooms have never been occupied by so many top-line star names before. Life is hectic for the production staff and technicians. Granada producers prefer to have a variety of small sets in their programmes rather than one large permanent set-piece for each show. Consequently, the audience in the circle can watch set-pieces, large and small, silently wheeled on and off during action, with cameras pointing in various directions, property men moving furniture or operating smoke effects, heavenly choirs chanting in one corner while a skiffle group gets ready in another. It all looks quite crazy, but it finds its way to the television screen with extraordinary



View from the gallery of a TV show in progress.

smoothness. The audience leave the theatre with their heads in a whirl and sticks of peppermint rock in their hands, presented to them by genial Granada commissionaires. This was just another

Fitting the stage spot and floodlights.

bright idea of Master Showman Bernstein—the name printed inside the rock was GRANADA.

Costs

The cost of running an isolated single-stage television theatre must be quite high. My guess is that the local overheads of staff salaries, heat, light, insurance, etc., of theatres like the Chelsea Palace must be around £1,000. Add to this the costs of individual shows, scripts, actors, scenery, wardrobe and music—and you can very quickly run up a bill of several thousands for a one-hour programme. If the output is one big show per week, then the financial returns from the commercials or from networking the show to other I.T.A. contractors must be correspondingly enormous. Of course, other programmes of less ambitious character might be worked into each week's schedule, but it is important that these do not encroach on the rehearsal times of the big show. This, therefore, is a measure of Sydney Bernstein's confidence in the future of commercial television. He entered the fray with his Granada Television Network at a time when the future seemed to be highly speculative. Now the tide has turned, and backed with the high rating audience figures for the Lancashire and Yorkshire areas, he can plan even bigger and better shows from the Granada Television Centre, Manchester—and also from the London "branch" studio at Chelsea. Programme policy is "to draw on as wide a range of entertainment as possible for the enjoyment of viewers."

A typical early programme from Chelsea included Menuhin, Charles Laughton, Zsa Zsa Gabor, a skiffle group, Edgar Bergen, and Charles Macarthy, choristers, chorus and ballet. This is certainly a wide range of artistes of top-line star quality. What home viewer could grumble at such prodigality? There will be grumblers, of course—probably those viewers who think that they, too, should have some Granada Peppermint Rock sent to them by post!

BBC Facts and Figures

IN 1936 BBC Television had one transmitter and a handful of viewers. In 1958 is has 18 transmitters and can serve 97 per cent. of the population of England, Scotland, Wales and Northern Ireland.

In 1947 one out of every 500 adults was a viewer. To-day half the adults in the country watch television.

There are 27,000,000 viewers in Britain. The adults among them watch an average of 15 hours television every week.

People who own sets see, on the average, 2 out of 5 evening programmes.

Sixty per cent. of the highest income group own a television set, against 50 per cent. in the lower income groups.

Forty per cent. of set-owners who earn between £4 10s. and £8 a week watch television during the main evening hours. Thirty-four per cent. of owners earning £20 a week and over will be viewing at any one time.

Thirty-four per cent. of set-owners with a university education normally view during the evening against 39 per cent. with a secondary education and 41 per cent. of those who left school at 14 or 15.

The two activities which television does not seem to have affected are gardening and courting.

The greatest number of television sets per head of the population in Britain is found in those suburbs of London which stretch south-eastwards from Edgware to Dartford; also in Walsall, Tamworth, Coventry and Nuneaton.

The leading regular BBC programmes are normally seen by audiences of between 6,000,000 and 9,000,000. Big events have been seen by 12,000,000, or as many as 20,000,000.

The most popular hours for viewing are between 7.30 and 10 p.m.

An average hour of television costs £3,256—£1,538 for artistes, orchestras, royalties and general programme expenses; £1,242 for engineering costs, and £476 for overheads.

The viewer's licence contribution works out at less than 3d. a day.

Measuring V.H.F. Oscillator Frequencies

A SIMPLE METHOD OF CHECKING TV OSCILLATOR FREQUENCIES

By B. L. Morley

WHEN dealing with oscillators designed for television frequencies, and especially when trying out a newly-built circuit when the actual oscillator frequency is unknown, it is often a difficult matter for the amateur to find out the true frequency given out by the oscillating circuit.

Superhets are now standard for TV and the day of the straight receiver has gone. This has been mainly due to the increase in the number of channels used and has now become a practical necessity where I.T.A. reception is concerned.

The basic principle of such circuits is to have a number of intermediate frequency (I.F.) stages which are tuned permanently to a fixed band of frequencies. Two or sometimes three stages are used in the vision receiver, and one or sometimes two stages are used in the sound receiver.

The important point is that the tuning of these stages is fixed and is remote from the frequency of channel it is desired to receive : the receiver's signals are mixed with the frequencies generated by a local oscillator and the resultant "beat" frequency is amplified in the intermediate amplifier stages.

Fig. 1 shows a schematic block diagram of the arrangement. It is clear that if the frequency of the received signal is altered, then the frequency of the oscillator must also be altered. As an example, supposing the intermediate frequency amplifiers are tuned to 30 Mc/s and it is desired to receive Channel 2 on 60 megacycles (Mc/s) then the oscillator frequency must be fixed at 30 Mc/s which gives us an intermediate frequency of 60−30=30 Mc/s.

Should the oscillator frequency be removed from this figure then no signal will get through to the detector. If, for example, the oscillator frequency were 40 Mc/s, then the intermediate frequency produced with the 60 Mc/s signal would be 60−40=20 Mc/s.

It is clear that if the oscillator frequency is not correct, no signal will get through although the first stages of the receiver are correctly tuned to the desired channel.

The Sound I.F. Amplifier

Let us take this a stage further. We have two sets of I.F. amplifiers, the vision and the sound. The vision will be at 30 Mc/s and the sound will therefore be at 30−3.5=26.5 Mc/s. Assume an incoming signal on Channel 2 at 60 Mc/s. then if the oscillator should be operating at 90 Mc/s then we shall have a vision I.F. of 90−60= 30 Mc/s—the same as that of the vision I.F. stages and so we shall get a vision signal through.

Now the sound I.F. stages are tuned to 26.5 Mc/s and if the oscillator is at 90 Mc/s the sound will actually appear at the I.F. amplifier at a rather different frequency. If vision is 60 Mc/s then the sound channel will be 56.5 Mc/s beat this sound signal with an oscillator frequency of 90 Mc/s and we get a sound I.F. of 90−56.5= 33.5 Mc/s.

The sound I.F. amplifier will not deal with this frequency and the sound signal will therefore be lost.

This condition often happens and the oscillator frequency can be altered by means of the trimmer or fine tuner so that three conditions are obtained.

(1) Sound but no vision ;
(2) Sound and vision ;
(3) Vision but no sound.

It is obvious that the frequency of the oscillator is of some importance. If there was a simple method of checking this frequency it would be very helpful.

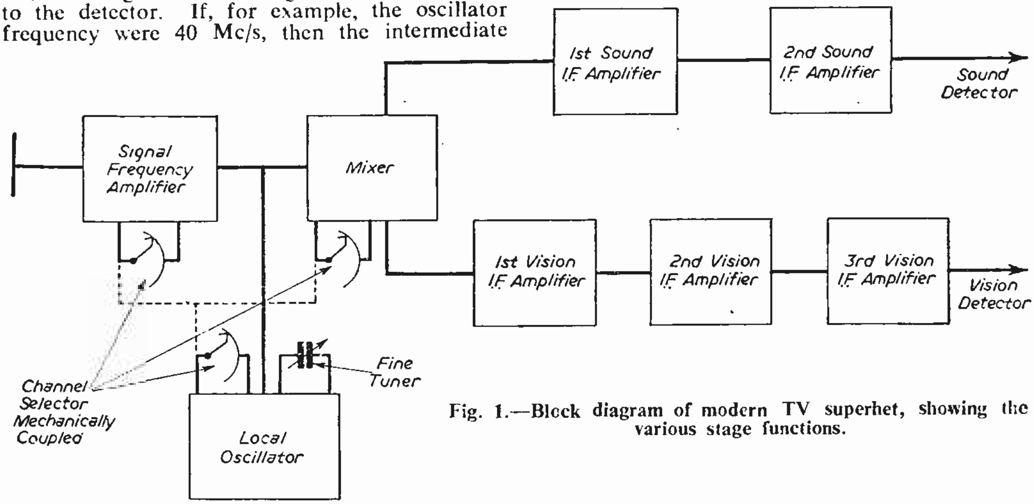


Fig. 1.—Block diagram of modern TV superhet, showing the various stage functions.

The Lecher Wire

At V.H.F. we are fortunate in that we can utilise a very simple method for checking the frequency which is almost as old as radio itself and has been used by the "Hams" for many years.

This system is the use of Lecher wires.

All that is necessary is to erect a simple Lecher wire system, inject into it the oscillator frequency and then with the aid of a simple detector and shorting bar the wavelength and hence frequency of the oscillations can be measured physically.

The Lecher wires are simply two copper wires mounted a short distance apart and just over one wavelength long (see Fig. 2). At one end is a small coupling loop used for injecting the oscillator frequency.

The length of the wire should be sufficient to accommodate the frequency required and the following formula can be used.

$$\text{Length (inches)} = \frac{5905}{F(Mc/s)} \times 2 + 12$$

Example: To measure a frequency which is around about 30 Mc/s the wire would have to be

$$= \frac{5905}{30} \times 2 + 12$$

$$= 18 \text{ feet approx.}$$

This length of wire could be mounted along the wall of a workshop or garage.

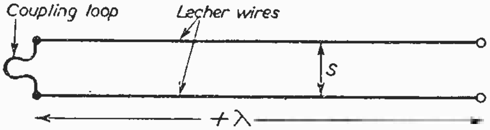


Fig. 2.—Basic Lecher wires.

With Band III the dimensions become much smaller and for Band III oscillators the wire should be in the region of 7ft.

The spacing between the wires ("S" Fig. 2) should be not less than 2 per cent. of the shortest frequency which is to be measured. A figure of about 2in. is practicable for most purposes.

The wires must be mounted very firmly and kept taut. Turnbuckles can be used in each wire to ensure that they are strained really tight.

Ordinary copper wire such as is used for earth wires can be employed. The wires must be kept clean and bright or good contact cannot be made.

It is a good idea to calibrate the wires by marking off the inches and half-inches underneath the wire. Alternatively chalk marks can be made on the wall underneath where the current loops occur as described later.

The Coupling Loop

The coupling loop which is used to transfer energy from the oscillating circuit into the Lecher wire is made very simply. Fairly stiff wire of about 18 or 16 s.w.g. (or even larger) is used, and it is desirable that this wire is insulated with PVC sheathing or the like.

The wire should be made into a loop of about one inch diameter (this is not critical and between one and two inches can be used) and it is then connected by very short ends to the Lecher wires. Fig. 3 gives the details.

It is generally practicable to make the loop stand out at 90° to the Lecher wires though the actual position is not at all critical.

The Shorting Bar

A shorting bar is the next item required and as its name implies, it is a short-circuiting bar of metal made so that it can be slipped along the length of the wires and used to short-circuit them at any point.

The bar can be made very easily by simply mounting a strip of metal with a knife edge (such as a triangularly shaped file) on a block of wood. The block of wood should be a little thicker than the distance between the wire and the wall at its back (the wire can be fixed about 2in. from the back of the wall and the block would then be about 2¼in. to 2¾in. thick).

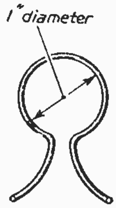
It is not strictly necessary to have a prefabricated shorting bar like this as a short circuit can be easily run up and down the wire using a thin short circuiting object such as the back of a knife, but it is really better to have a separate item such as described, and it makes for greater accuracy.

Theory of Use

Having made the equipment it is as well to understand the theory underlying its use.

Currents at V.H.F. are subject to much the same laws as all alternating currents. They start from a zero point, rise to a certain maximum and fall again to zero point. From here they rise to another maximum of opposite polarity and once again fall to zero—and so the operation continues.

The frequency of the wave is the number of times the complete operation occurs each second. The wavelength is the actual distance between one peak and the next identical peak. The higher



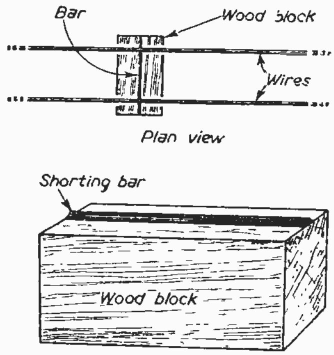


Fig. 3 (Left).—The coupling loop. Fig. 4 (Right).—Shorting bar.

the frequency then the shorter the wavelength.

If we can measure the point where two maxima current peaks arise then we shall have one half of the physical wavelength of the current.

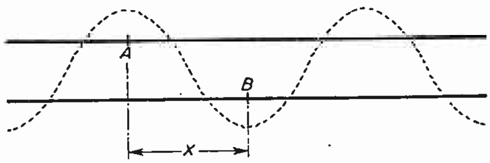
This figure holds good for the media in which the wave is propagated. For example the current travels more easily in a copper wire than it does in free space and certain modifications have to be made for this feature.

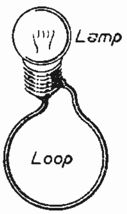
The comparison between the travel of a wave in free space and in a wire can be determined for different circumstances. It can actually be calculated and, for example, manufacturers can supply the comparison factor for their products. It is termed the *Velocity Factor* and is given the symbol Vo. It is very useful to know this figure when calculating lengths of coaxial cables, etc., for use as shorting stubs in V.H.F. work.

The formula given previously takes the velocity factor into account.

In Fig. 5 we show a simple sine-wave travelling along a Lecher wire system. When the signal is injected into the Lecher wire the currents travel along and it will be found that there are certain points along the wires where the current is at maximum and certain points where they are at minimum.

In the illustration we show two maxima. The





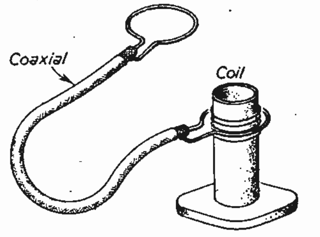


Fig. 5 (Top).—Standing curves on Lecher wires. Fig. 6 (Bottom left).—Simple detector. Fig. 7 (Bottom right).—Coaxial loop.

two points are found by moving the shorting bar up and down the wires. the points being marked as shown "A" and "B." The distance between the points is accurately measured in inches and can be converted to frequency by the formula used earlier, slightly modified. This figure "x" determines the frequency. The formula is

$$\text{Frequency (Mc/s)} = \frac{5905}{x \text{ (inches)}}$$

That is all there is to it. We simply measure physically the frequency by finding the current maxima.

The Detector

Having established a method of measurement it is now necessary to have some form of detector to indicate when the shorting bar has arrived at the correct point.

Undoubtedly one of the simplest methods is the use of a bulb and loop. All that is necessary is a loop of stout wire about 10 or 8 s.w.g. which is formed into a simple loop 1½in. in diameter. At the top of the loop is soldered a low-consumption flashlight bulb. A 6v. .04 amp bulb. such as is used as rear lights for many cycle dynamo sets, can be employed.

If the Lecher wire system is coupled to the oscillator and the loop of the detector held close to the coupling loop of the Lecher wire the bulb will glow.

As the shorting bar is moved along the wire the bulb will become dim and when the point of maximum current on the wire is found the bulb will go out. This is the short-circuiting of the maximum current position.

When checking the frequency the shorting bar is kept at the loop end of the Lecher wire and then moved away from the loop. The point where the lamp goes out is noted and then the bar moved farther along the wires until the second point is found.

The distance in inches between the two points is measured, and this becomes "x" in the formula just quoted.

Now it may be found, in practice, that two points where the lamp goes out cannot be found: instead there is one point where it goes out and a second point where it dims. This second point is the second current maximum and can be used for the measurement of "x."

To ensure as great an accuracy as possible the coupling between the bulb and the input loop to the Lecher wires should be made as loose as possible. If it is too loose (that is the bulb is too far away from the loop). then the bulb will not light. If it is too close then it will be difficult to get an actual extinction of the light.

Coupling the Oscillator Output

The method used to inject the output of the oscillator into the Lecher wire system is quite simple. All that is required is a length of coaxial cable of standard type which will reach from the receiver oscillator section to the Lecher wire system. The shorter this length of cable then the better.

At one end of the coaxial the inner conductor and sheath is bared and a loop of wire connected across the two, similar to the coupling loop on the Lecher wire system. The other end of the coaxial is terminated with a similar loop but of smaller dimensions. This latter loop is slipped over the oscillator coil and coupled to it quite closely. The coupling can be made looser when the lamp is tested. It should be made as loose as possible consistent with sufficient brightness of the lamp.

It should be noted that the oscillations should normally be powerful enough to light the lamp. This can be checked by slipping the lamp loop over the oscillator coil when it should be found to light up.

This. incidentally, is one method of checking that the oscillator is actually functioning.

Servicing Television Receivers

No. 34.—THE ULTRA VT917 AND WT917 (WITH NOTES ON THE ULTRA TUNER UNIT)

By L. Lawry-Johns

(Continued from page 272 January issue)

THE frame pulse is limited by a diode (V18B) and an associated network. The resulting clipped pulse is applied to V8B (triode) control grid in sufficient magnitude to overcome its fixed bias. The valve only conducts, therefore, when the frame flyback pulse occurs. As the video signal is also applied to this grid, the sum total of this and the flyback pulse causes the valve to operate at a level determined by the black level of the video signal, the flyback pulse being applied to "open the gate." The video content does not affect the valve since no flyback pulse is applied during the time this is present on the composite waveform. The output of the triode is applied to the cathode of the second diode of V18 (20D1). The control bias for V1 and V3 is derived from the anode of this diode which is also manually controlled by the contrast control P4.

Line Timebase

This consists of a triode (half of V8 20L1) working as an oscillator in conjunction with a waveform obtained from the line output transformer. The line output valve V9 is a 20P4 and the whole circuit including that of V11, the efficiency diode (U329), is very straightforward and reasonably trouble free. The function of T4 is to minimise the cross-talk between the line and frame scanning coils which tends to give rise to left side striations, i.e., wavy vertical lines on the left side of the raster. The correct setting of this capacitor is that which eliminates these lines.

EHT

A U25 EHT rectifier is used in a conventional circuit to supply some 14Kv to the final anode of the C.R.T. The usual symptoms of a failing rectifier are to be expected, i.e., poor focus on a raster which is oversize and which "blows up" and fades as the brilliance is advanced. These symptoms should lead to the immediate replacement of the U25.

Frame Timebase

The frame oscillator is a 20L1 double triode (V19) working as a fairly conventional multivibrator, the output of which is applied to the frame amplifier (V20, 20P3) control grid. A pulse

LIST OF COMPONENT VALUES

C1—82 pF	C20—680 pF	C83—200 pF	R8—39 K.	R36—8.2 K. 1 watt	R101—1.2 MΩ
C2—500 pF	C21—680 pF	C84—.02 µF	R9—68 K.	R37—10 K.	R102—68 K.
C3—500 pF	C22—680 pF	C85—500 pF	R10—68 K.	R38—1 MΩ	R103—1 K.
C4—3 pF	C23—.001 µF	C86—.1 µF	R11—15 K.	R39—22 K.	R104—1 MΩ
C5—680 pF	C34—12 pF	C87—.1 µF	R12—1 K.	R40—22 K.	R105—6.8 MΩ
C6—500 pF	C35—12 pF	C88—8 µF	R13—10 K.	R43—1.5 MΩ	R106—470 Ω
C7—500 pF	C36—3 pF	C89—.1 µF	R14—100 K.	R44—100 K.	R107—300 K.
C8—680 pF	C37—12 pF	C90—.04 µF	R15—390 K.	R45—1 K.	R108—1 K.
C9—680 pF	C38—1 µF	C91—250 µF	R16—3.3 K.	R46—820 K.	R109—1 K.
C10—680 pF	C39—.001 µF	C92—.003 µF	R17—100 K.	R47—4.7 K. 6 watt	R110—39 K.
C11—680 pF	C40—.1 µF	C95—.25 µF	R18—470 K.	R48—10 MΩ	
C12—1.3 pF	C42—6 pF		R19—1 K.	R49—100 Ω 3 watt	**PRESET CONTROLS**
C13—2 pF	C43—120 pF	R1—1.5 MΩ	R20—12 K.	R50—15 Ω	P1—Limiter 2 MΩ
C14—.001 µF	C44—.01 µF	R2—1.5 MΩ	R54—270 K.	R51—3 Ω	P2—Horiz. hold 100 KΩ
C15—3.3 pF	C45—.5 µF	R3—27 K.	R55—470 K.	R52—6.8 K. 6 watt	P3—Volume cont. .5 MΩ
C16—15 pF	C46—50 µF	R4—22 K.	R32—4.7 K.	R97—22 K.	P4—Contrast 100 KΩ
C17—7 pF	C47—30 pF	R5—1.5 MΩ	R33—270 Ω	R98—220 K.	P5—Vert. hold 500 KΩ
C18—680 pF	C48—500 pF	R6—1.5 MΩ	R34—22 K.	R99—220 K.	P6—Height 1 MΩ
C19—.001 µF	C49—.002 µF	R7—47 K.	R35—8.2 K 1 watt	R100—180 K.	P7—Brightness 250 KΩ

is taken from the frame output control secondary via C90 to serve as frame flyback blanking applied to the C.R.T. control grid. An electrolytic capacitor is included in the brilliance circuit to maintain the grid potential after the receiver is switched off. This avoids the appearance of the familiar spot of light which normally appears. The voltage on C88 is held at grid potential whilst the set is on and when it is switched off the voltage remains until it, relatively slowly, leaks away through R102.

Sound Output

The detected signals at pin 7 of V16 (20D1) are fed via the second section of the valve, which acts as a noise limiter, to the volume control functioning as the grid leak for the sound output valve, V17 (10P13).

Power Supplies

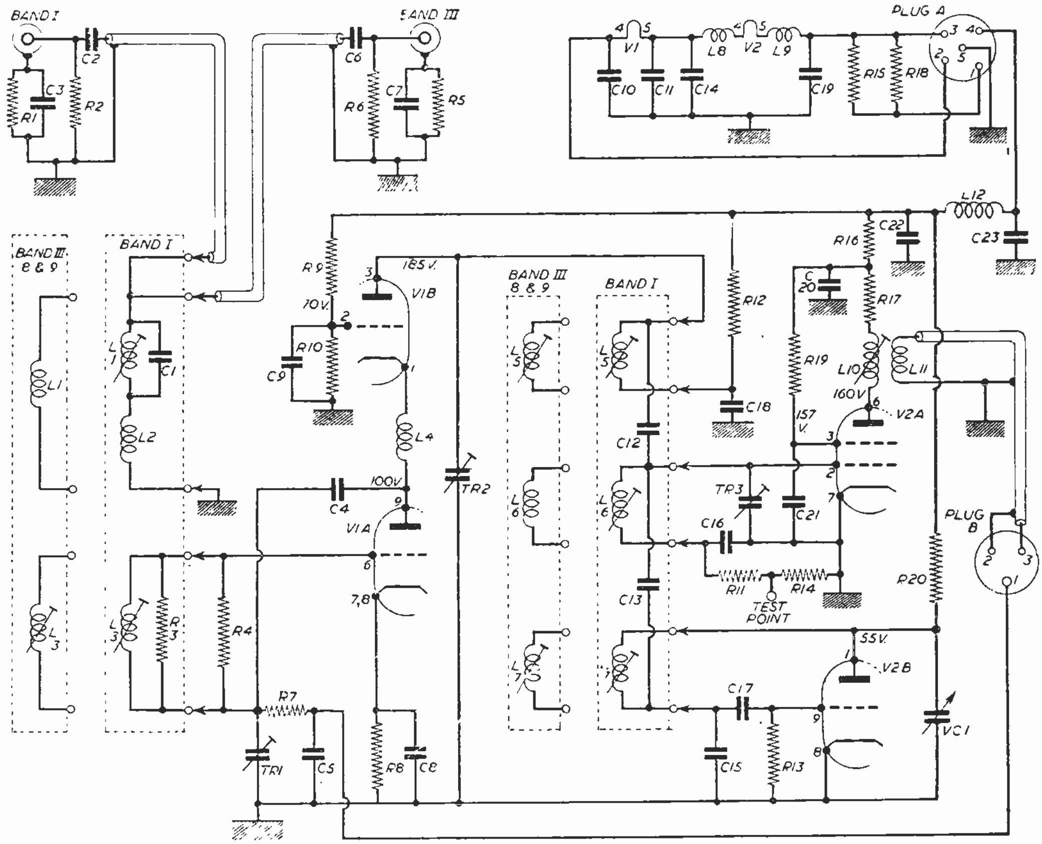
A U801 (V13) is used for H.T. rectification with four surge-limiting resistors wired to the anodes. C55 and C56 (100 × 200μF) are the main smoothing capacitors with a series choke and resistor (R67, 2Ω) wired between. Point X is taken to the scanning coils, thus a very small amount of H.T. current is passed through the scanning coils. The R59 Varite (thermistor) is included only in the .3 amp. and .1 amp. heater chain and it is normal for some of the "20" series values (especially the 20D1 type) to heat up rapidly when the set is first switched on.

Circuit Variations

Several component and wiring differences may be encountered on later models of the 917 type, and receivers of the 915 type have a different line output circuit and embody the V21 extra I.F. stage between V2 and V3. Also the frame circuit is modified slightly.

Handling

The C.R.T. is attached to the chassis and is removed with it for cleaning purposes. To remove the chassis, unscrew the two screws holding the right side control escutcheon and also the two screws inside the rear of the cabinet. Remove the tuner unit and the L.S. plug from the output transformer T2. The chassis may be completely withdrawn. When replacing, slip the smoke ring over the face of the tube so that when it is in position the ring may be slipped forward to fill the gap between the tube and the mask. This is for dust exclusion, etc.



Complete circuit of the Tuner Unit.

Scanning & Synchronisation

6.—LINE SCANNING CIRCUITS (2)

By G. K. Fairfield

BEFORE going on to the complete circuit description it is necessary to say a little about ways of linearising the scanning waveform. Several methods are applicable to line scanning generators, but only two need concern us here.

One of these relies on the properties of a choke having a partially saturated magnetic core. This is placed in series with the deflection coils as shown in Fig. 36, and as the sawtooth current through the choke winding increases the core become more satuated, and the inductance falls allowing an increase of current to take place. Its effect then is to speed the rate of current increase towards the peak of the sawtooth waveform thus expanding the right-hand portion of the picture. The C.R. damping circuit shown connected across the choke is to suppress "ringing" which would be seen as a variation in scanning speed at the left-hand edge of the screen.

In its practical form the "Saturated Choke" method consists of a small solenoid of 2 to 5 mH inductance, wound on a dust-iron or ferrite core. This core is subject to a magnetic field supplied by a small bar magnet completing the magnetic field circuit as shown in Fig. 37. The bar magnet is made capable of rotating in order to adjust the amount of saturising field and hence control linearity. A variation on this arrangement is shown in Fig. 38, where the leakage field of the permanent magnet focusing device for the cathode-ray tube is used. The choke coil is mounted between iron pole pieces affixed to the focus magnet. In this case linearity adjustment can be obtained by moving the ¼in. diameter ferrite rod in and out of the solenoid.

Tuned Transformer Method

A second linearity circuit is shown in Fig. 39. This uses a transformer coupled into the line scan transformer, and tuned by a capacitor C so as to resonate at line frequency. When this circuit is shock-excited by the rapid change of current through it during the flyback, it will resonate and the oscillations set up will add to the sawtooth scanning current (see Fig. 40), correcting for the non-linearity present. The amplitude of the correction waveform (b) can be controlled by damping resistor R, and variation of the inductive element L, by adjustment of the small transformer core, will provide a linearity control.

Picture Width Control

It was shown in the previous article how the E.H.T. for the tube is derived from the pulse voltage developed across the line scanning transformer. Now it is obviously desirable to keep this voltage constant in order to prevent undue variations of picture size and focusing. Control of picture width must be obtained, therefore

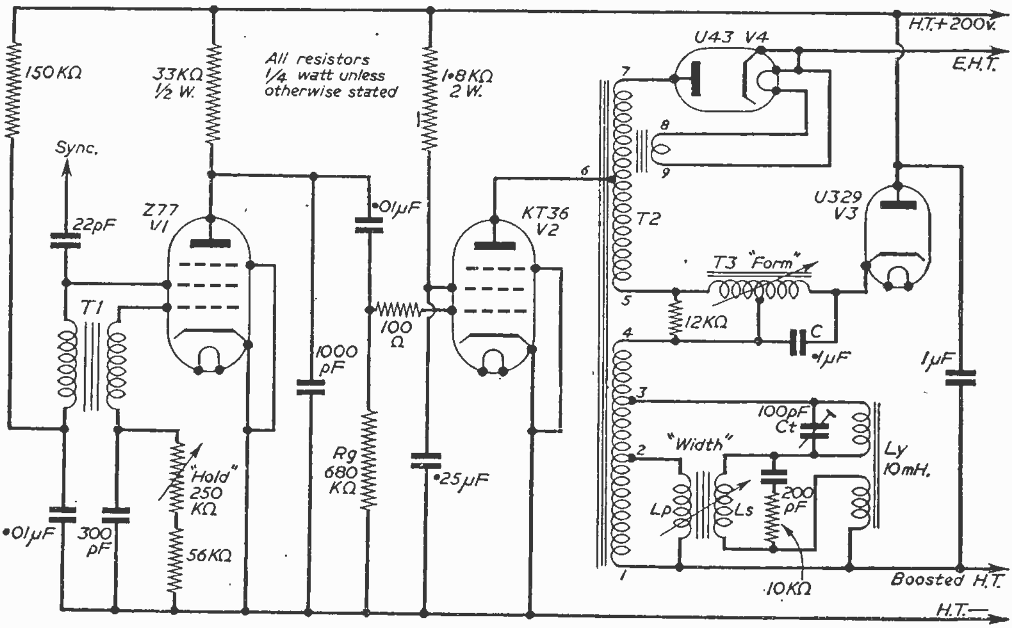


Fig. 42.—A complete line scanning circuit.

without varying the transformer working conditions.

About the only practical way of doing this is to use two coils, one in series with the deflection coils and the other in shunt with part of the transformer winding. These coils are wound on the same former sharing a common adjustable dust-iron or ferrite core, as shown in Fig. 41, so that as this core is moved so the inductance of one coil is increased, whilst that of the other is decreased. Thus from the transformer point of view, the

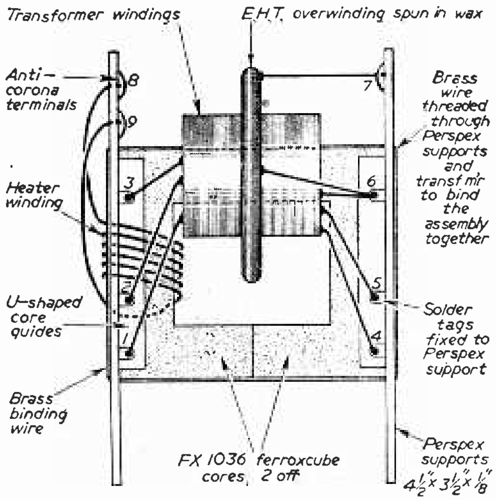


Fig. 43.—Constructional details—line output transformer.

WINDING DETAILS FOR FIG. 43.

Winding 1-2 28 turns
Winding 2-3 252 turns
Winding 3-4 348 turns
Winding 5-6 180 turns
} All 0.0124in. dia. enamelled covered wire.

Windings 1-6 are layer-wound on a ⅞in. dia. insulated former with .003in. paper interleaving between every layer.
Winding 6-7 1,100 turns 0.0048 en. and single silk wire, wavewound ⅛in. wide.
(Gears: A 42, B 31, C 36, D 48, E 80, F 40.)

variation in scanning current caused by Ls is counterbalanced by an equal and opposite change in the current flowing due to Lp and the change in picture width can be obtained without affecting operating conditions in the total transformer winding and hence derived E.H.T. for the tube.

Complete Line Scanning Circuit

The complete circuit is shown in Fig. 42, and incorporates several of the features described in the preceding articles. A blocking oscillator saw-tooth voltage generator is used and, as this has already been described in the second article of this series, when constructional details for T1

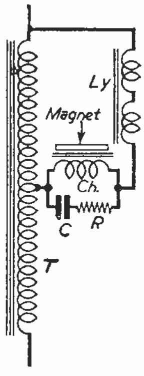


Fig. 36.—The saturated reactor linearity circuit.

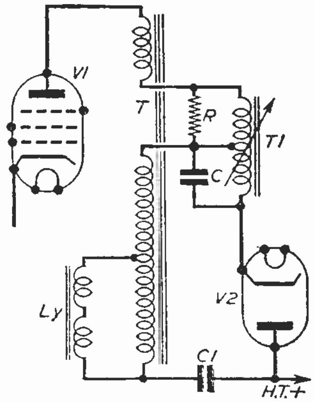


Fig. 39.—A tuned transformer linearity method.

were given, we will go on to consider the efficiency-diode output circuit. This is fundamentally similar to Fig. 35 of last month's article with the addition of a tuned transformer linearity circuit T3C and a width control circuit LpLs. It will be noticed that this latter has its series coil inserted between the two halves of the deflection coil. This is to reduce resonances which can result in "ringing" at the left-hand side of the tube screen. For similar reasons a high working-voltage trimmer Ct has been shunted across the non-earthy side of the deflection coils.

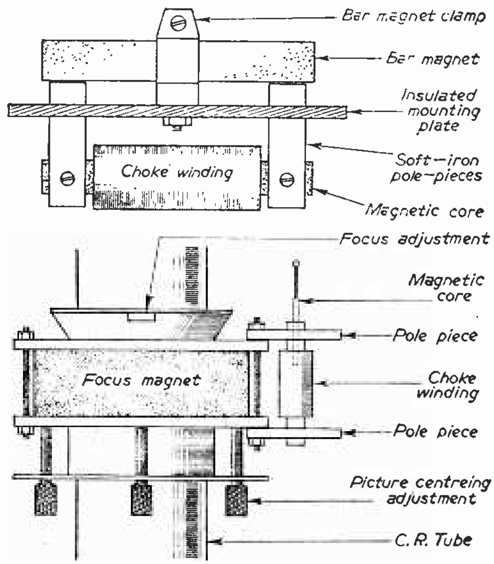


Fig. 37 (Top), Fig. 38 (Bottom).—Practical forms of saturated reactor choke and magnet.

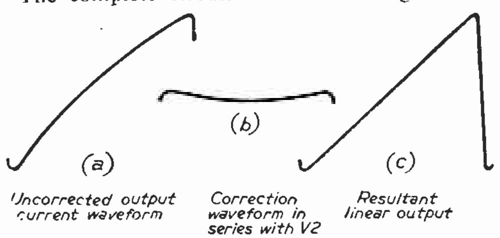


Fig. 40.—Waveforms in tuned transformer linearity circuit.

E.H.T. for the tube is obtained from the transformer overwind 6-7 and high-voltage rectifier V4. The smoothing capitance C will probably be incorporated in the tube itself and as the supply ripple is inversely proportional to frequency only a few hundred pF is required at line frequency.

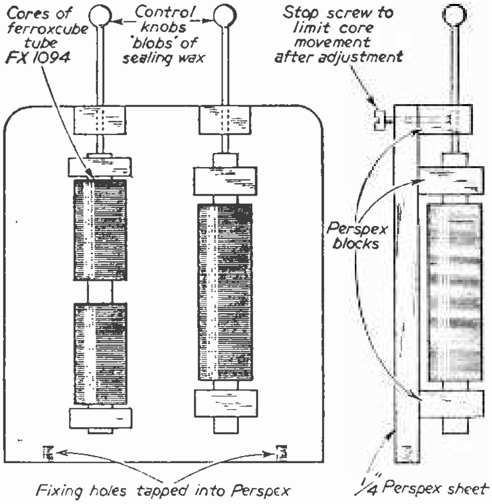


Fig. 46.—Mounting of linearity and width coils.

Transformer Construction

10 mH line deflection coils are used and a suitable design will be described later in this series. The matching transformer T2 is illustrated in some detail in Figs. 43 and 44. Wavewinding is very desirable for winding 6-7 and gear table figures are given for a Douglas machine. If a suitable machine is not available, however, it is possible to wind the coil between thin Perspex cheeks, spaced 3/32in. apart. Care must be taken to prevent turns from slipping down and causing later breakdown of the winding (it must be remembered that from 5 to 8 kV is developed across the coil during the flyback). A method of avoiding this is to continually impregnate with "Denfix," a polystyrene solution, whilst winding a few hundred turns at a time, allowing the solution to harden between each group of turns. Smooth rounded anti-corona terminals are required for terminals 6, 7, 8 and 9, and a useful source of supply for these is to use the large metal press-studs found in many covers and satchels enclosing surplus military equipment. An impregnation in ozokerite wax is necessary for the completed transformer and a thick coating placed over the E.H.T. overwind to prevent corona. The heater winding for V4 consists of seven turns of polythene-covered wire which is obtained by using the "inner" of a piece of 70Ω coaxial cable.

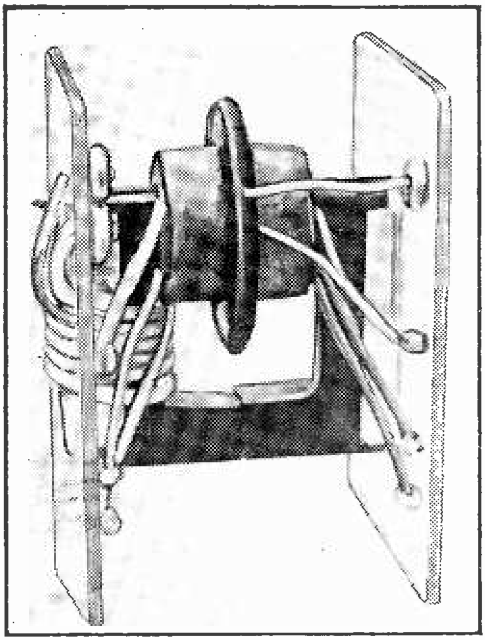
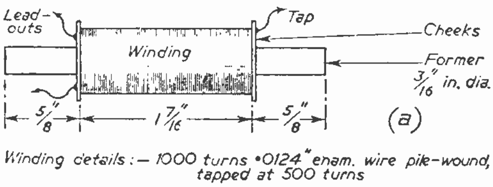


Fig. 44.—This illustration shows the line output transformer, which is described in Fig. 43.



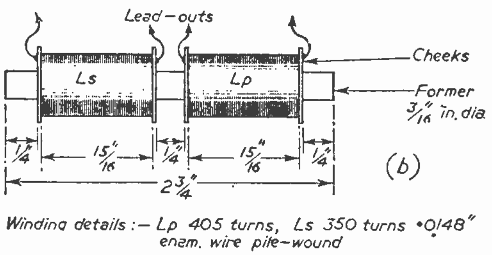


Fig. 45 (a, above).—Details of the linearity transformer ; (b, below).—Details of the width coils.

The linearity transformer shown in Fig. 45 requires very little comment. The only point to watch is the mounting of the coils and adjustable core, considering the large pulse voltage (3 to 4 kV) appearing at V3 cathode during the flyback. A Perspex mounting plate is desirable for this and the width coil as shown in Fig. 46.

(To be continued)

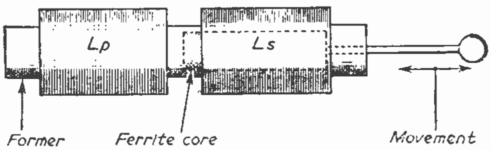


Fig. 41.—Width control—practical coil arrangement.

FLYWHEEL SYNC. & A.G.C.

AN EXPLANATION OF THESE CIRCUITS, AND METHODS OF INCLUDING OR ELIMINATING THEM IN EXISTING RECEIVER CIRCUITS (3)

By H. Peters

(*Continued from page 266, January issue*)

THE function of L1 C2 in Fig. 4 of last month's instalment is more important than one would suppose. As well as peaking the end of the scanning stroke as applied to V1 grid, it improves the stability of the blocking oscillator. This type of timebase has a habit of "wandering around" somewhere near the correct speed and, although this is unimportant when direct locking is used and a pull-in range of over a kilocycle is obtained, it is not good enough when flywheel sync. is used and a 4 per cent. drift is the most that can be tolerated. It is usual to provide a switch to disconnect the sync. pulses whilst the line hold control is set. The control is rotated until the picture slowly passes across the screen when the switch is released, locking the timebase.

As with the sine wave system, the setting-up drill is important and is given rather than fault-finding tips. First set the manual hold control midway, then disconnect the sync. pulses at C4 (use your switch if there is one) and short C2. Adjust the core of T1 until the picture is almost synchronised and is passing slowly across the screen. Restore the sync. pulses and remove the short from C2. Adjust L1 core for the greatest degree of hold both ways. It should be possible to turn the linehold control fully to each end without losing lock.

Voltages to be expected around the circuit vary from make to make, but V1 anode is usually about 60v. with minus 7v. on its cathode. V2 anode is around 250v. and the valve has a very negative grid.

To disconnect the system temporarily proceed as for setting up—i.e., open C4 and take a 5 pF link to the anode of V2 if direct locking is required. As the system is extremely reliable as flywheel systems go there is seldom need to do this.

As the system uses but one double valve it can be adapted to replace almost any existing line oscillator if flywheel sync. needs to be fitted.

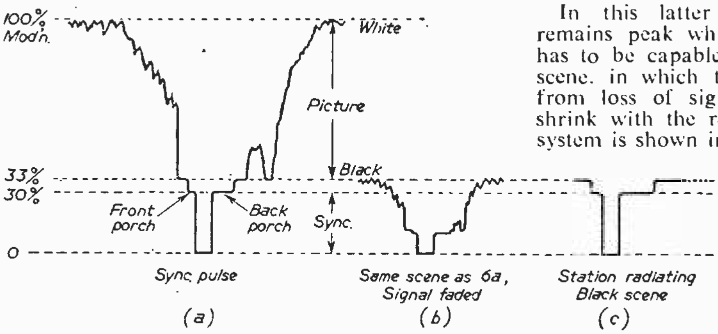


Fig. 6 – Waveform at the end of one line showing fading and change of scene to black both reducing signal strength equally.

Circuit values were included in Fig. 5 last month for those experimenters who may wish to try out the system on their own sets.

A.G.C. Systems

At the outset it was intended to treat A.G.C. in a similar manner to flywheel sync., namely to take three or four common systems in general use and analyse their behaviour, but after perusing scores of circuit diagrams it was soon realised that the only common feature that A.G.C. systems have is that they are all different from each other. Luckily, most of them fall into one of three groups: non-gated, gated, and sync. cancelled, and these will be discussed in a general way. Before doing so a few words will not be out of place about black level, which started out in life as something vaguely connected with the BBC, and then developed into a commodity which had to be preserved at all costs right up to the tube cathode.

The Waveform

Figure 6 shows the familiar waveform around the line sync. pulse. A white picture is represented by 100 per cent. modulation of the transmitter, a black one by 33 per cent. modulation. There follows a 3 per cent. "no man's land" which is a recent addition to reduce the prominence of the half line frame sync. pulses at the receiver during the flyback period. All below 30 per cent. modulation is used for sync. information, and during this period the C.R.T. in the receiver ought to be well cut off, but in daylight viewing receivers it seldom is. It follows that if the transmitted scene is varied from white to black the average D.C. voltage developed across the detector in the receiver will fall to 30 per cent of its peak white value (Fig. 6c). This will also happen if fading causes the signal in the area of the receiver to fall to 30 per cent. of normal, or if a transmitter reduces power due to a breakdown (Fig. 6b).

In this latter case the picture transmitted remains peak white, and a true A.G.C. system has to be capable of distinguishing a change of scene, in which the sync. pulse stays constant, from loss of signal when the sync. pulse will shrink with the rest of the modulation. Such a system is shown in Fig. 7.

Gated A.G.C.

From the foregoing remarks it can be seen that the only useful indication of signal strength is the amplitude of the back porch, which follows the line sync. pulse, and if this could be separated from the rest of the signal a

D.C. voltage could be derived according to its amplitude. In Fig. 7 this is done in the following way: D1 anode is connected to the anode of the video amplifier, where the picture is negative going, and its cathode is taken to a tap on the potential divider R2 R3 R4 R5. This is more positive than the anode and so the diode does not conduct. A positive waveform from the line flyback is passed through C2, which differentiates it with R7 and produces an additional negative spike which occurs after the flyback and coincides with the back porch. This passes to the cathode of D1 and lowers its potential enabling it to conduct.

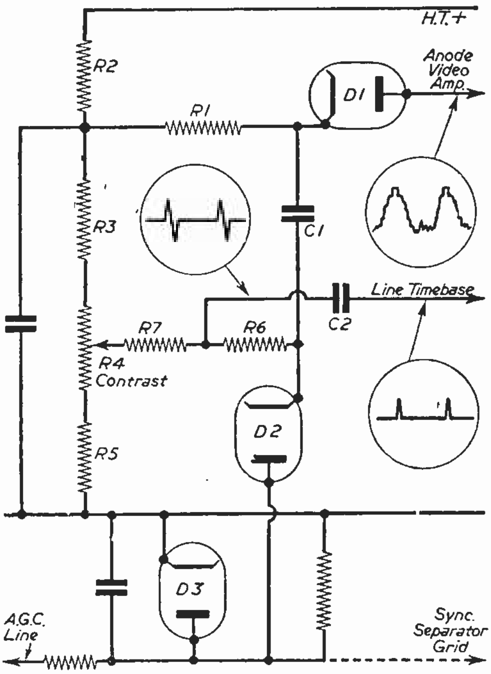


Fig. 7.—Gated A.G.C. D1 is the diode gate, D2 the A.G.C. rectifier, D3 for protection.

When this happens there is virtually a short between the junction of R1 C1 and the video anode and so this point (R1 C1) will assume the potential of the latter, which will be more negative when the signal is greater and which is handling the back porch at the instant D1 opens up.

The negative voltage pulses produced at R1 C1 corresponding to the true value of the signal are passed to the cathode of D2, causing it to conduct, and a steady negative D.C. voltage is built up at this diode's anode, smoothed by an R-C network, the equivalent of the "time constant" box in flywheel sync. and applied to the grids of the I.F. and R.F. stages to bias them back and reduce the gain. Contrast is varied by R4, which fixes the standing voltage at the cathode of D2, which has to be overcome before it can conduct. Its action is therefore to provide a ceiling at which the signal strength is automatically levelled out.

Additional refinements to the circuit in practice include the taking of the bottom of R3 to the anode of one of the controlled I.F. valves. This gives a cumulative action to the whole arrangement by lowering the positive bias on the cathode of D1, providing a more exaggerated control when small changes in signal are involved. D3 is usually added as a protection device which short circuits the A.G.C. line in the event of a fault causing positive voltages to be present. In conjunction with the cathode bias of the I.F. and R.F. valves it also acts as A.G.C. delay, preventing attenuation of very weak signals, and it is labelled thus in some diagrams.

In the absence of such a device a fault would cause the set to run at full gain and burning-up around the vision detector and video amplifier would result. This kind of damage can also occur during the warming-up period until the line timebase starts, and most circuits arrange for a limiting voltage to be applied from either the sync. separator grid or the sound A.V.C. to keep the output at a safe value temporarily. Some rather odd conditions arise at the instant the A.G.C. takes over from the protection device and on some sets the sound fades out for a moment at this point.

Variations on this system are many. Triodes are used in place of diodes and the gating is then performed in a manner similar to the coincidence detector. Two excellent examples are given in the August, 1957, issue (page 9), and no further reference need be made here. A number of circuits show triodes strapped as diodes and pentodes used as triodes, and this is merely a matter of convenience in production. Various semi-conductor diodes are found in A.G.C.

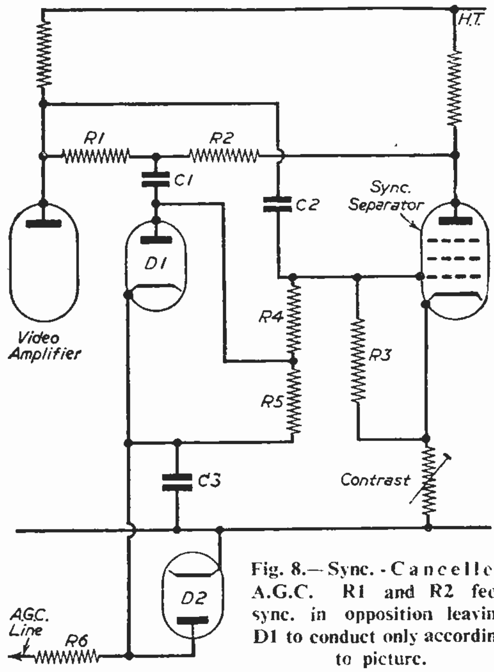


Fig. 8.—Sync.-Cancelled A.G.C. R1 and R2 feed sync. in opposition leaving D1 to conduct only according to picture.

systems, and although exact replacements should be fitted where possible, most functions can be met by the use of either an OA70 or OA71 (Mullard), which between them make a good emergency stock.

Sync. Cancelled System (Fig. 8)

This type of control is found in some sets by H.M.V. and Philips, etc. The anode of D1 is fed with the composite video waveform from the video amplifier via R1. A sync. pulse exactly

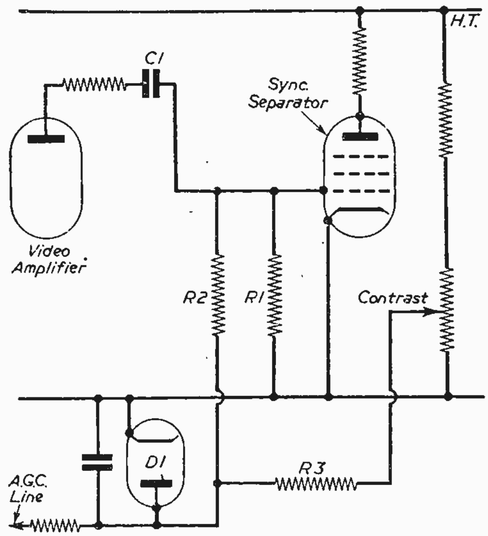


Fig. 9.—Non-gated A.G.C. The negative sync. grid voltage, being roughly proportional to the signal is used as bias for the I.F. stages.

equal and of opposite polarity to the one included in the composite waveform is introduced at the same point via R2. This cancels out the sync. present in the combined waveform and a positive voltage proportional to picture content only is built up on D1 cathode. A heavier negative voltage proportional to the combined video signal is built up on the sync. separator grid. These two voltages meet at the bottom end of R5 and a negative voltage corresponding to the sync. only is produced, as the two picture voltages, being opposite to each other, cancel out. This sync. voltage is decoupled by C3R6, with D2 for protection, and fed as A.G.C. to the R.F.-I.F. amplifier. The contrast control in the cathode of the sync. separator varies the negative grid voltage and the positive voltage at the cathode of D1 by like amounts. The negative A.G.C. output due to their difference is therefore proportional to the setting of this control and varies the picture accordingly.

Due to the independence of this system from the line timebase, nothing is needed by way of overload protection during the warming up period.

Simple A.G.C.

This type of circuit is not a true A.G.C. system since it does not discriminate between a fading picture and a darkened scene, but as quite a number of viewers like to increase the brightness during night scenes in a play, perhaps this is not such a terrible failing as it sounds. Many leading manufacturers have quietly introduced it to their models in place of the gated systems, and since no hue and cry has been raised by the "black level fanatics," nobody seems to have noticed any difference. In essence Fig. 9 is the same as the circuit on page 10 of the August issue, which can be successfully fitted to most sets that require it, and its operation relies on the fact that a heavy negative voltage, roughly proportional to the incoming signal, is available at the grid of the sync. separator. It is passed back via R2 and the usual filter and protection circuit to the front end valves, and provides good control in the majority of cases. In extreme fringe areas where there are wide variations of signal it is not so effective as the gated method. Control of contrast is provided by a potentiometer between H.T. and chassis and the amount of A.G.C. fed back to the I.F. stages depends on the ratio of the negative voltage at the end of R2 to the positive voltage at the end of R3.

Flutter Reducer (Fig. 10)

This is not an A.G.C. system at all, but its inclusion in some sets by Murphy and Ferguson make it worth mentioning. It can be fitted, like the previous system, to any set, and simply comprises the insertion of a .1μF condenser between the video amplifier anode and the cathode of the C.R.T., thus losing the D.C. component. To keep the cathode voltage right for the brightness control and to provide a return path for beam current, R1 and R2 are fitted as a potential divider and adjusted so that the voltage at their

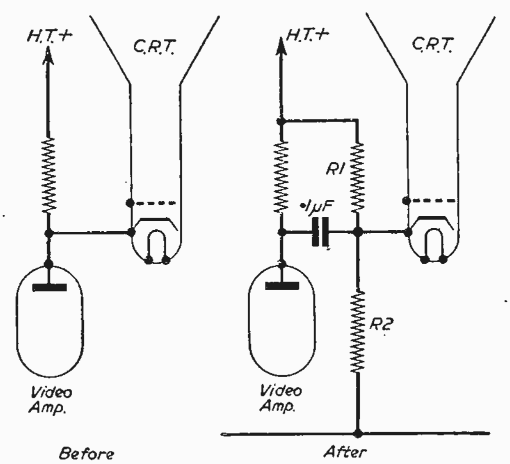
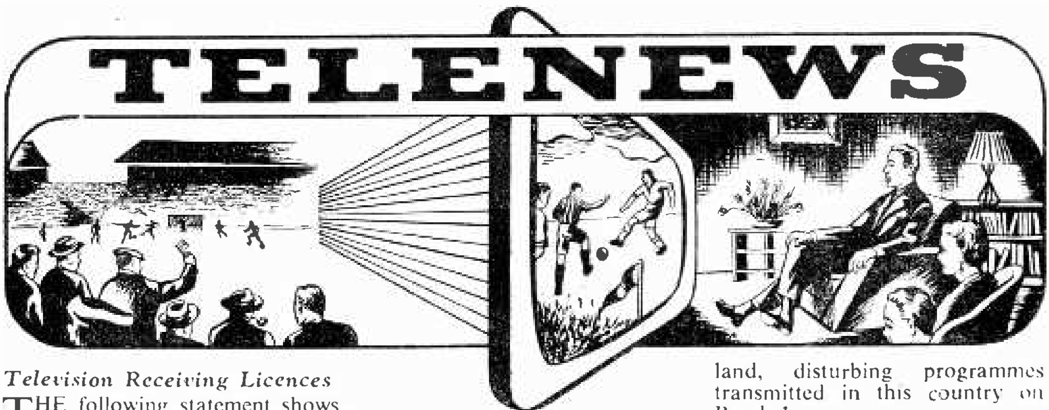


Fig. 10.—Flutter Reducer. C1 loses D.C. component. R1 and R2 maintain C.R.T. cathode voltage constant.

junction is about the same as the voltage at the anode of the video amplifier. The fitting of such a modification will also enable the contrast and brightness to be adjusted independently of each other.



Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of November, 1957, in respect of television receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London Postal	1,538,077
Home Counties	928,705
Midland	1,249,377
North Eastern	1,220,599
North Western	1,079,918
South Western	574,976
Wales and Border Counties ...	431,934
Total England and Wales ...	7,023,586
Scotland	558,828
Northern Ireland	74,770
Grand Total	7,657,184

1,000,000 Ekcovision Receivers

HISTORY was made by E. K. Cole Ltd. on December 11 when the 1,000,000th Ekcovision receiver came off the production line at the Southend-on-Sea works. E. K. Cole Ltd. is the first British radio firm to announce the production of one million television receivers.

The millionth set—a 17in. table receiver with V.H.F. radio (Model T311)—was presented by Mr. E. K. Cole, the chairman and managing director, to Nurse E. M. Howling, who accepted it on behalf of a local children's home.

The presentation ceremony, which took place in the works, was attended by the Mayor of Southend (Councillor Fred. J. Woods, J.P.), directors, senior executives and works employees.

Cost of Failure

THE high cost of failure on American television is illustrated by the cancellation of plans to present a new Columbia Broadcasting System programme "The Seven Lively Arts" every Sunday afternoon for 26 weeks. As a result of unfavourable reactions, the number of showings has been reduced to ten.

The show business publication "Variety" says: "The network will write it off as a £446,000 experiment."

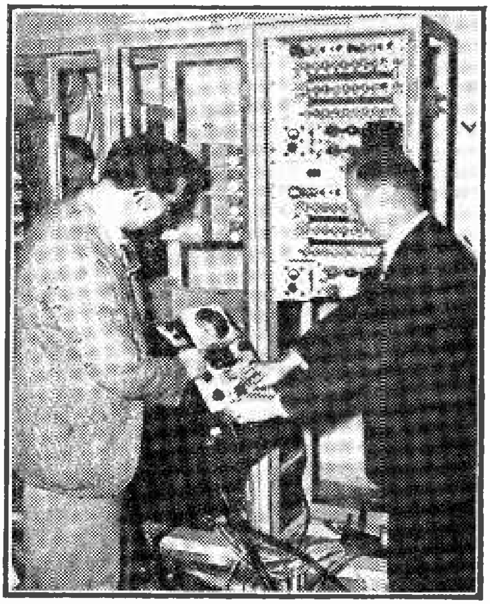
Australian TV Seen in New Zealand

"HIGHLY successful" reception of Australian TV programmes has been reported by Pye engineers in Auckland, New Zealand, over 2,000 miles away. Pictures and sound were described as "perfect" for four hours on November 19th.

Similar long distance reception has been reported from other countries in recent months and is likely to be due to abnormal atmospheric conditions which have also been affecting reception of TV transmissions in many parts of this country. Afternoon programmes, including those for schools, have been particularly affected. Unusual activity in the upper atmosphere has caused a "scatter" effect on transmissions from as far as Greenland, disturbing programmes transmitted in this country on Band 1.

This is the peak of the 11-year sunspot cycle, and the greatest effect has been on the 45 Mc/s band, which is TV Band 1. Conditions are expected to improve from now on.

A Pye dealer in Bury, Lancs, has reported hearing a American police transmission on a TV set accidentally switched to Channel 1 on November 15th. An American voice was heard calling "Car 68" and reporting a vehicle theft. The transmission was heard intermittently for two



A small part of the technical section at the new studios for T.W.W. Limited (Independent Television for South Wales and the West of England) at Pontcanna Farm, Cardiff. In this picture, Mr. Nathan, Senior Television Engineer and Mr. G. Ibsen are setting up a pulse generator with an oscilloscope.

hours, but the station was unidentified.

The report from New Zealand follows a recent similar report of record long-distance reception in New York, when sound and pictures from the BBC were picked up on six out of seven days by engineers of Press Wireless, Inc., using a British-made set.

BBC Test Transmissions

THE morning trade test transmissions, which are radiated from all BBC television stations to assist the radio industry and trade in the testing and adjustment of television receivers, have been extended.

As from Monday, November 25, these tests have been extended to 1 p.m. Mondays to Saturdays inclusive. In addition, the first hour of the trade test, 10 a.m. to 11 a.m., which in the past has been transmitted on reduced power (except from the stations at Truleigh Hill, Blaenplwyf, Douglas and Rosemarkie), is now at full power from all stations. The tests may for technical reasons be subject to interruption and variation in power, but such interruptions will be kept to a minimum. Should it become necessary to operate any of the transmitters on reduced power during the trade tests a special signal will be transmitted to indicate this. It will consist of either Test Card C bearing the words "Reduced Power" or the transmission for a period of one minute in every five of a vision signal in the form of a horizontal bar pattern accompanied on sound by tone at a frequency of 250 c/s.

Cameras for Television Centre

THE BBC announces that it has placed orders for 30 television camera channels for the new television centre now being built at White City, London. Fifteen channels will be supplied by E.M.I. Electronics Ltd. and fifteen by Marconi's Wireless Telegraph Co. Ltd. The cameras will use 4½in. tubes of the image orthicon type. This type of camera tube has been decided upon after extended trials under the conditions of operation that will be encountered.

It is hoped that three of the studios at the new television centre will be brought into operation during 1961, and a fourth early in 1962. Of the 30 camera channels ordered, four working channels and one spare channel will be installed in each of the two larger of these studios, and three working channels and one spare channel in each of the other two studios. Others will be used as spares, and the remainder for equipping additional studios.

A new television-assisted welding plant designed to overcome the difficulties associated with interior welding of steel pipes has been designed by Quasi Arc Ltd. The plant makes use of Marconi industrial television equipment to overcome the problems of alignment of the welding head with the seam to be welded and after-inspection.

New I.T.A. Stations

A SITE has been chosen at Burnhope, approximately five miles south-east of Consett, for the I.T.A.'s transmitting station in the north-east of England. The station will be entirely equipped by Marconi's Wireless Telegraph Company who are to supply vision and sound transmitters, combining units and programme input equipment in addition to aerials and feeders. Twin eight-stack horizontally polarised quadrant directional aerials mounted on a 750ft. stayed mast have been chosen to provide the maximum coverage, having regard to the population distribution of the region. No channel has yet been allocated.

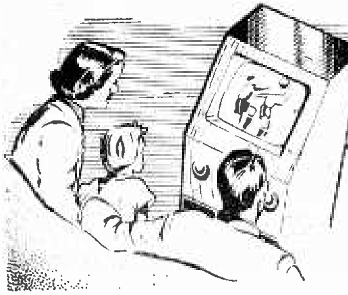
Work has begun on the Authority's transmitting station at Chillerton Down, Isle of Wight, another Marconi equipped station, which will serve approximately 2½ million people in Hampshire and the surrounding area. This will be the first I.T.A. station to be equipped with the new Marconi 4 kW vision transmitter, details of which were recently announced. Twin eight-stack vertically polarised directional aerials mounted on a 750ft. high stayed mast will be used, designed to give a coverage pattern similar to that provided by the I.T.A. transmitting station at Emley Moor, Yorkshire. The station will use Channel II.

Bid for Baird Museum

ADDRESSING the Scottish Radio Industry Club in Glasgow (December 4), Mr. William Harries, chairman of R.G.D. — Regentone — Argosy, announced that he would launch a fund for the preservation of John Logie Baird's home as "a museum and monument to a great Scottish genius."

Mr. Harries told nearly 100 Scottish dealers: "As soon as I return to London the wheels will be set in motion. Every British and American television manufacturer will receive a letter from me—an appeal for funds to preserve Baird's birthplace.

"Everything within the four walls is just as it was in Baird's time, furniture, workroom, etc..."



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

Detectives Galore

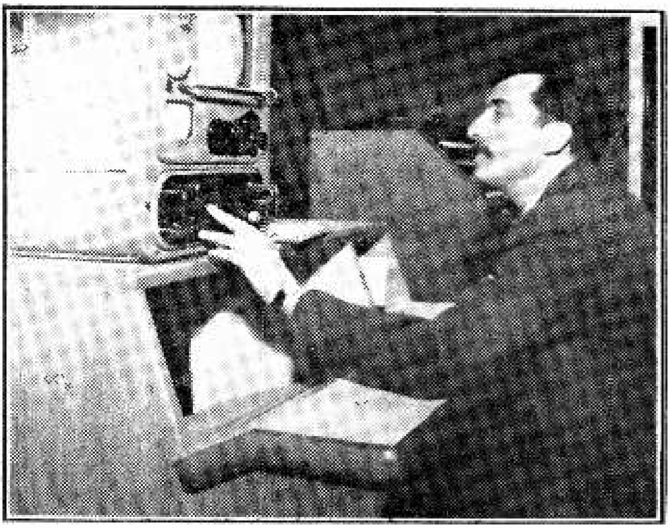
DETECTIVE and crime series plays continue to be highly popular in spite of stories and scripts which are often so elementary that Doctor Watson wouldn't bother to refer them to Sherlock Holmes! Mark Sabre's adventures, a British series which has achieved a great success in America, is decidedly in the kindergarten category. Much more effective is Granada's "Shadow Squad," with Peter Williams as the detective unravelling not-so-obvious murder mysteries to the accompaniment of oh-so-obvious (but excellent) musical background. In episode two, the voices were a bit woolly, though whether this was due to bad microphone placement or a poor landline from Manchester, I could not tell. A voice purporting to come from a telephone receiver was clearer than some of the voices in the room, which indicated a considerable loss in "top" on the normal microphone set-up in the studio. This lack of top and brilliance on sound is all too common on I.T.A. transmissions. Sometimes one gets the impression that the picture receives the prime consideration and sound is left to take care of itself. The contrary is the case for television plays in which the dialogue is of major importance. Producers sometimes make matters worse by having the actors rattle off their lines machine-gun fashion, under-emphasise key words or plot lines, drop the last syllables of words, slur or throw away lines. This is said to be "natural acting." With the television sound regulated at low in the home (so that it won't wake the baby!) all this arty-craftiness merely means that the dialogue becomes inaudible. When will producers learn! The customers want to hear what is said—and will switch off if they don't.

Audience Reactions

FOR many years there have been grumbles about the hearty laughter of studio audiences on sound radio. Grumbles continue about the live audiences in the television theatres and studios, both on the BBC and the I.T.A. The general criticism is that the laughter and applause appears to be regimented, with the audience only too anxious to react to the "applause" electric sign or the mute exhortations of the assistant producer on the stage (known, for some obscure reason, as the "Studio Manager").

Synthetic Laughter

THE fact of the matter is that the audiences are usually too responsive in their encouragement to the actors. They rarely have to be cued for applause: on the contrary, they have to be kept down and cut short as much as possible. Normal generous applause, lasting a few seconds or half-a-minute, seems to be larger than life either on radio or television, both in time and volume. It may sound "canned" or automatic, but it is invariably genuine appreciation. On the other hand the applause and laughter on filmed television playlets, such as the Burns and Allen series, "I Love Lucy" and other American comedy features, is invariably added on afterwards. There is no doubt at all that it adds very considerably to the comedy atmosphere, especially with



Granada TV Centre, Manchester—an engineer checks picture quality by press-button switching to different camera circuits. A light control console can be seen in the background.

situation comedies. There are literally hundreds of different types of laughter and applause sound tracks, which are skilfully selected, edited and dubbed on to the dialogue tracks. The experienced comedy television film director and editor introduce pauses of just the right length for the various shades of laughter, and it is welded together in re-recording to make one composite sound track of dialogue, music, effects, laughter and applause. Mind you, this operation has to be done with great care; it is a craftsman's job. Well done, it sounds far more authentic even than a real live audience in the studio. Why is the laughter added on in this synthetic manner, you may ask. The reason is that the making of a half-hour comedy episode takes up to two or three days, with rehearsals, when put on to film—and is a more polished job than can be obtained with telerecording. The final cutting and editing imparts the final polish and slickness.

"The Guinea Pig"

ONE of the best-produced television plays for a long time was Warren Chetham Strode's "The Guinea Pig," already well known by its successful film version and by the sound radio play. This time the difficult part of the scholarship boy at the big public school was brilliantly played by James Kenney, who succeeded in conveying the subtle polishing up and ageing process of the character during the four years stay at the school. Equally sensitive performances were given by Michael Hodern, as the house-master who resented the presence of a boy without "background," and George Baker as the master who favoured the experiment on the young guinea pig and helped him with sympathetic understanding. Technical values, sets and camera work were all first-class, and there was no self-conscious arty-craftiness about the direction of producer Cliff Owen. The play lasted ninety minutes and held you for that time without difficulty.

Growing Pains

THE I.T.A. programme companies are suffering from growing pains. Having overcome their initial struggles for existence, losing hundreds of thousands of pounds in their first year's operation, they began to break even, and last year reached the stage of recouping earlier losses. They have now taken the initiative and are becoming more and more ambitious, with new ideas in presentation, bigger production budgets, more and better equipment, expanding staffs, long-term planning. The premises, however, have not been expanded correspondingly with the greater demands upon space. Hence the growing pains.

I.T.A. Lease and Lend

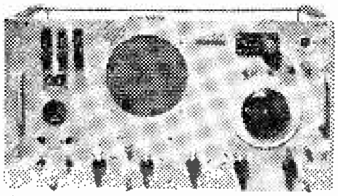
FOR the time being there is a considerable amount of leasing and lending of accommodation and equipment going on. For instance ABC-TV. borrowed the newly fitted up Granada Television Theatre in Chelsea for their pantomime "Cinderella." Unfortunately, the Granada Theatre is not yet fitted up with telecine, so the filmed interpolations had to be sent by line from Rediffusion's fine telecine plant at their Wembley studios. In the provinces, Granada have similarly found it necessary to hire the ABC-TV. Theatre at Didsbury, Manchester, to cope with the overflow. The position in that important area is particularly difficult, in spite of the excellent facilities provided at the Granada Television Centre in Quay Street. Lancashire and Yorkshire are possibly the most important areas for television in the country, not only on account of the colossal potential viewing public, but because the impact of television, and particularly of television commercials, is greater there than in any other area. Lancashire and Yorkshire folk take their television very seriously, much to the disadvantage of the theatres, music halls and cinemas in those counties. Advertisers appreciate the value of these areas for television advertising, with the result that they can be neatly divided into two: Lancs and Yorks, and these have become the two biggest plums in the I.T.A. pie. Commercials are often divided in the same programme, some going to the Lancashire transmitter, while a different selection go simultaneously to the Yorkshire one.

The International Voice

THE export market for British-made commercials for television is expanding at the same time as the increased sales of British television films and telerecordings. So far as commercials are concerned, these can be used for many territories where British products, soaps, detergents, cigarettes, cars and so forth are sold. In many cases the picture content, either cartoon or photographic scene, is quite acceptable, but the voice on the sound track has to be changed. This is where voices clear of any particular accent are essential. Voices which are understandable in any countries where English is spoken may be said to have international appeal. The varying volume and quality of the sound tracks of commercials has also caused trouble at home and abroad. Some commercial sound tracks are very fully modulated, with compression on the recording, and they roar out at great volume on viewers' receivers as compared with other tracks which are more delicately recorded and have no compression. Compression in recording frequently results in the automatic contraction of, say, 24 db into 12 db. It brings up minor sounds, and "irons out" light and shade to some extent—but it bangs out the advertiser's sound message in no uncertain manner. Naturally, the advertising people like it this way. Some commercials are lacking in sibilants and consonants—others have them very strongly registered, depending upon the microphones used, the frequency characteristics and the general handling of the recording by the studio engineers. This variety of volumes and qualities is a problem for the sound control people of the I.T.A. programme companies. There is little time to rehearse the tracks, so that volume and frequency corrections can be satisfactorily made manually. Failing the standardisation of volume and quality in recording, ways are being found to even things out automatically, and A-T.V. are making interesting experiments to find a cure for this trouble. I hope that it results in toning the ballyhoo of the loud commercials *down*—not to bring the weak ones up!

SPUTNIK-SPECIAL

SHORT-WAVE RECEIVER 10-60 Mc/s (5-30 Metres) RECEPTION SET TYPE 208



Complete with 6 valves. 2-6K8G, 2-EF39, 6Q7G and 6V6G. Internal mains power pack and 6 v. vibrator pack. Built-in 6½" speaker. Muirhead slow-motion drive. B.F.O. and R.F. stage. Provision for 'Phones and Muting and 600 ohm. Input 100/250 v. A.C. and 6 v. D.C. Size 21 x 18 x 12. Weight 70 lbs. In metal transit case. All sets in new condition and air tested.

£6. 19. 6. Carr. 15/6.

BE PREPARED TO LISTEN TO THE SATELLITES.

FT241A 72nd HARMONIC CRYSTALS IN MEGACYCLES

32.5	32.7	36.4	36.6	at 5/-
32.6	36.3	36.5	36.7	each

QUARTZ CRYSTALS

FT243 Fundamentals

80 Types 5706.667 kc/s to 8340 kc/s. (In steps of 33.333 kc/s). 120 Types 5675 kc/s to 8650 kc/s. (In steps of 25 kc/s).
(*Excluding Types* 7000/7300 *and* 8000/8300).
5/- EACH

Complete Sets of 80 Crystals	£6 0 0
Complete Sets of 120 Crystals	£7 10 0

7000 kc/s to 7300 kc/s. in steps of 25 kc/s.
8000 kc/s. to 8300 kc/s. in steps of 25 kc/s. **7/6** each

FT241A—54th HARMONIC

80 Types 20 Mc/s to 27.9 Mc/s. (In steps of 100 kc/s.)
(Excluding 24/25.9 Mc/s. and 27 Mc/s.)

5/- EACH — Complete Set of 80 Crystals. **£6.**

24/25.9 Mc/s. and 27 Mc/s., at 7/6.

100 Kc/s Gold Plated D.T. Cut ...	15/-
100 Kc/s Two Pin 10x... ...	15/-
150 Kc/s Two Pin Round ...	12/6
160 Kc/s Two Pin 10x ...	12/6
200 Kc/s FT241A ...	10/-
500 Kc/s FT241A ...	7/6
500 Kc/s Brook's ...	15/-
2500 Kc/s Octal ...	12/6
5000 Kc/s Piezo 2-Pin Holder ...	12/6

P.O. TYPE 4B CERAMIC

100 Kc/s. 819.6 Kc/s.
163.9 Kc/s. 1000 Kc/s. **15/-** EACH

CERAMIC 2-PIN BANANA PLUG

15.010 Kc/s. ; 16.135 Kc/s ; 16.435 Kc/s. ; 18,025 Kc/s. ; 15.110 Kc/s. ; 16,335 Kc/s. ; 16,700 Kc/s. ; 18,125 Kc/s.

7/6 EACH

MARCONI, S.T.C. 2-PIN 10X FUNDAMENTALS IN KILOCYCLES

1544.4	1700	2055	3280	10.245	10,823
1561.1	1727	2065.75	3310	10.300	10,856
1566.5	1749	2067.5	3317.5	10.433	10,878
1566.75	1761	2087.5	3390	10.445	11.437
1572.5	1764.5	2089	3440	10.501	11.501
1579	1775	2090	3630	10.511	11.526
1588.68	1780	2118.25	3850	10.534	11.587
1613.25	1815	2196	3920	10.545	11.751
1650	1870	2261	3960	10.557	11,788
1668.2	1875	2295	4210	10.567	11.814
1674.9	1890	2312	4860	10.622	11.851
1680	1900	2315	10.166	10.755	11,876
1680.5	1981	2430	10.189	10.767	12,685
	2012	3270	10,233		

at 7/6 each.

MINI-TWO

TWO-TRANSISTOR MINIATURE POCKET RADIO. The smallest Transistor set offered on the market. Variable Tuning. Drilled Chassis, Plastic Case size 3in. x 2in. x ¾in. Miniature Hearing Aid, 2 Transistors and all components including 1½ volt Battery, Circuits and full practical layout diagrams.

Total Cost **49/6** Complete.

"EAVESDROPPER"

THREE-TRANSISTOR POCKET RADIO
(No Aerial or Earth required)

Medium Wave, Variable Tuning. Total cost, as specified, including Transistors, Transformers, Coils, Condensers and Battery, etc., with circuit and plastic case.

All items sold separately. **77/6** POST FREE

With single 'phone, 81/-. With Acos Mike, 90/-. With Min. Hearing Aid, 90/-.

The New "TRANSISTOR—8"

Push-Pull Portable Superhet—**Can be Built for £11 10/0.**

This Portable 8 Transistor Superhet is tunable for both Medium and Long Waves and is comparable in performance to any equivalent Commercial Transistor Set. Simplified construction enables this set to be built easily and quickly into an attractive lightweight cabinet supplied.

We can supply all these items including Cabinet for **£11 10/-.**
All parts sold separately.

Send for circuit diagrams, assembly data, illustrations and instructions, and full shopping list FREE.
Post 3d.

Call and hear demonstration model.

373 MINIATURE I.F. STRIP 9.72 Mc/s.

The ideal F.M. conversion unit as described in "P.W." April/May 1957. Complete with 6 valves, three EF91's, two EF92's and one EB91, I.F.T.'s, etc., in absolutely new condition. With circuit 42/6 (with valves).
Postage and Packing 2/6 (either type). **12/6** (less valves).

EVERSHED WEE-MEGGERS

500 v. good condition with leather case	£8 19 6
500 v. brand new with leather case...	£12 10 0

T.C.S. CRYSTALS. 3-PIN TYPE 249, IN KILOCYCLES

1522.5	1700	2070.3	2105	2667.5
1572.5	1962.5	2072.5	2410	2865
1665.5				

at 7/6 each.

TRANSMITTER RECEIVER
Army Type 17 Mk. II

Complete with Valves, High Resistance Headphones. Hand-mike and Instruction Book and circuit.

- Frequency Range 44.0 to 62 Mc/s.
- Range Approximately 3 to 8 miles.
- Power requirements: Standard 120V H.T. and 2V L.T.

Ideal for Civil Defence and communications.

BRAND NEW **59/6**
Calibrated Wavemeter for same, 10/- extra.

"HOMELIGHT"
2 Transistor Personal Portable
Variable tuning.

We can supply all components including 2 Transistors, Diode, Resistors, Condensers and Miniature Hearing Aid and Plastic Case size 4½ x 2½ x 1¼ and 1½V Battery. FOR 52/6. All items sold separately.

R.F.24, **10/-**. R.F.25, **12/6**. R.F.26, 25/-.
Brand new with valves, carr. 2/6.

5-VALVE A.C. D.C. PORTABLE RADIO-GRAM CHASSIS THREE WAVE BAND SUPERHET, 200/250V A.C. D.C.
(With Internal Aerial)

Short Wave 16-50 m. Medium Wave 187-575 m. Long Wave 900/2000 m. (With Gram. Switching)
Well-known Manufacturer's product complete with Five Marconi Valves, type: X109, W107, DH107, N108 and U107 and 7 x 4 Elliptical Speaker. Ideal for Portable Radio-Gram. Chassis size: 19 x 4 x 9in.

£7. 12. 6. P.P. 7/6

Also available as above at the same price, similar chassis with following specifications: Short Wave 11.27—31.9 m. Short Wave 31.2—91 m. Medium 187—575 m. and Gram. Switching.

WALKIE/TALKIE TYPE 38. TRANSMITTER RECEIVER.

Complete with 5 Valves. In new condition. With circuit. These Sets are sold without Guarantee, but are serviceable.

22/6 p.p. 2/6.

H'Phones 7/6 pair. Junction Box, 2/6. Throat Mike, 4/6. Canvas Bag, 4/-. Aerial Rod, 2/6.

SEND STAMPS FOR NEW 1958 28-PAGE CATALOGUE. OPEN MONDAY to SAT. 9-6. THURS. 1 o'clock.

HENRY'S RADIO LTD.

5 HARROW ROAD, EDGWARE ROAD, LONDON, W.2. TEL.: PADDINGTON 1008-9

CORRESPONDENCE

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

DABBLERS

SIR,—Recent issues of PRACTICAL TELEVISION have contained so much correspondence critical of radio and television retailers and their staffs that one must sadly conclude that editorial policy is to deliberately foster animosity towards the professional trade.

In all types of work there are good and bad people, the latter fortunately being always a small minority, but whenever a trade or organisation comes under fire it is always the unscrupulous minority which is held up as an example to the public.

Little has been said of the average dealer in the radio and TV trade who always endeavours to do an honest job skilfully and at the lowest possible cost consistent with losing on the job. For the majority of us there is too much competition to even entertain the idea of deliberately misleading people as to the condition of their sets. Nothing at all has been said of irresponsible customers who avidly desire their luxuries but are not at all prepared to pay for the inevitable upkeep.

Many, like myself, in the professional trade made their early beginnings as dabblers, home constructors, etc., owing much to the various amateur and hobby publications. I freely admit that without PRACTICAL TELEVISION I would know a whole lot less about television. I'm absolutely in favour of service information being freely available to anyone who desires it—jolly good luck to anyone who wants to go ahead and try their hand at comprehensive servicing with few resources other than ability and pride in a job well done. We all of us can do spare-time work free or for next-to-nothing—time is not at a premium or overheads existent, but when use is made of the service provided by a business undertaking the hard facts of economic life appear.—DEREK WRIGHTSON, G3BTO (Cleveleys).

[*The policy of this journal is not to denigrate television retailers or their staffs. It is, however, part of our policy to expose radio rackets, and whilst we readily acknowledge that there are many honest traders we do not agree with you that their number is large. Daily we receive complaints of dishonest trading, and have done so over a long period of years.*—ED.]

SPECIAL NOTE

Will readers please note that we are unable to supply Service Sheets or Circuits of ex-government apparatus, or of proprietary makes of commercial receivers. We regret that we are also unable to publish letters from readers seeking a source of supply of such apparatus.

A C.R.T. TESTER

SIR,—Many thanks to Mr. J. Hillman for a worthwhile and valuable piece of servicing equipment, "C.R.T. Tester and Rejuvenator," in December issue.

I feel that an amendment must be made with reference to Cathode to A1 leak (S3 position 3). This, I think, should read cathode to grid leak. Having had faults of this nature I noticed that this not uncommon fault was missing.

Hoping this will help any readers who are contemplating building the tester.—G. AUNGIERS (Preston).

PROJECTION SCREEN

SIR, With the object of being helpful to your correspondent of Burslem, Mr. G. M. Worthington (December, 1957, issue), may I point out there is no such thing as "crystal beaded paint." The beads are blown on to a rubber surface and embed themselves into the base. This material can be bought from many cine dealers at about 5s. per square foot.

A cheap, but quite efficient method is to paint the smooth side of hardboard (required size) with two or three coats of "flat" white. When absolutely dry, paint with silver paint (not varnish type) which has the amyl-acetate medium. This can be obtained from any Halfords' shop. Better results are obtained with a spray-gun.—W. CHESTER (Barnsley).

BIG SCREENS

SIR,—I would like to tell of a conversation I overhead by some workmates. One was saying that if he was getting another TV he would get a 21in. screen, so he could see more. So I remarked "See more in what way," and the reply was, "For instance, if a race was on and they were following the horses to the post a person with a 21in. screen would see the winning post before a person with a 12in. screen." I was amused at this and walked away.—W. COOPER (Doncaster).

AERIAL DESIGN

SIR,—Should your correspondent, R. Brown, or any other reader, have any difficulty in fully understanding the relationship between aerial design and bandwidth a simple explanation is available in terms of Q.

One formula for the "Q" of a resonant device or circuit is: $\frac{f}{f_1-f_2}$ or in other words the resonant frequency divided by the bandwidth.

$$\frac{\text{Resonant Freq.}}{\text{Bandwidth.}}$$

The Q increases as the elements increase.

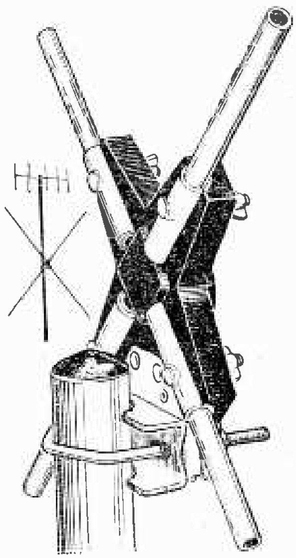
For a resonant frequency of 51 Mc/s and a bandwidth of 3 Mc/s, this permits a maximum Q of 17. This figure is much higher than that which is normally obtainable.

Thus it will be seen that lack of bandwidth is not necessarily due to the aerial. It is more likely to be due to mismatch of the aerial and feeder.—Your faithfully, H. W. CRITCHLEY, A.M.Brit.I.R.E.

News From the Trade

Antex Array 1X1

THE Antex array, model 1X1, which was previously fitted with pole clamps, has now been modified and incorporates a universal mast clamp so that it can be fitted to all types of masts up to 2in. diameter.



The new mounting for Antiference's Aerial array type 1X1.

The accompanying illustration of the new array shows how it can be fitted to any part of mast, which is very useful where conditions demand additional height for a Band 3 array.

The price of the 1X1 array is 42s. 6d. retail. —Antiference Ltd., Bicester Road, Aylesbury, Bucks.

Philips Thermocouple Wire

A NEW type of thermocouple wire is now being marketed by Philips Electrical Limited. It has been specially designed for measuring a wide range of temperatures under extreme conditions, e.g., surface and working temperatures of all kinds of heat-treated materials, of furnaces, working machine parts, and in heating and cooling installations. It is particularly suitable for use in atomic energy plants, steel mills, the mechanical engineering and motor industries, and in many other situations where an alternative temperature-measurement method would be impracticable.

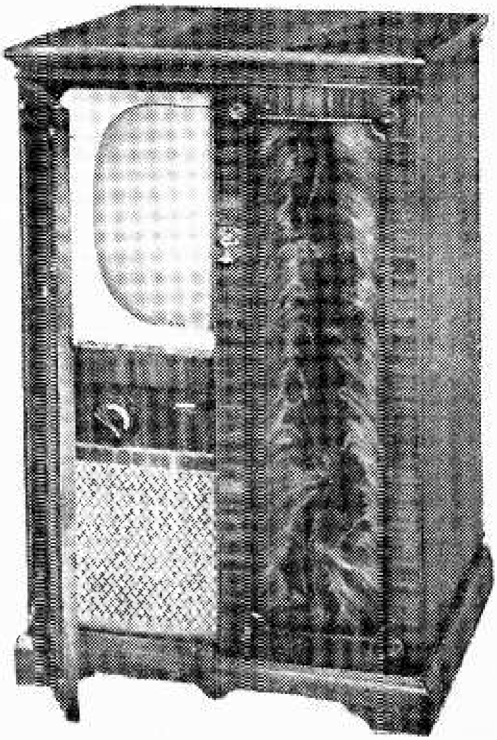
Four different types are available for temperatures ranging from minus 200°C. up to plus 1,000°C. with ceramic packed single or double core in metal sheathing. Diameters vary between 0.5 mm. and 1 mm., according to type. The wire can be bent to a curve having only five times the wire diameter and into any configuration without risk of earthing or shorting the cores. It has extremely low heat capacitance at the hot junction and, therefore, a high response sensitivity. Suitable for high-pressure working conditions, it requires no additional insulation, is simple to instal and is ideal for multi-point measurement where space is limited.—Philips Electrical Ltd., Century House, Shaftesbury Avenue, W.C.2.

A New 21in. Television by Dynatron

THE new 21in. Dynatron console television receiver, "Chippendale," is now in production. It is designed for the customer who desires luxury viewing and listening combined with a superb cabinet.

The "Chippendale" has a 23-valve A.C. mains chassis designed for long life. It consists of a 12-position high gain, low-noise turret tuner providing coverage for all BBC/I.T.A. television transmissions plus the unique feature of pre-tuned reception of the BBC's V.H.F. radio broadcasts. Gated automatic picture control provides pictures of constant range even when signal strength may be varying. Interference limiters are included in both vision and sound channels and a stabilised EHT supply maintains a constant picture size over any variation in picture content.

Excellent sound reproduction is ensured by a high quality amplifier with push-pull output together with a large wide range loudspeaker. The complete receiver is built as a single unit inside a metal frame making it easily removable from the cabinet for servicing. A craftsman-built cabinet in the Chippendale style and finished in matching mahogany veneer completes this luxury instrument. Retail price 210 gns.—Dynatron Radio Ltd., The Firs, Castle Hill, Maidenhead.



A fine Chippendale design in the Dynatron range.

PREMIER RADIO CO.

(Regd.) B. H. MORRIS & CO. (RADIO) LTD.

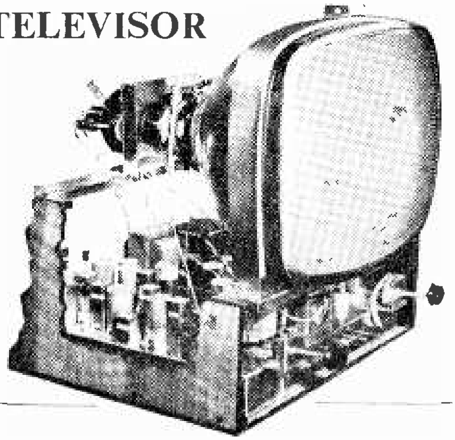
OPEN TILL 6 P.M. SATURDAYS

(Dept. P.T.2) 207, EDGWARE ROAD, LONDON, W.2

Telephone : AMBASSADOR 4033 PADDINGTON 3271

Build the NEW "MAYFAIR" TELEVISOR

which gives complete SAFETY to the constructor !



These Televisors use a double wound mains transformer which gives you complete safety from contact with the mains supply when handling the chassis or controls.

★ **B.B.C. & I.T.A. DESIGN** With New Turret Tuner may be built for **£33.7.11** plus cost of C.R.T.

Build in 5 easy stages. Full Construction details available.
Instruction Book, 3/6 Post Free.
Console Cabinets with full length doors for 14in., 16in., and 17in. tubes. Price **£14.14.0.**
H.P. Terms : Deposit **£7.7.6** and **9** monthly payments of **18/6.**
Console Cabinets. Half door **£12.12.0.**
H.P. Terms : Deposit **£6.6.0** and **8** monthly payments of **18/3.**
On above cabinets add **21/-** for pkg. and carr.

The "Petite" PORTABLE

MAY BE BUILT FOR

£7·7·0

plus 3/- post & packing.

★ Size only 8in. x 8in. x 4½in.

Batteries extra.

HT **10/-** (Type B126) or equivalent.

LT **1/6** (Type AD 35) or equivalent.

Battery eliminator now available for **37/6.**

The New De-Luxe TAPE RECORDER TR 3

for £6.5.0 DEPOSIT & 8 MONTHLY PAYMENTS OF £5·17·11 OR CASH 45 GNS.
plus 21/- post & pkg.

Write for details of the New PREMIER TAPE RECORDER KIT for £33.15.0.

Case finished in Red and Cream with gilt styling and fittings. Size 18½in. x 15in. x 9in. for A.C. Mains 200/250 v. 50 cycles.
TRADE ENQUIRIES WELCOMED

8-WATT AMPLIFIER

This design includes 5 miniature Valves of the latest types, an Ultralinear Output Transformer suitable for Speakers of 3 and 15 ohms and a very attractive Perspex front panel with gold lettering, complete set of parts, £8.8.0.

Postage & Packing, 5/- extra.
Instruction Book 1/6.

RECORD CHANGERS

Collaro RC456—£9.15.0. Dep. **£1.5.0** & **8** monthly payments of **£1.5.9.**

Staar Galaxy ... £9.15.0. Dep **£1.5.0** & **8** monthly payments of **£1.5.9.**

AT LAST !

PREMIER RADIO COMPANY Have opened a branch in the middle of the West End at

23, TOTTENHAM COURT ROAD

The best HI-FI Showroom in the district.

Telephone : MUS. 3451.

RECORD PLAYERS

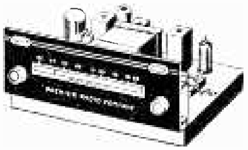
Collaro 4/554 — £7.7.0
Collaro Junior — £4.14.6

B.S.R. TU8
3 speed record player
£3.19.6.
plus 2/6 postage & packing.

WHY buy surplus or reconditioned tubes when these Fully Guaranteed Wide Angle Tubes are available ? The latest type 17in. Rectangular Tube MW43/64 by Telefunken at £17 (inc. tax) post and packing 21/- extra. Also 14in. Rectangular Tube type 14 LPA **£13.17.6** (inc. tax) pkg. & carr. 15/- extra.

NEW F.M. TUNER

for the Home Constructor



A new design using the latest circuit techniques. Includes 4 valves plus magic eye tuning indicator, permeability tuning and an integral power supply. Two controls only, a gear driven slow motion tuning control and an output volume control with on/off switch. Suitable for fringe area reception.

All components may be purchased for **£8.15.0,** plus postage and packing 3/6.

OR less Mains Transformer & Rectifier **£7.12.6**, plus postage and packing 3/-.

Power requirements H.T. 230 v. 50 mA., L.T. 6.3 v. 1.5 A.
Dial size 3½in. x 11¾in., overall size 11⅝in. long, 5¼in. deep, 4½in. high. Instruction Book 1/6.

Your Problems Solved

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 349 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

EKCO No. T164

Recently we have had trouble which started with fuses blowing fairly frequently. Finally one part of the set is getting really hot, so much so that the solder melted from one wire joining on to it.

The part is green and is situated between the two fuses. Does the fact that the part is getting very hot indicate that this part needs replacing? If so, what is the part?

If this is not the case could you explain the cause and how it can be rectified?—W. Boyd (Peterlee).

The part which is getting hot is the 225 ohm dropping resistor which feeds the 200 milliamp chain of valves. These are the ones labelled "20 . . ." and also the U801. This latter is the usual one to give rise to your symptoms and should be replaced.

Before doing so check that all four of the 50 ohm surge limiters underneath (which feed from the mains transformer to each of its anodes) are intact as your fault may soon re-occur if they are not.

ENGLISH ELECTRIC T40

Up till Christmas last year I had four valves replaced on E.H.T. system of the set. The picture is always on dark side with brightness control just about fully advanced. However, last Christmas the tube finally went, so I was told, and a new one fitted, same type, Mullard 17in. 43-64 rectangular. The picture is still on dark side with brightness fully advanced accompanied with like a net over picture, in the form of diagonal lines closely placed and sometimes wavy, giving a net effect over whole picture. It has been present for some time. I have been told it is patterning from a near-by Holm Moss aerial. Some time ago this aerial was removed but I am afraid my patterning remained. My set is tuned to Pontop Pike. Most evenings, due to darkness of picture, it is not worth viewing as compared with other sets.—James Fitzgerald (Middlesbrough).

Remove the aerial, turn down the contrast control and advance the brightness control. If the raster, which should now be present, is reasonably bright, then the poor picture may be caused by a weak aerial signal, particularly if you are situated in a difficult reception area. Make sure that you are using the best channel for your location, and, if necessary, attend to the aerial in an endeavour to improve the picture.

PYE VT4

This set is 12 months old. The picture is quite good but it does not fill the screen at top and bottom. There is a $\frac{3}{4}$in. blank space at the bottom and a $\frac{1}{4}$in. at the top. I cannot increase the picture height as the control is at maximum. By turning up the brightness the picture will then fill the screen but it is flat. As I have not got a service sheet can you please tell me where to look for the fault.—B. Painter (Worcester).

Check the condition of the ECC82 and PL82 valves which are situated in the far left-hand corner of the chassis, close to the brightness control, and replace if low emission.

PETO SCOTT 1210

Recently a fault has developed in the frame hold. After the set has been switched on for about half an hour or so the picture starts moving downwards. The frame hold control is at its limit, and sometimes I can stop the slip by increasing the height of the picture, but this is only for a short time, and then the slip increases its momentum, and I can't do anything to stop it.

I have fitted a new ECL80 valve and a new PL38, and whilst I was on the job I fitted a new EY51 valve in place of a U151; the dealer said it would suit. Other than the frame slip the picture is a very good one. I might add that all the other valves are good, having almost renewed them all.—R. Shaw (St. Helens).

Although you state that you have replaced the ECL80 you do not state whether the valve is actually the frame timebase ECL80. If this is so, check or replace the resistors associated with the frame hold control centre slider or contact.

VIEW-MASTER TUNER

I have recently built the View-Master three-station tuner after converting V.M. to I.F. amplifier. Up till now I have not bothered about the I.T.A. owing to the distance being too great, i.e., Birmingham. I have just been using the tuner for Wenvoe, Channel 5, with, I might say, very good results; much more gain in signal than I can use.

However, now that I.T.A. are opening a station near Wenvoe, i.e., Channel 10, St. Hilary, I decided to tune in this station with a signal gen. I did not hope to pick up the signal direct because of the temporary low power which I.T.A. is working on, 1Kw., later 100 Kw.

But the result was I could not get the osc. to oscillate any farther than 90 Mc/s; no amount of adjustment to the coils of Band III would bring me more than 90 Mc/s. Note I was on the Channel 8 switch. The sig generator was tested and found to be ± covering — 210 Mc/s 1 per cent. accurate. I would be obliged for your guidance.—J. W. Grice (Chippenham).

Difficulty in making the tuner oscillator circuit function above 90 Mc/s may be due to either too high an inductance for the tuning coil, in which case one turn can be removed, or possibly too high a capacity in the oscillator circuit as might occur if the fine tuner was badly mounted and was thereby throwing an excessive capacity across the circuit.

MARCONI VC53DA

The auxiliary controls for width, vertical hold, horizontal hold are at end of slide, left-hand side when viewed from rear. Picture is broken at top. Can you advise me as to necessary replacements?—John J. Sullivan (Amersham).

It is quite likely that a failing B36 valve (small valve next to left side KT33C) is being aggravated by a deteriorated metal rectifier (14A86). Therefore we would suggest that both these items be replaced, with the KT36 being tested to clear this of suspicion.

ULTRA V814

I have been having trouble with the volume control switch on my set. I wish to replace it with a new one, could you please tell me what size and value I should have to get?—D. King (Wingerword).

The correct control for your set is a ½ megohm with a double pole switch. It is stocked at most dealers as a standard item and may have too long a spindle, or a wrong shaped "flat." These should be checked before fitting, and if you need to cut or file the spindle do it with the body of the control in a plastic bag to prevent filings getting into the "works."

PYE VT17

After approximately two hours running the picture breaks up into lines—the horizontal hold having no effect, neither has the preset control. Sometimes it worsens and the picture closes in from the sides and disappears altogether.

If I switch off and then switch on again a few minutes later there is still no picture and no line whistle.

Upon examination I found that the EY86 was not glowing. Does it need replacing or is it something more obscure?—R. Robinson (nr. Oldham).

You should replace the PCF80 line oscillator valve located in the centre of the chassis, just behind the main input plug.

FERRANTI 20T4

Although a fairly good picture is obtainable, brightness control is at maximum travel. Should picture be dull and contrast increased to brighten the picture, white highlights turn negative. Since replacing faulty frame oscillator valve picture comes on as 6in. square increasing to fill the screen then disappears. After approximately two minutes picture forms over whole screen at once. I have no test equipment, but have a service sheet. —J. W. Ormerod (Ellesmere).

Whilst the dull, negative picture could well be due, and probably is, to a failing cathode-ray tube, it would be advisable to replace the PZ30 H.T. rectifier which you may find will clear most of the fault conditions.

BUSH 43

Recently I have been troubled by a very fine white line which appears about half-way up the screen and this is more noticeable when the picture is light, it doesn't show much when the pictures are duller. I have had the ECL80 valve changed twice; the first time it cured the fault, but the last time it failed to do so. I must say the line does not spoil the picture quality but I would like to know what the cause of it is? Maybe the last valve is not up to the mark, but why should this particular valve keep giving this trouble? Is there another that may cause it, if so could you please tell me the number and where it is situated in this particular set?—F. W. Berwick (nr. Pershore).

We are inclined to think that the ECL80 valve is the cause of the trouble, as even new valves can have this slight defect which causes the appearance of the white line.

MURPHY CONSOLE V180C

A series of bright lines approximately $\frac{1}{8}$in apart have appeared over the picture, running down about 2in. from the top of the tube. There does not seem to be any fold over of the picture.—W. J. Tew (Leamington Spa).

The trouble you describe is slow frame flyback, and this is probably due to a faulty 6K25 frame generator which is second from the right on the row on top of the timebase deck as you look from the back.

Failing this a leaky condenser in the associated circuits could cause such a trouble, as could incorrect settings of the brightness and contrast controls.

If this latter is the case you will notice some change in picture quality as well.

EKCO T207

When the set is first switched on a perfect picture appears. After a few moments the picture disappears entirely and a high pitched heterodyne appears. On switching off and on again the heterodyne disappears and the picture comes on once more. By continually switching on and off eventually after some 15 minutes the set settles down for a period of about an hour. Could you please tell me where to check?—J. W. Armitage (Leeds).

We would suggest you check the U25 E.H.T. rectifier which is soldered beneath the plastic dome of the line output transformer. If the valve glows or flashes purple whenever your fault

(*Continued on page* 349)

SETS & COMPONENTS

MAKE YOUR AERIALS with our 'fully' machined parts. Examples: Band 1, "H," complete with lashings, for **£3/10/-**; 5 Element, Band 3, with folded dipole, mast and clamp for **45/-**. Get further details from our illustrated lists and data on all aerials, sent for 1/- P.O. SKYLINE WORKS, Burnsall Rd., Coventry. (Tel.: **60418.**)

TELEVISIONS, 9in. models, **£7/10/-**, 12in. models **£13/10/-**, 12in. 5-Channel models, **£19/10/-** each; all working; carriage paid. Send for list. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23. (FOR 5497.)

LOUDSPEAKERS repaired promptly. MODEL LOUDSPEAKER SERVICE, Bullington Rd., Oxford.

GUARANTEED TELEVISION, 12in. 5-Channel models; first-class picture. **£26** each, carriage paid. THE GRAMOPHONE SHOP, 19-21, Brockley Rise, London, S.E.23.

5-CHANNEL TELEVISIONS: 12in. screen Ferguson 988, Ekco 161, etc., **£22** each. A good selection of 12in. T/Vs (London), 100% condition, from **£12**; 9in. from **£7**, also 12in. T/Vs, slight faults, from **£5**; 9in. from **£3**. TYLER TELEVISION, 63, Lee High Rd., Lewisham, S.E.13. (LEE 5979.)

TELEVISIONS, NEEDING ATTENTION, 9in.-10in. models **£4/10/-** each, 12in. models **£6/6/-** each, 15in. models and Philips's Projection models **£11/10/-** each; immediate despatch; carriage paid. BARKERS, 325, Brockley Road, S.E.4. (TID 6752.)

TELEVISION TUBES. Good quality reclaimed and guaranteed for 6 months, as supplied to the trade throughout the British Isles; 14-15-16in. **£5**; 17in. **£6**; c.w.o., or proforma carriage, **15/-**. (Smaller sizes available, but in short supply. TELETUBES, 34 and 18, Market Parade, Rye Lane, Peckham, S.E.15. (Tel.: New Cross 4551.)

12IN. T.V., out of order, **£5**; working O.K., **£10**; 12in., 5-channel, **£15**; 14in. from **£18**. Auto Radiograms from **£15**. Callers only. JOHN GILBERT TELEVISION (SHE 8441), 1B, Shepherds Bush Rd., London, W.6.

TELEVISIONS, 12in. 5 channel, **£14**; 14in., **£18**; 17in. **£27**; Faulty Sets from **£2**. WILKINSON'S, 146, Goldhawk Rd., W.12. (SHE 4379.) Callers only.

DIPOLE INSULATORS, 1in. boom, ½in. elements, suitable T.V. or F.M. Dipoles, **5/-**. P.O. with order. C. & H., 2a, Mona Street, Liverpool, 7.

MAKING YOUR OWN? Telescopes, Enlargers, Binoculars, Microscopes, Projectors, or, in fact, anything that needs lenses. Then get our booklets "How to Use ex-Gov. Lenses & Prisms," Nos. 1 & 2, price **2/6** ea. Also our stereo book, "3-D Without Viewers," price **7/6**. Comprehensive list of lenses, optical, radio and scientific gear free for s.a.e. H. W. ENGLISH, Rayleigh Road, Hutton, Brentwood, Essex.

UNREPEATABLE OFFER.—12in., 5 channel T.V., **£15**; 14in., **£22**; good working order. C. EDWARDS, 1070, Harrow Rd., London, N.W.10. (Phone: LADbroke 1734.)

RATES: 4/- per line or part thereof, average five words to line, minimum 2 lines. Box No. 1/- extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Television," Tower House, Southampton St., Strand, London, W.C.2.

SIGNAL GENERATOR

Coverage 120 kc/s—84 Mc/s. A.F. modulation or unmod. R.F. Accuracy, 2%. A.C. Mains 230/250 v. Complete **£4.19.6.** P./Ins. **4/6.** **SIGNAL and PATTERN GENERATOR.** 7.6 Mc/s.—210 Mc/s in five bands (fundamentals). Accuracy 1%. A.C. Mains 200/250 v. Complete **£6.19.6.** P./Ins. **6/-.** **The RADAR KILOVOLTER.** Range 3-30 kV. Measures E.H.T. volts. **£3.15.0.** P./Ins. 2/6. The famous **BRAYHEAD** 12-Channel Turret Tuner. State set make and model No. **£6.19.6.** P./Ins., **2/6.** Send 3d. stamps for lists.—**WESTWAY RADIO, 5, Westward Way, Harrow, Middx.**

TELEVISIONS, all sizes and channels, at lowest prices ever! Also a few tubes. Trade supplied. HYNES, 9, Cumberland St., Victoria, S.W.1. (TAT 9140.)

LIMITED SUPPLY.—Indicator Units, Type 95, containing VCR97 with mu-metal screen, 20 valves, 2 VR92, 2 VR54, 4 CV118, 12 VR65, plus pots, switches, H.V. condenser, Muirhead S.M dial, double deck chassis and crystal—as new. **42/-** (carr. 10/-). Also Indicator Units, Types 6A and 6F containing VCR97 with mu-metal screen, 4/VR91, 3/VR54, good condition, **21/-** (carr. 8/-). PARK GATE & CO. LTD., 54, West Lower St., Carlisle.

I.F. STRIP 373, new, with valves, **42/6.** Test Sets: 74A with 10 valves, VCR139A and 50-cycle power pack, fair condition, **50/-** (carr. 8/6). BC1066 VHF Receiver, valves, 2/957, 1/1D8GT, new, **15/-** (p. 3/6). Responser ZC8931, 160/190 mc/s; new, with valves, **15/-** (carr. 7/6). Brand New RF26, 27, **25/-** (post 3/-); RF26, 27, good cond., **20/-**. Metal Rectifiers: 240v. 100 mA., **4/-**; 240v. 30 mA., **3/6**; 1,000v. 30 mA., **7/6.** Chokes, L.F., 10H, 120 mA., Screened, **7/6**; 5H, 200 mA., **4/6.** VHF Amplifier, valves 2/CV66, 1/VR136, with 50 c. power unit, **40/-** (p.p. 3/6). Test Meters: New, 4 x 4 x 2¼in.; read 1.5 and 3v., 60 mA. and 5kΩ, **12/6.** TS347 contains 10 mA., 3¼in. meter, res., etc., **8/6.** TS350 with 1 mA., 3¼in. meter, valve TP25, etc., **30/-**. Meters, contain 2 separate micro-amp. movements and 2 neons, new, **10/-**. Formers ¾in. dia., twin dust cores, can 2 x 1in. dia., 9d. Indicators RDF1B, new, 2/VR65, 1, VR66, less VCR139A, **10/-**. Metal Boxes, 6½in. cube, with 2 Bel/Lee insulated terminals and metal toggle switch (ideal for charger), new, **5/-**. Transformer 230v. to 6.3v., CT 3A., with 4 panel fuses and 2 toggles, DPST, in metal box, new, **10/6.** List and enquiries, s.a.e. please! Terms, c.w.o.: postage extra; immediate despatch. SUPERADIO (WHITECHAPEL) LTD. (P.T.), 116, Whitechapel, Liverpool, 2.

T.V. TUBES £1, including carriage ! ! ! This ridiculous price owing to slight screen burns. Perfect picture. Ideal for stand-by or for testing 14in. and 17in. rectangular. DUKE & CO., 621/3, Romford Road, Manor Park, E.12. (Tel.: ILF. 6001-3.)

ELECTRADIO.—Dual Wave Coil **2/6** with circuit, ditto, plus Reaction **4/-**, Tuning Condenser **3/10**, Crystal Diode **1/6**, tested 4 Transistor Set Circuit, **1/3.** All Transistor Components stocked. Post free. 18, Broadlands Av., Keynsham, Somerset.

R.F. UNITS, Types 27 or 26, **22/-**; 25 or 24, **9/-**; brand new, with valves, post, 3/-. E.W.S. CO., 69, Church Rd., Moseley, Birmingham.

RECLAIMED TUBES, 12in., 14in., 17in., all at **£5** each, guaranteed; 100 (5 channel) T.V., Ekco 161, Ferguson 988, **£15** each. C. EDWARDS, 1070, Harrow Rd. (Phone: LADbroke 1734.)

17IN. TV. CABINETS, surplus to maker's requirements. Limited quantity only, **22/6** plus 5/- carriage. Large stocks of Valves, Tubes (all sizes), and Components at surplus prices. Let us quote by return for your requirements. ACE RADIO SERVICE, 109, Bensham Lane, Thornton Heath, Surrey.

CATHODE RAY TUBES, used, but in good working order, and with 3 months' guarantee. All 12in. to 17in. Mazda, Mullard and Emitron types at **£4/10/-** each, plus **13/6** carriage. Orders and enquiries by letter only to: BHP DISTRIBUTORS, 379, Staines Road, Hounslow, Middlesex.

TUBES, high grade, reprocessed by our own system; guaranteed. Old tube required for exchange, postage, insurance, 15/-. TELEVISION TUBE SUPPLIES, 135, Frances Rd., Birmingham, 30.

VALVES from 1/6. Radio, T.V. Components, low prices. Lists 3d. J. PALMER, 32, Neasden Lane, N.W.10.

NEW SHOP IN LEEDS.—We are stocking Spares for Radios and T.V.s. New and surplus Valves. Bring this ad. for free valve testing this month. We have plenty of reduced Aerials and Converters in stock for callers only. T.V. SPARES, 41, Call Lane, Leeds, 1.

T.V. TUBES as new; revacuumed, all makes; 6 months' straight guarantee: 12 in. **£5**, 14in. **£5/10/-**, 17in. **£7/10/-**; carriage and insurance 12/6. U.K. Free delivery Greater London. VIDIO REPLACEMENT CO., Hales St., Deptford High St., London, S.E.8. (Tideway 4506.)

FOR SALE

SUPERTONIC SUNLAMPS, listed £7/10/-; **80/-**. S.A.E. SCIENTIFIC PRODUCTS CO., Cleveleys, Lancs.

VALVE CARTONS. Miniatures 10/6, "GT's" **12/-**, "G's" **14/-** per 100, plus 2/- p. & p. RHS, 155, Swan Arcade, Bradford, 1. Lists free.

CO-AXIAL CABLE, low loss 7/0076, 75 ohm, **7d.** yd.; c.w.o.; under £2 add 1/6 p. and p. J. HARRISON, 26, Thurleigh Rd., London, S.W.12.

P.T. SUPERVISOR 16IN. T.V., mask and filter tube, perfect, less cabinet. 57, Broughton Crescent, Weymouth, Dorset.

WANTED

ALL TYPES OF VALVES REQUIRED for cash. State quantity and condition. RADIO FACILITIES LTD., 38, Chalcot Road, N.W.1. (PRImrose 9090.)

NEW VALVES WANTED. EY51, EY86, PCF80, PL81, 5Z4G, U25, or what have you? Prompt cash. RHS, 155, Swan Arcade, Bradford, 1.

SERVICE SHEETS

SERVICE MANUALS/Sheets Tel/Radio for hire. Sale and wanted. Mixed Manuals and Sheets, 12 for 10/-; s.a.e. enquiries. W. J. GILBERT (P.T.), 24, Frithville Gdns., London, W.12.

SERVICE SHEETS for sale and hire. Radio/T.V.; s.a.e. enquiries. J. PALMER, 32, Neasden Lane, N.W.10.

SERVICE SHEETS for sale and hire. Radio, T.V., Electrical, Army, Navy, Air Force Equipment. SULTAN RADIO (P.T.), 11, Old Bond St., London, W.1.

SITUATIONS VACANT

AGENTS REQUIRED to sell I.T.V. Converters, Aerials, etc.; s.a.e. for details. G. A. STRANGE, N. Wraxall, Chippenham, Wilts.

EDUCATIONAL

A.M.I.P.R.E.—For details of suitable study courses (only a limited number of students accepted) send for free Syllabus of Instructional Text. I.P.R.E. Conditions of membership booklet 1/-. "The Practical Radio Engineer," journal, sample copy, 2/3; 6,000 alignment peaks for Superhets, 6/-. All post free from SECRETARY, I.P.R.E., 20, Fairfield Road, London, N.8.

11 + EXAMINATION.
Write for FREE 24-page GUIDE and Test, stating age of child to: THE REGISTRAR (Dept. M7), Mercer's Correspondence College, 69, Wimpole St., London, W.1.

FREE ! Brochure giving details of Home Study Training in Radio, Television and all branches of Electronics. Courses for the Hobby Enthusiast or for those aiming at the A.M.Brit.I.R.E., City and Guilds, R.T.E.B. and other Professional examinations. Train with college operated by Britain's largest Electronics organisation. Moderate fees. Write to E.M.I. INSTITUTES, Dept. PT28, London, W.4.

LEARN IT as you do it—we provide practical equipment combined with instruction in Radio, Television, Electricity, Mechanics, Chemistry, Photography, etc. Write for full details to E.M.I. INSTITUTES, Dept. PT47, London, W.4.

BUILD YOUR OWN T/V and learn about its operation, maintenance and servicing. Qualified engineer-tutor available while you are learning and building. Free Brochure from E.M.I. INSTITUTES, Dept. PT58, London, W.4. (Associated with H.M.V.)

RADIO AND TELEVISION COMPONENTS

We operate a prompt and efficient MAIL-ORDER Service
13d. stamp (only) for Catalogue.

JAMES H. MARTIN & CO.
FINSTHWAITE, NEWBY BRIDGE, ULVERSTON, LANCS.

FIRST-CLASS TELEVISION and RADIO COURSES . .

GET A CERTIFICATE!

After brief, intensely interesting study —undertaken at home in your spare time—**YOU** can secure your professional qualification or learn Servicing and Theory. Let us show you how !

FREE GUIDE

The New Free Guide contains 132 pages of information of the greatest importance to those seeking such success compelling qualifications as **A.M.Brit.I.R.E., City and Guilds Final Radio, P.M.G. Radio Amateurs' Exams., Gen. Cert. of Educ., London B.Sc. (Eng.), A.M.I.P.E., A.M.I.Mech.E., Draughtsmanship (all branches),** etc., together with particulars of our remarkable Guarantee of

SUCCESS OR NO FEE

Write now for your copy of this invaluable publication. It may well prove to be the turning point in your career.

FOUNDED 1885—OVER 150,000 SUCCESSES

NATIONAL INSTITUTE OF ENGINEERING
(Dept. 462), 148, HOLBORN, LONDON, E.C.1.

Air-spaced Coaxial Cable, 75 80 ohms, new, 9d. per yd., 70/- per 100 yds. **Meters**, 500 microamps, F.S.D., marked 15/600 v., 2in. dial, 15/-. **12in. Plessey P.M. Speakers**, new, 27/6. **Television Aerials**, Band III Channels 8 9/10, 3-element, 28/6; 5-element, 38/6; 8-element, 53/6; Band I all channels, "H," 77/6; "X", 74/6. **Combined Aerials** from 25/-. Why not send S.A.E. with your aerial enquiry and we will reply by return. We only stock the well-known guaranteed made aerials, thereby giving better value for money. **Pifco All-in-one Radiometer.** A.C./D.C. ranges 0-6-240 volts, 0-30 m/a, also continuity and valve filament tester, 32/6. **F.M. Feeder Cable**, new, standard 300 ohms, 6d. per yd. **Volume Controls**, special offer ½ meg. S.P. Long spindle, 3/-. **Volume Controls**, D/P. 5/6; L/S. 3/6; Pre-set, 4/-. R.M.1, 4/6; R.M.2, 5/6; R.M.3, 7/6; R.M.4, 16/6; R.M.5, 25/-. **Ion-Trap Magnets**, 5/-. **Chrome Car Aerial**, 37/6. **Fidelity 4-speed Autochange Amplified Record Players**, new and guaranteed, 18 gns. **Pifco Electrical Blankets**, new, Single, 67/6; Double, 87/6.

GUARANTEED VALVES

OZ4	5/-	6K8	9/-	B36	19/3	PCC84	12/6
1A5	3/-	6Q7	9/-	EB91	5/-	UBC41	8/6
1LN5	3/-	6AT6	8/-	EL84	10/6	UCH42	8/6
2X2	4/-	6AQ5	8/6	ECL80	12/6	UL41	10/-
3D6	2/6	6SL7	8/-	1625	6/6	W81	18/6
4D1	3/6	6A7	10/-	PY82	8/-	W76	10/6
5Z4	9/6	6BW6	8/-	PY80	9/-	30	12/6
5U4	9/-	6BG6G	19/6			ECC81	9/6
6U7	6/6						

MAIL ORDER ONLY.
NO CALLERS.

Terms : C.W.O. or C.O.D. Minimum C.O.D. charge 3/6. Postage and packing per valve 8d. Under £2, 1/9; £4, 2/3. All Aerials 2/6 carriage.

ELECTRO-SERVICES & Co.
221 BATTERSEA PARK ROAD, LONDON, S.W.11. MAC 8155

A SPENCER-WEST BAND III CONVERTER FOR £6.5.0

The Type 80 with printed circuits, panel controls for Band switch and fine tuning and a performance which ensures enthusiastic satisfaction. Handsomely designed and finished to stand on your receiver with its self-contained power supply it just plugs straight in.

Full descriptive leaflet on request.

Available from all good dealers or post free direct from the manufacturers if any difficulty.

SPENCER-WEST LTD.,
Quay Works, Great Yarmouth, Norfolk.

Phones : Works 4794 ; Sales 3009
Grams : Spencer-West, Great Yarmouth.

COVENTRY RADIO

Component Specialists since 1925

We have now trebled the size of our premises in order to supply a larger range of Components, Amplifiers and Hi-Fi Equipment

Send your enquiries to:
189-191 Dunstable Road, Luton, Beds.

New Telephone No.: LUTON 7388-9

occurs it needs replacing, and the new valve is more conveniently mounted on the top of the plastic.

We assume you have checked the setting of your horizontal hold "H" button, as this will cause blacking out of the picture when hold is lost but in this case turning up the brightness control will reveal a raster.

PYE FV1

I am troubled with a brightening of the raster on the left-hand side of picture looking towards the set.

This bright band is from top to bottom of picture and extends from the left side to almost the centre. The amount or width of band does vary with operation of the line hold control and can be made to just show on the extreme left of picture. At this position the line timebase just locks, any further movement of line hold results in line coming out of lock.

The line linearity and width controls have been adjusted with no effect on fault. Also the line output valve and re-claim diode have been substituted with no effect.—W. Corbindale (Wolverhampton).

The light band on the left side indicates that the C.R.T. is being modulated at line frequency. Try connecting a .1µF capacitor 500v. D.C. from chassis to tag 10 of the C.R.T. If no improvement is obvious, try on tag 2.

EKCO TC174

The vision and sound have gone off. I get a white horizontal line across the centre of the tube; about five of the glass valves do not light up and I had the 10P13 valve tested and found it low on emission. This I have replaced with a new one, but still without results. High tension sparks jump from casing of tube to metal frame supporting it, also U25 valve, which has soldered connections, has a blue flash in it when first switched on. I have not got a service sheet for set, so would be obliged if you could give me some idea of the trouble.—E. W. Mathews (Birkenhead).

The cause of your failure is a break in the 100 mA series of valves (prefixed "10 . . .") and a quick way of finding the offender is with a torch bulb on two wires. When this is bridged across the offending valve heater the rest of the chain will light up. If some of the "10 . . ." series are lit the trouble is a heater-cathode breakdown.

U25 valves normally glow blue just before the picture appears.

PHILCO A1717

When on Channel 8 at about seven o'clock onwards the picture gradually fades until we can hardly see the picture. The BBC station can be received quite good, even when the I.T.A. programme has faded. It also rolls over and over and the vertical hold will not hold it altogether, it will only stop it for a moment and then rolls the other way. I changed the following valves about three month ago which improved it a lot, but it has gone worse now. PL81, PY81, EY51. I have two separate aerials and plug in which ever station we are receiving as this improves our reception quite a lot.—H. Blairs (Porthill).

We would advise you to replace first the PCC84 valve (tuner unit), and then the PCF80. We feel sure that one of these two will be found at fault.

EKCO T221

I have just had the tube out to clean the face of the screen, which was very dirty. On replacing the tube I found the picture was sloping diagonally at about 30 degrees to the right; none of the holds will put the picture horizontal. Please tell me what is wrong and if possible give me a diagram of how to put it right.—S. Dyke (New Brighton).

You have disturbed your scancoils in cleaning the tube face. The adjustment for this is a small brass arm with a hole in it clamped to the scancoils themselves by which they can be rotated around the neck.

You will find this arm just beyond the focus magnet and if you prefer you can move it by using a plastic knitting needle poked into the little hole, as peaky voltages are present around this part.

Your picture may also be out of centre. This may be corrected by the shuffle plate between the scancoils and the focus magnet.

DEFIANT TR1453/T

The least drop in the mains supply and I have trouble and unfortunately one of the peak load periods is around children's hour so you can understand how much trouble I get into. I know very little about televisions but by reading "Practical Television" I have recently replaced PY81 and PL81 and a couple of resistors associated with these valves and whilst the picture is much better I would like to know if there is anything I can do to check this terrible picture on the slightest mains drop?—F. Ward (Chester).

From the description given in your letter, we would be inclined to suspect that the metal rectifier is failing. This is, of course, the H.T. supply rectifier and a note of the connections should be made before renewal.

QUERIES COUPON

This coupon is available until FEBRUARY 21st, 1958, and must accompany all Queries sent in accord with the notice on page 345.

PRACTICAL TELEVISION, FEBRUARY, 1958

Published on the 22nd of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and printed in England by W. SPEAIGHT & SONS, Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A'sia), LTD. South Africa: CENTRAL NEWS AGENCY, LTD. Subscription rate including postage for one year: Inland 19s., Abroad 17s. 6d. (Canada 16s.). Registered at the General Post Office for the Canadian Magazine Post.

C.R.T. ISOLATION TRANSFORMER
Type A. Low leakage windings. Ratio 1:1.25 giving a 25% boost on secondary.
2 v., **10/6**; 4 v., **10/6**; 6.3 v., **10/6**; 10.8 v., **10/6**: 13.3 v., **10/6**.
Ditto with mains primaries, **12/6** each.
Type B. Mains input 220/740 volts. Multi Output 2, 4, 6.3, 7.3, 10 and 13 volts. Input has two taps which increase output volts by 25% and 50% respectively. Low capacity suitable for most Cathode Ray Tubes, **21/-**. Ditto for 6 v. C.R. Tubes only, **17/6**.
Type C. Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 220/240 volts. Output 2-2½-2¾-3 volts at 2 amps. With Tag Panel, **17/6** each.
NOTE.—It is essential to use mains primary types with T.V. receivers having series-connected heaters.

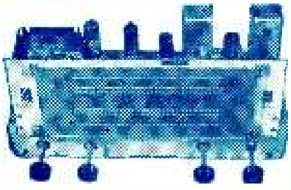
TRIMMERS, Ceramic. 30, 50, 70 pf., **9d.**; 100 pf. 150 pf., **1/3**; 250 pf., **1/6**; 500 pf., 750 pf., **1/9**.
RESISTORS. Preferred values. 10 ohms to 10 meg., ¼ w., **4d.**; ½ w., **4d.**; 1 w., **6d.**; 1½ w., **8d.**; 2 w., **1/-**.
HIGH STABILITY. ½ w., 1%, **2/-**. Preferred values 100 ohms to 10 meg. Ditto, 5%, **9d.**
WIRE-WOUND RESISTORS
5 watt, 10 watt, 15 watt: 25 ohms—10,000 ohms **1/3**, **1/6**, **2/-**
15,000 ohms—50,000 ohms, 5 w., **1/9**; 10 w., **2/3**.

12/6 PURETONE RECORDING TAPE
1,200 ft. on standard 7" Metal reels.
Spools 5" metal, 1/6, 7" metal, 2/3.
FERROVOICE 1,200ft. Plastic Tape 25/- on Plastic Spools.

O/P TRANSFORMERS. Heavy Duty 50 mA., **4/6**. Multiratio, push-pull, **7/6**. Miniature, 384, etc., **4/6**
L.F. CHOKES 15-10 H. 60/65 mA., **5/-**; 10 H. 80 mA., **8/6**; 10 H. 150 mA., **12/6**.
MAINS TRANS. 350-0-350, 80 mA., 6.3 v. tapped, 4 v. 4 a., 5 v. tapped 4 v. 2 a., ditto 250-0-250, **22/6**. Bargain 300-0-300 65 mA., 6 v. 4 a., 4 v. 2 a., **15/-**.
HEATER TRANS. Tapped prim., 200/250 v. 6.3 v. 1½ amp., **7/6**; tapped sec. 2, 4, 6.3 v., 1½ amp., **8/6**; prim. 230 v. Sec. 6.3 v. 7 amp., **10/6**.
ALADDIN FORMERS and core, ¼in., **8d.**; ⅜in., **10d.** 0.3in. **FORMERS 5937/8** and **Cans TV1/2.** ½in. sq. x ¾in. and ⅞in. sq. x 1 in., **2/-** ea., with cores.
TYANA.—Midget Soldering Iron. 200/220 v. or 230/250 v., **16/9.** **Solon Instrument Iron, 24/-.**
MAINS DROPPERS. 3in. x 1¼in. Adj. Sliders. 0.3 amp. 750 ohms, **4/3.** 0.2 amp., 1,000 ohms, **4/3.**
LINE CORD. .3 amp., 60 ohms per foot, .2 amp., 100 ohms per foot, 2-way, **6d.** per foot, 3-way, **7d.** per foot
LOUDSPEAKER, P.M. 3 OHM. 2½in. square, **17/6.** 3in. Goodmans, **17/6**. 7in. x 4in. Goodmans, **21/-**. 3½in. square, Elac., **21/-**. 8in. Plessey, **19/6.** 6½in. Goodmans, **18/6.** 10in. R. & A., **30/-.** T.S.L. Tweeter, LSH75, **8/6.** 12in. Plessey, **30/-.** 8in. M.E. 2.5k field, tapped O.P. transf., **24/6.** 15 ohm Plessey 10 wt. 12in. with Tweeter, **97/6.**
CRYSTAL DIODE G.E.C., **2/-.** **GEX34, 4/-.**
HIGH RESISTANCE PHONES. 4,000 ohms, **16/6** pr.
MIKE TRANSF. 50 : 1, **3/9** ea.; 100 : 1, Potted, **10/6.**
SWITCH CLEANER Fluid, squirt spout, **4/3** tin.
TWIN GANG TUNING CONDENSERS. 365 pf. miniature 1in. x 1½in. x 1¾in., **10/-.** .0005 standard with trimmers, **9/-**; less trimmers, **8/-**; midget, **7/6**; single, 50 pF., **2/6**; 100 pF., **7/-**; 150 pF., **8/6**; solid dielectric 100, 300, 500 pF., **3/6.**
SPEAKER FRET. Expanded Metal Silver, 12in. x 9½in., **2/-** each.
GOLD CLOTH. 17in. x 25in., **5/-**; 25in. x 35in., **10/-.** Tygan 4ft. 6in. wide, **10/-** ft.; 2ft. 3in. wide, **5/-** ft.

All Boxed **VALVES** New & Guaranteed

1R5	8/6	6K8	8/6	EBC33	8/6	HABC80	
1S4	8/6	6L6	10/6	EBC41	10/6		12/6
1S5	8/6	6Q7	10/6	EBF80	8/6	HVR2A	7/6
1T4	8/6	6SA7	7/6	ECC84	12/6	MU14	10/6
2X2	3/6	6SG7	8/6	ECF80	10/6	P61	6/6
3V4	8/6	6V6G	7/6	ECF82	10/6	PCC81	12/6
5U4	8/6	6V6GT	8/6	ECH42	10/6	PCC84	12/6
5Y3	8/6	6X4	7/6	ECL80	8/6	PCF80	10/6
5Z4	10/6	6X5	7/6	ECL82	12/6	PCF82	10/6
6AM6	8/6	12A6	7/6	EF39	7/6	PCL82	10/6
6B8	5/6	12AH8	10/6	EF41	10/6	PEN25	6/6
6BE6	7/6	12AT7	10/6	EF50	5/6	PL82	10/6
6BH6	10/6	12AU7	10/6	Equip.		PY80	10/6
6BW6	8/6	12AX7	10/6	EF50	5/6	PY81	10/6
6BW7	8/6	12BE6	10/6	Sylv.	8/6	PY82	10/6
6CH6	10/6	12BH7	10/6	EF80	10/6	SP61	5/6
6D6	7/6	12K7	8/6	EF92	5/6	UBC41	10/6
6F6	7/6	12Q7	8/6	EL32	5/6	UCH42	10/6
6H6	3/6	35Z4	10/6	EL84	10/6	UF41	10/6
6J5	6/6	80	8/6	EY51	11/6	UL41	10/6
6J6	7/6	954	1/6	EZ40	10/6	UY41	10/6
6J7	8/6	EA50	1/6	EZ81	11/6	U22	10/6
6K6	6/6	EABC80	8/6				
6K7	5/6	EB91	6/6	E1148	1/6	X79	10/6



1958 RADIOGRAM CHASSIS

THREE WAVEBANDS. FIVE VALVES
S.W. 16 m.—50 m. LATEST MULLARD
M.W. 200 m.—550 m. ECH42, EF41, EBC41,
L.W. 800 m.—2,000 m. EL41, EZ40
12-month guarantee.
A.C. 200/250 v. 4-way Switch: Short-Medium-Long-Gram. A.V.C. and Negative feedback 4.2 watts. Chassis 13½ x 5½ x 2¼in. Glass Dial 10 x 4½in., horizontal or vertical available. 2 Pilot Lamps, Four Knobs Walnut or Ivory. Aligned and calibrated. Chassis isolated from mains.

10 gns. Carr. & Ins. 4/6.
TERMS: Deposit £5.5.0 and six monthly payments of £1.
MATCHED SPEAKERS FOR ABOVE CHASSIS. 8in., **17/6**; 10in., **25/-**; 12in., **30/-**.

RECOMMENDED FOR ABOVE CHASSIS
★ COLLARO ★
HIGH-FIDELITY AUTOCHANGER
Model RC456
7in., 10in., 12in. Records
16, 33, 45, 78 r.p.m.
4 SPEEDS—10 RECORDS
With Studio " O " pick-up
BRAND NEW IN MAKER'S BOXES
OUR PRICE £9.15.0. post free
TERMS: Deposit £5.5.0 and six monthly payments of £1.
Space required 14in. x 12½in. 5in. above and 3in. below.
Suitable Player Cabinets. 49/6.
Amplifier Player Cabinets. 63/-.

GARRARD 4-SPEED SINGLE RECORD PLAYER 4SP
Brand new and fully guaranteed 12 months

AUDIO PERFECTION

Designed to play 16, 33, 45, 78 r.p.m. Records. 7in., 10in., 12in. Lightweight Xtal pick-up, GC2 turnover head, two separate sapphire styli, for Standard and L.P., each plays 2,000 records Voltage 200/250 A.C.
OUR PRICE £8.0.0 each. Post Free.
Terms: Deposit £5 and 4 monthly payments of £1. Space required 14in. x 12½in. 3in. above and 2½in. below.
Amplifier Player Cabinets, **45/-**.

ALUMINIUM CHASSIS. 18 s.w.g. undrilled. With 4 sides, riveted corners and lattice fixing holes, 2½in. sides, 7 x 4in., **4/6**; 9 x 6in., **5/9**; 11 x 7in., **6/9**; 13 x 9in., **8/6**; 14 x 11in., **10/6**; 15 x 14in., **12/6**; 18 x 16 x 3in., **16/6.**

TRANSISTORS. Audio, **10/-**. R.F. 2.6 Mc/s, **21/-**. Mullard OC71, **20/-**.

SUPERHET COIL PACK. 27/6. Miniature size 2½in. x 2¾in. x 1½in. HIGH "Q" Dust cored Coils. Short, Medium, Long, Gram Switching. Single hole fixing with connection diagram and circuit. 465 Kc/s I.F.

BUILD THIS REPRODUCER BARGAIN
Special Single Player Kits.
Famous maker's surplus stocks. 4-speed Gram. pick-up unit, **£4 12 6.**
Handsome portable case, 17½in. x 13½in. x 7in., **£2 5 0.**
Ready built powerful amplifier with valves and loudspeaker, **£3 12/6.**
All available separately or if all purchased together, **£9 15/0**, complete kit, post free.

CRYSTAL MIKE INSERT by Acos, precision engineered. Size only 1¾ x 3/16in. Bargain Price **6/6.** No transformer required.

CHAMPION VHF (FM) TUNER, 88-96 mc/s.
5 Mullard valves and superhet tuning heart. Maroon and cream receiver styled cabinet 12 x 6 x 6in. Features: This is a self-powered 200/250 v. A.C. VHF (FM) Adaptor with operating and servicing data and a screened lead for connection to pick-up sockets of any radio, radio-gram or amplifier.
Brand new with 12 months' guarantee. List price, 16 gns. Our price, **10 gns.,** carr. 4/6.
Terms: Deposit £6 and 6 monthly payments of £1

Volume Controls
Long spindles. Guaranteed 1 year. Midget 10,000 ohms to 2 Meg. No Sw. S.P.Sw. D.P.Sw.
3/- 4/- 4/9
Linear or Log Tracks.

80 ohm CABLE **COAX**
Semi-air spaced Polythene insulated. ¼in. dia. Stranded core. Losses cut 50% **9d.** yd
Fringe Quality · Air Spaced, 1/6 yd

COAX PLUGS ... **1/-** **DOUBLE SOCKET 1/3**
SOCKETS ... **1/-** **OUTLET BOXES** ... **4/6**
BALANCED TWIN FEEDER yd. 6d. 80 or 300 ohms.
DITTO SCREENED per yd. 1/-. 80 ohms only.
WIRE-WOUND POTS. 3 WATT. Pre-Set Min. T.V. Type. All values 25 ohms to 30 K., **3/-** ea. 50 K., **4/-.** (Carbon 50 K. to 2 m., **3/-**).
WIRE-WOUND 4 WATT. Pots 2¼in. Spindle. Values, 100 ohms to 50 K., **5/6**; 100 K., **6/6.**
CONDENSERS. New stock. .001 mfd. 7 kV. T.C.C., **5/6**; Ditto, 20 kV., **9/6**; 100 pf. to 500 pf. Micas **6d.**; Tubular 500 v. .001 to .01 mfd., **9d.**; .05, .1, **1/-**; .25, **1/6**; .5/350 v., **1/9**; .1/350 v., **9d.**; .01/2,000 v., **1/9**; .1 mfd., 2,000 volts, **3/6.**
CERAMIC CONDS. 500 v., .3 pf. to .01 mfd., **10d.**
SILVER MICA CONDENSERS. 10% 5 pf. to 500 pf., **1/-**; 600 pf. to 3,000 pf., **1/3.** Close tolerance (+ 1 pF.) 1.5 pF. to 47 pF., **1/6.** Ditto, 1% 50 pF to 815 pF., **1/9**; 1,000 pF. to 5,000 pF., **2/-.**

I.F. TRANSFORMERS 7/6 pair.
465 Kc/s Slug tuning Miniature Can. 2½in. x 1in. x 1in. High Q and good bandwidth. By Pye Radio. Data sheet supplied.
Wearite M800 IF 465 Kc/s 12/6 per pair.

NEW ELECTROLYTICS. FAMOUS MAKES

TUBULAR		TUBULAR		CAN TYPES	
1/350 v.	2/-	100/25 v.	2/-	8+16/500 v.	5/6
2/450 v.	2/3	8+8/500 v.	4/6	16+16/500 v.	6/-
4/450 v.	2/-	16+16/500 v.		25+20/450 v.	5/6
8/450 v.	2/3		6/-	32+32/350 v.	4/6
8/500 v.	2/9	CAN TYPES		32+32/450 v.	6/6
16/450 v.	3/6	Clips	3d.	50+50/350 v.	7/-
16/500 v.	4/-	16/450 v.	3/6	60+100/350 v.	11/6
32/450 v.	5/6	32/350 v.	4/-	100+200/275 v.	
25/25 v.	1/9	64/350 v.	5/6		12/6
50/25 v.	1/9	500/12 v.	3/-	1,000+1,000/6 v.	
50/50 v.	2/-	8+16/450 v.	5/-		6/6

SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGE. K3/25 2 kV., **5/-**; K3/40 3.2 kV., **7/-**; K3/45, 3.6 kV., **7/6**; K3/50 4 kV., **8/-**; K3/100 8 kV., **14/6.** 50 c.p.s. voltage, 30% of above.
MAINS TYPE CONTACT COOLED 250 v. 50 mA., **8/6**; 250 v. 85 mA., **9/6.** Selenium 300 v. 85 mA., **7/6.**
COILS Wearite "P" type, **3/-** each. Osmor Midget "Q" type adj. dust core, from **4/-**. All ranges.
TELETRON. L. & Med. T.R.F., with reaction, **3/6.**
FERRITE ROD AERIALS. M.W., **8/9**; M. & L., **12/6.**
T.R.F. COILS A/HF **7/-** pair. **H.F. CHOKES, 2/6.**
FERRITE ROD 8in. x 3/8in. dia., **2/6.**

JASON F.M. TUNER COIL SET. 26/-. H.F. coil, aerial coil, Oscillator coil, two I.F. transformers 10.7 Mc/s. Detector transformer and heater choke. Circuit book using four 6AM6 **2/-**. J.B. Chassis and Dial, **19/6.**
Complete Jason F.M. Kit, **£5.18.6.**
With Jason superior calibrated dial, **£6.15.0.**

FULL WAVE BRIDGE SELENIUM RECTIFIERS; 2, 6 or 12 v. 1½ amp., **8/9**; 2 a., **11/3**; 4 a., **17/6.**
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amp., **15/6** 2 amp., **17/6**; 4 amp., **22/6.**
VALVE and **T.V. TUBE** equivalent books, **5/-**.
TOGGLE SWITCHES. S.P. **2/-**, D.P. **3/6**, D.P.D.T. **4/-**
WAVECHANGE SWITCHES.
5 p. 4-way 2 wafer long spindle ... ... [illegible]
2 p. 2-way 3 p. 2-way short spindle ... ... [illegible]
2 p. 6-way 4 p. 2-way 4 p. 3-way long spindle [illegible]
3 p. 4-way, 1 p. 12-way, long spindle ... ... [illegible]
VALVEHOLDERS. Pax. Int. Oct., **4d.** EF50, EA50 **6d.** B12A, CRT, **1/3.** Eng. and Amer. 4, 5, 6, 7, and 9 pin, **1/-**. **MOULDED** Mazda and Int. Oct., **6d** B7G B8A, B8G, B9A, **9d.**, B7G with can, **1/6.** VCR97, **2/6**, B98 with can, **2/6.** **CERAMIC** EF50, B7G, B9A, Int. Oct., **1/-**. B7G with can, **1/9**
BLACK CRACKLE PAINT. air drying, **3/-** tin.

NEW AND ENLARGED SHOWROOMS NOW OPEN
OUR WRITTEN GUARANTEE WITH EVERY PURCHASE. Please address all Mail Orders correctly as below

RADIO COMPONENT SPECIALISTS
337 WHITEHORSE RD., WEST CROYDON
OPEN ALL DAY—(Wed. 1 p.m.) *Catalogue 6d.*
Tel. THO 1665. Buses 133 or 68 pass door. 48-hour postal service. *P. & P. 1/-, over £2 post free. (Export Extra.) C.O.D. Service 1/6.*