

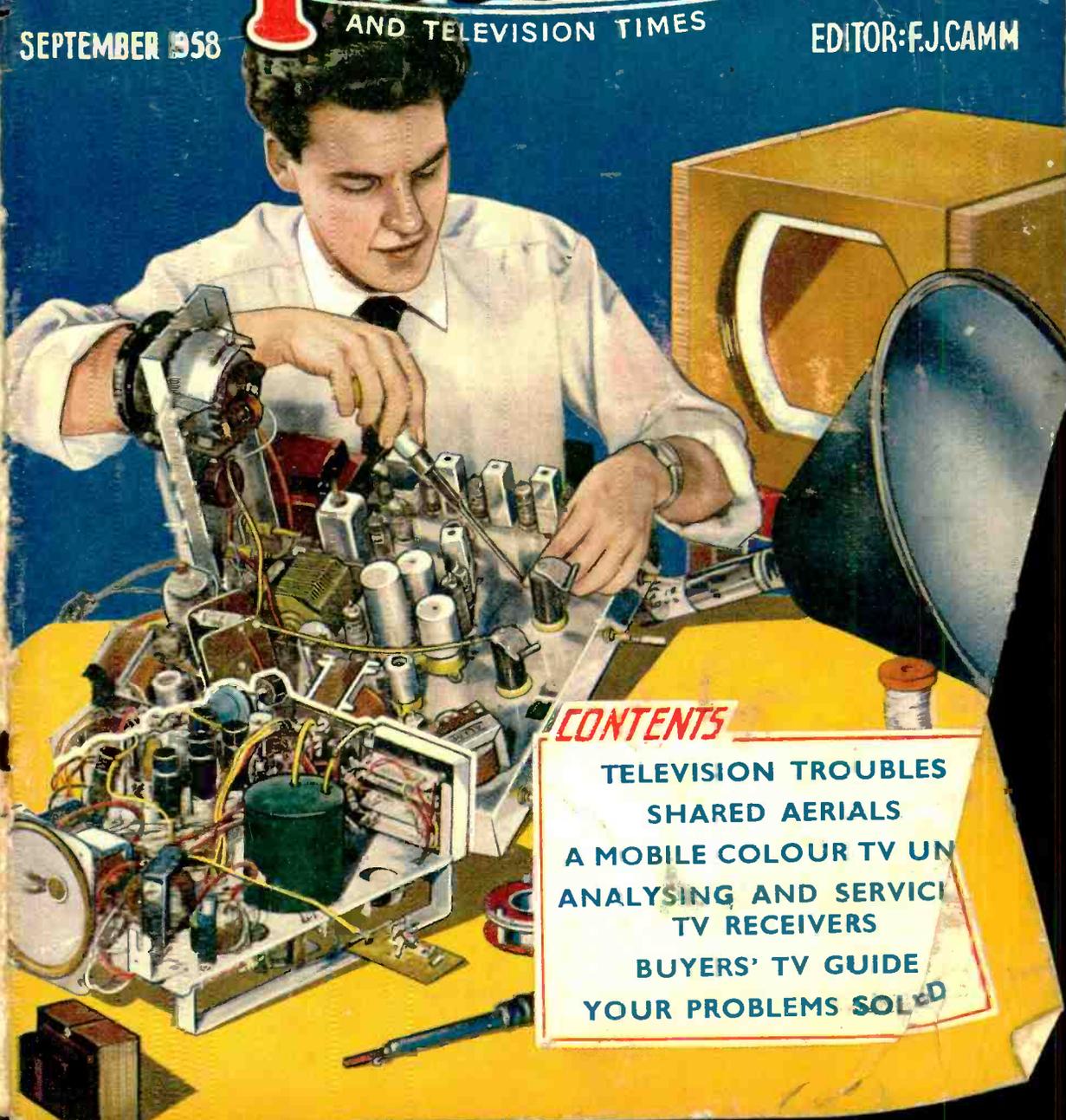
TUBES FOR COLOUR TELEVISION

Practical Television 13

SEPTEMBER 1958

AND TELEVISION TIMES

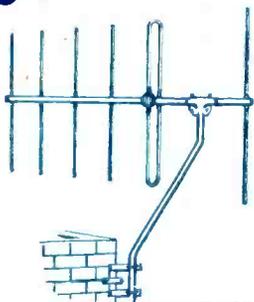
EDITOR: F.J. CAMM



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- A MOBILE COLOUR TV UN
- ANALYSING AND SERVICE
- TV RECEIVERS
- BUYERS' TV GUIDE
- YOUR PROBLEMS SOLVED

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AT HOME

AERIAL FITTINGS FOR BAND III, BAND I & RADIO F/M.
 Useful formulæ and hints for constructing your own aerial quickly and cheaply. Catalogue illustrating our increased range of Diecast Alloy Fittings, including Band III to Band I Mast Couplers, Reflector and Director Rod Holders, Insulators (both "Inline" and "H" types), Masthead Fittings, Masts and Elements, Chimney Brackets, etc. Send 1/- in stamps for the above to :-

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ERSIN MULTICORE

Contains 5 cores of extra-active, non-corrosive Flux. Prevents oxidation, cleans surface oxides.

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Wherever precision soldering is essential, manufacturers, engineers and handymen rely on MULTICORE. There's a MULTICORE SOLDER just made for the job you have in hand. Here are some of them.

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A specially formulated alloy to reduce the wear of soldering iron bits. Contains 5 cores of non-corrosive Ersin Flux and is ideal for all soldering purposes.

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Available in three specifications.



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Strips insulation without nicking wire, cuts wire cleanly, splits extruded flex 3/16 each



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Re 12" tubes, please confirm before placing order.

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Please add 12/6 Carriage and Insurance.

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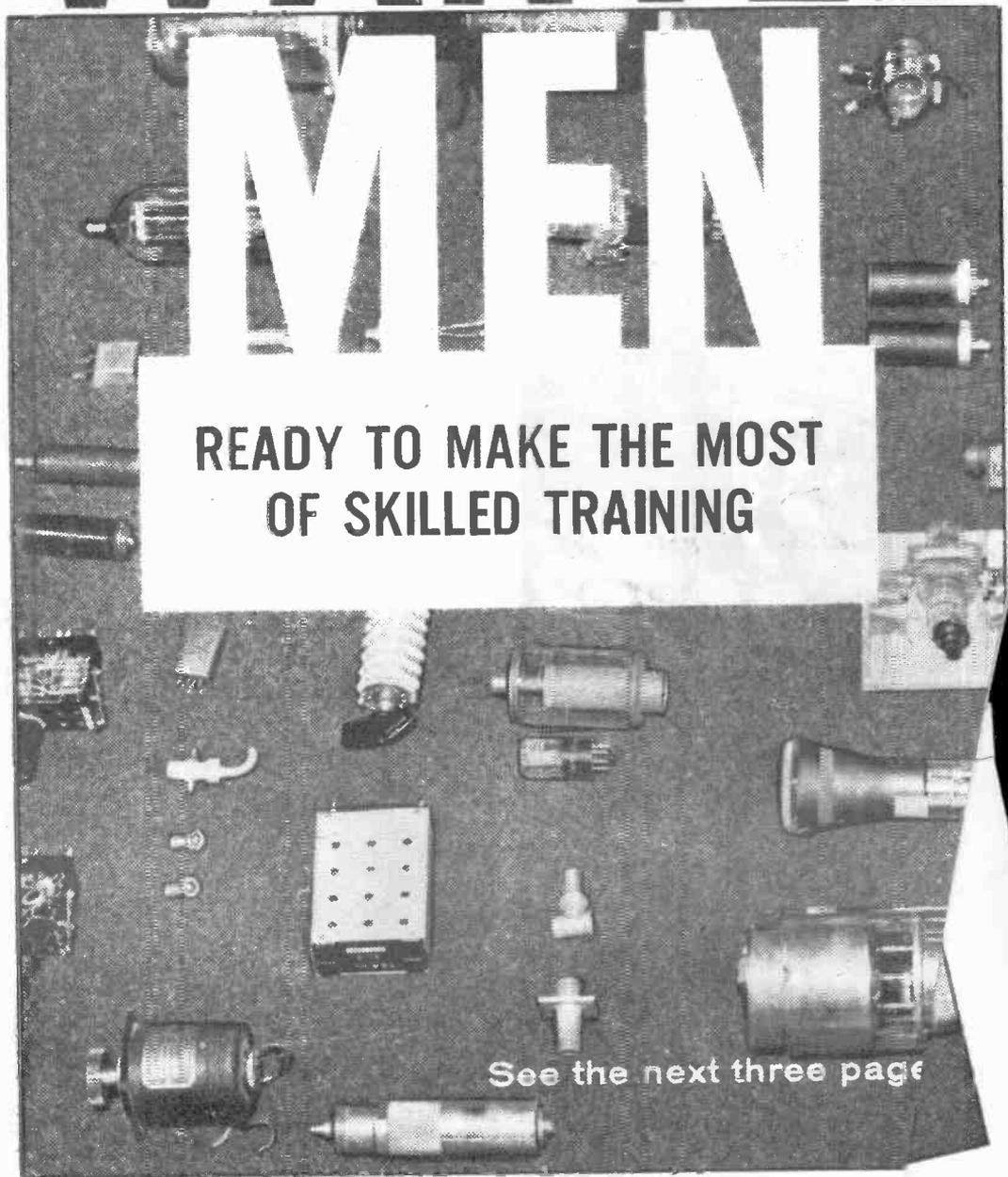
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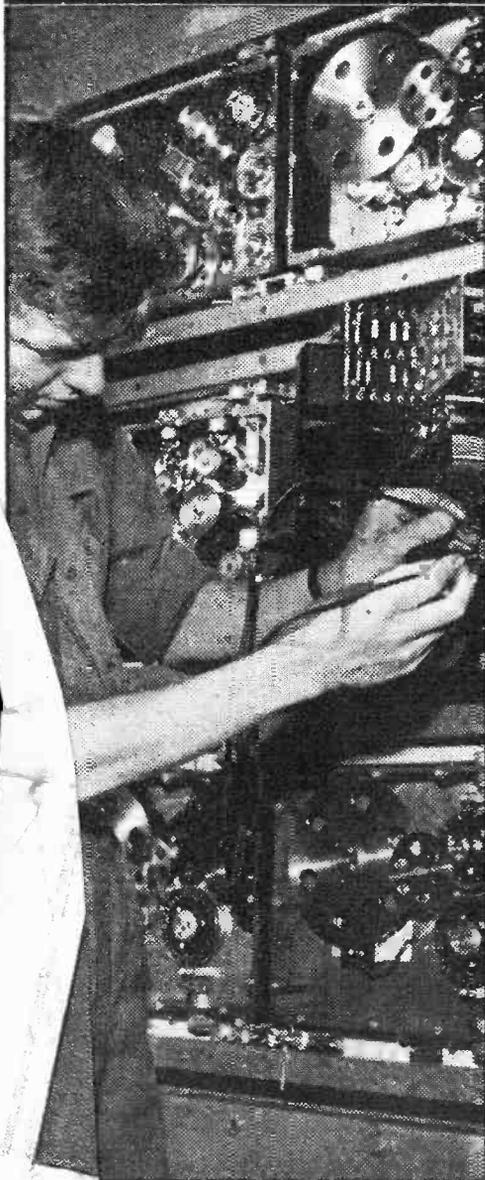
MEN

READY TO MAKE THE MOST
OF SKILLED TRAINING

See the next three pages



The Regular Army will make a skilled man of you



FIRST-CLASS TRAINING

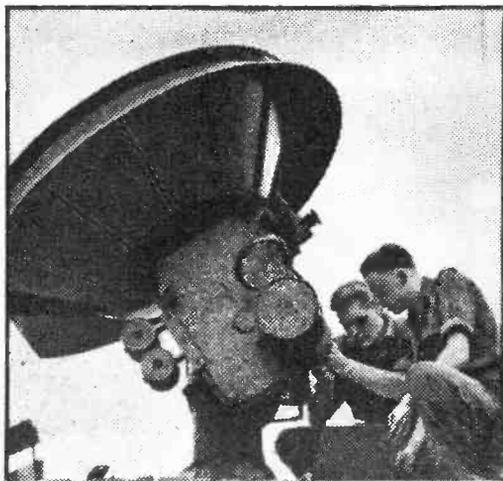
in key trades covering Electronics, Electrical Engineering, Radar, Metallurgy, Motor Engineering, Physiotherapy, Laboratory work, etc., etc.

AND FULL PAY FROM THE WORD GO! IF YOU ARE OVER 17½

Who's the man who gets ahead these days? The *skilled* man of course. If you are already skilled there are wonderful prospects in the Army and there's no place like the modern Army for learning a modern trade. In today's Army, the technician is the key man—who else can maintain the rockets, the radar, the electronic equipment that gives an Army its teeth?

The army can accept the skilled man with a guarantee that he will be employed in his trade.

(continued at head of next page)



Testing sector switch on aerial of radar A.A. No. 3, Mark 7.

to the Army's technical training.

The Army also wants the brightest young men in Britain *now* to train. It wants to train them to be the nucleus of the most highly-developed fighting force in the world. Standards are high—you must be fit, you should have G.C.E. or its equivalent. Prospects are higher still. You can earn good money from the word go and you get first-rate training, as thorough as any in the country.

NO 'OIL RAG' STUFF—YOU REALLY LEARN THE TRADE

When the Army teaches you a trade, you really learn everything.

No spending your first two years turning a nut on a conveyor belt.

The fully-trained man in the Army knows his subject like the back of his hand.

THERE'S £1,000 A YEAR OR MORE WAITING FOR THE TOP MEN—PLUS PENSION

Yes, key technicians in the Army today, who are married, can collect as much as £20 a week or more. Promotion comes fast to the capable and ambitious man. These £20-a-week soldiers are often Warrant Officers under 30. Remember too, the advantages of Army life—free uniform, free meals, special-rent married quarters, and plenty of leave on full money. Many technical Warrant Officers go on to a commission.

AND AFTER? SECURITY!

The trained technician who leaves the Army is assured of a good job in civilian life. Everyone wants the man with know-how—and after 22 years you'll have the added advantages of a good pension and a terminal grant. All the technical trades are recognised by the Trades Unions or professional bodies concerned.

YOU CAN EVEN START AT 14!

Even if you're still at school, you're old enough to start training for a key technical post in the Army. You can join an Army Apprentices School, earning a decent wage from the start. You get the time of your life, and technical training that gives you a flying start.

COMPARE THESE RATES

Here's what you can earn in the Modern Army.

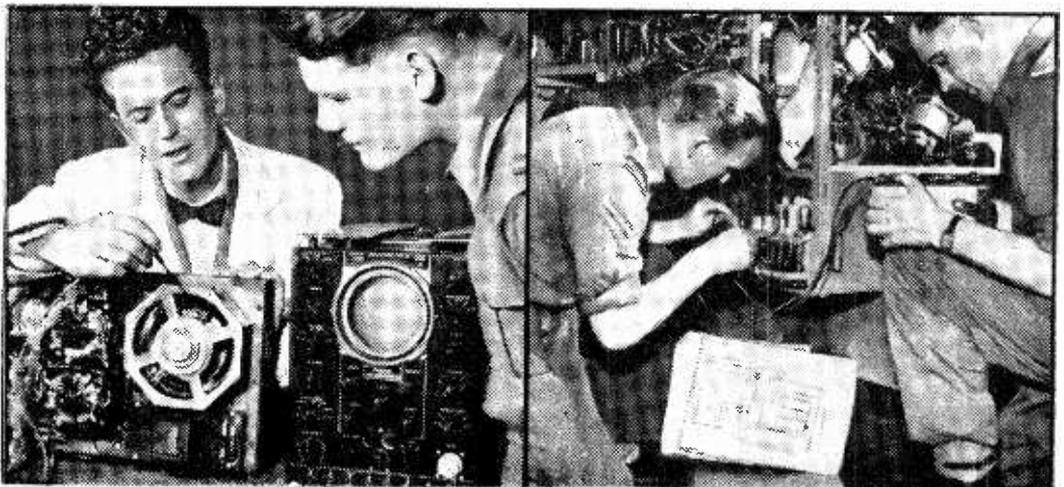
As a Private on joining and during initial training £5.1.6 (or £6.2.6 if you enlist for 9 years).

When you have completed your training and become a technician

Private.....	£8. 11. 6
Corporal.....	£10. 10. 0
Sergeant.....	£12. 12. 0
Warrant Officer Class II	£15. 1. 0

Promotion to those ranks is quick if you are good. More, of course, when you're married, and there are also special overseas allowances.

Turn over for more details of the finest life in the world

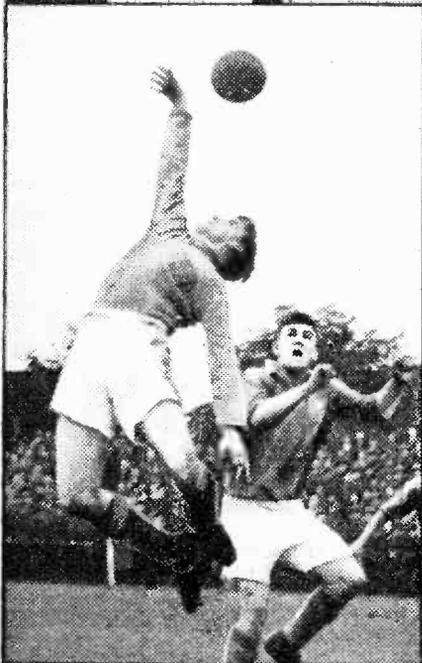


Starting a unit from a No. 11 walk talker

Working on the display unit of the radar A.A. No. 3, Mark 7.

The Army of today's all right!

Forget anything your Grandad ever told you about Army life! Instead, ask the young Regular of today what it's like. He'll tell you straight—it's a real man's life, with plenty of travel, sport, and adventure. Conditions in the Army today are better than they've ever been before—and getting better all the time. The British soldier is the finest workmate in the world—you get a sense of comradeship you won't find anywhere else. But what you get as well, today, is a real pride in technical training. He's got a technical training as thorough as any firm in the country could give him. He's got security—and he knows where he's going. Today, when he goes back to Civvy Street, the trained man has a good chance of getting a plum job in industry, with more technical knowledge than most of his contemporaries. Don't forget that the long service man has a good pension as well.



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ONE OF THE
PICKED MEN
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Without committing myself in any way, I would like to know more about the opportunities for skilled training in the Regular Army.

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IL4	6/6	68R7	11/6	6S57	8/-	12SH7	8/6	956	3/-	E46	2/-	EL41	11/-	MH4	7/6	U18/20	10/-	X66	12/6
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IA05	10/6	6C9	12/6	6Z4/84	12/6	19A95	11/-	9006	6/6	EBC33	7/6	EN31	34/9	OA71	5/-	U58	7/6	XFR3	21/-
2C26	4/-	6C10	12/6	6Z5	12/6	19H1	10/-	AC6PEN	7/6	EBC41	10/-	EY51	(Small)	OC72	30/-	U78	7/-	XFR5	27/6
2D13C	7/6	6CH5	12/6	6/30L2	10/-	20D1	16/-	AC/HL/	DDD	EBF80	10/6	(Small)	10/6	OZ4	6/-	U251	15/-	XFW10	17/6
2X2	4/6	6D5	6/6	7A7	12/6	25L6GT	10/-	AC/PA	15/-	EBF89	9/6	EY51	(Large)	P61	3/6	U404	10/6	XFW40	17/6
3A4	7/-	6E5	12/6	7B7	8/6	25Y5	10/6	AC/VP1	15/-	EC52	5/6	EY85	14/6	P215	10/6	UABC80	10/6	XFW50	17/6
3A5	12/6	6F6G	7/-	7C5	8/-	25Y5G	10/6	AC/VP1	15/-	EC54	5/6	EY85	14/6	PABC80	15/-	UAF42	10/6	XFY12	6/6
3B7	12/6	6F6GTM	8/-	7C5	8/-	25Z5	10/6	AL60	10/6	EC70	12/6	EZ35	6/6	PCC84	9/-	UB41	12/6	XFY14	17/6
3D6	5/-	6F8	12/6	7H7	8/-	25Z4G	10/-	AP4	7/6	ECC31	15/-	EZ40	8/-	PCC85	12/6	UB41	12/6	XFY15	24/6
3Q4	7/6	6F12	7/6	7O7	9/-	25Z6G	10/-	ATP4	5/6	ECC32	10/6	EZ41	10/-	PCC80	9/-	UBC41	8/6	XFY34	17/6
3Q5GT	9/6	6F13	12/6	7S7	10/6	27	7/6	AZ31	10/-	ECC33	8/6	EZ80	9/6	PCF82	12/6	UBF89	9/6	XFY35	17/6
3S4	7/6	6F17	12/6	7V7	8/6	28D7	7/-	BL63	7/6	ECC35	8/6	EZ81	9/-	PCL82	12/6	UBF89	9/6	XFY41	17/6
3V4	9/-	6F32	10/6	7Y4	8/-	30	7/6	CK506	6/6	ECC81	8/-	FW4/800	10/6	PCL83	11/6	UCC65	10/6	XFY43	17/6
SU4G	8/6	6F33	7/6	8D2	3/6	30C1	9/-	CK523	6/6	ECC82	7/6	10/-	PEN40DD	10/6	UCH42	11/-	XFY53	17/6	
SV4G	11/6	6G6	6/6	8D3	7/6	30F5	8/-	CV63	10/6	ECC83	9/-	GZ30	10/6	PEN45	25/-	UCH81	11/6	XFY54	17/6
SX4G	12/6	6H6GTG	3/6	19D2	4/-	30FL1	9/-	CV85	12/6	ECC84	10/6	GZ32	12/6	PEN46	7/6	UCL82	15/6	XH(1.5)	4/6
5Y3G	8/6	6H6GTM	3/6	10C1	4/-	30L1	9/-	CV271	10/6	ECC85	9/6	GZ34	14/-	PLB1	16/-	UF80	10/6	XH2.0	10/6
5Y3GT	8/6	6J5G	5/-	10F1	19/6	30P12	12/6	CV428	30/6	ECC91	5/6	H30	5/-	PLB2	10/-	UF85	10/6	XLI.5	10/6
5Y4	12/6	6J5GTG	5/6	10F9	11/6	30P16	10/-	D1	3/-	ECC80	13/6	H63	12/6	PLB3	11/6	UF89	10/6	XLI.0	10/6
5Z3	12/6	6J5GTM	6/-	10F18	12/6	30PL1	12/6	D2	4/6	ECC87	13/6	HABC80	12/6	PM2B	12/6	UL41	10/6	XLOI.5	10/6
5Z4G	10/6	6J6	5/6	10LD3	8/6	31	7/6	D3	5/-	ECC42	9/6	13/6	PM2B	12/6	UL41	10/6	XLO2.0	10/6	
5Z4GT	12/6	6J7G	6/-	10LD11	16/9	33A/158M	7/6	D77	6/6	ECC42	9/6	HK90	10/6	PM12	6/6	UL46	15/-	XLO2.0	10/6
6A8	10/-	6J7GT	10/6	10P13	17/6	30/-	DAC32	11/-	ECC81	9/6	HL23	10/6	PM12M	6/6	UL84	11/6	XPL.5	12/6	
6A87	8/-	6K6GT	8/-	11E3	15/-	35S15	12/6	DAF91	8/-	ECL80	14/-	HL41	12/6	PY80	8/-	UY41	8/6	XP2.0	12/6
6A88	14/-	6K7G	5/-	12A6	6/6	35A5	11/-	DAF96	10/-	ECL82	12/6	HL133DD	12/6	PY81	9/-	UY85	10/6	XR4	48/6
6AC7	6/6	6K7GT	6/-	12AH7	8/-	35L6GT	9/6	DF33	11/-	EF36	6/-	12/6	12/6	PY82	9/-	V1507	5/-	XSG1.5	15/6
6AG5	6/6	6K8G	6/-	12AH8	10/6	35W4	8/6	DF91	6/6	EF37A	8/-	HVR2	20/-	PY83	9/6	VL5492A	£3	XSG2.0	15/6
6AJ8	9/-	6K8GTG	11/-	12AT6	10/6	35Z3	10/6	DF96	10/6	EF39	6/-	HVR2A	6/-	QP21	7/-	VMP4Q	£5	XVS2.0	15/6
6AK5	8/-	11/-	12AT7	8/-	35Z4	7/6	DH63	10/6	EF40	15/-	EF35	8/6	QP25	15/-	VP2(7)	12/6	XW1.5	15/6	
6AK8	9/-	6L6G	9/6	12AU7	7/6	35Z5ZT	9/-	DH76	7/6	EF41	9/6	KL35	8/6	QS150/15	15/-	VP4(7)	15/-	XW2.0	15/6
6AL5	6/6	6L18	13/6	12AX7	9/-	41MTL	8/-	DH77	8/6	EF42	12/6	KT2	5/-	10/6	VP13C	7/-	Y63	7/6	
6AM3	5/-	6N7	8/-	12BA6	9/-	50C5	12/6	DK91	8/-	EF50(A)	7/-	KT33C	10/-	QVO4.7	15/-	VP41	6/6	Y65	10/6
6AM6	7/6	6Q7G	10/-	12BE6	10/-	150L6GT	9/6	DK92	10/6	EF50(E)	5/-	KT44	15/-	R2	10/6	VR105/30	9/-	Z63	10/6
6AQ5	8/6	6Q7GT	11/-	12E1	33/-	172	4/6	DK96	10/6	EF54	5/-	KT63	7/-	R12	12/6	9/-	Z63	10/6	
6AT6	8/6	6R7G	10/-	12HM6	3/-	77	8/-	DL2	15/-	EF73	10/6	KTW61	8/-	SD6	12/7	VR150/30	9/-	Z66	20/-
6AU6	10/6	6SA7C	8/6	12ISGT	4/6	178	8/6	DL33	9/6	EF80	8/-	KTW62	8/-	SP4(7)	15/-	VT61A	5/-	Z77	7/6
6B4G	6/6	6SC7	10/6	12J7GT	10/6	80	9/-	DL66	15/-	EF85	7/6	KTW63	8/-	SP41	3/6	VT501	5/-	Z719	8/-
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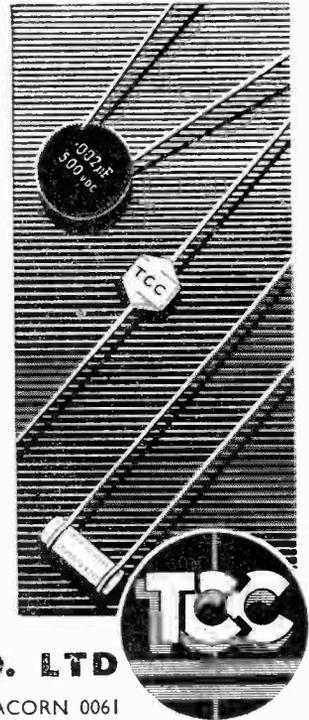
Hi-K TUBULARS

combine high capacity with small physical size: used widely as by-pass condensers in T.V. and other H.F. receivers where low inductance is of special value.

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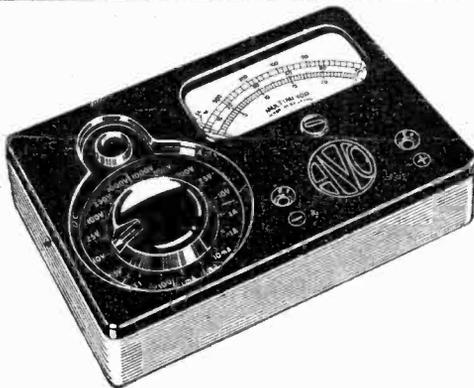
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LOW-K DISCS of up to 50 pF. with high negative temperature co-efficient permitting compensation of other components and frequency stabilisation in tuned circuits.



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Stand
60

THE

MULTIMINOR

19 Ranges

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M.M.2



Practical Television



& TELEVISION TIMES

Editor : F. J. CAMM

Vol. 9 No. 98

EVERY MONTH

SEPTEMBER, 1958

TELEVISIONS

THE RADIO SHOW

ALTHOUGH this issue goes to press some weeks before the Radio Show opens at Earls Court (August 27th to September 6th) and is in fact published about a week before, there is every indication that there will be record attendances for what promises to be the best show of the series. Both the BBC and the I.T.A. are staging exhibits and the results of the healthy competition between the two will be seen at the interesting side shows. Now that TV is running neck and neck with sound radio, interest in the various exhibits will be somewhat equally divided. On the radio side, of course, the accent will be on VHF, but the increasing interest in tape recorders will be seen in the increased number of recorders now available. Most firms are concentrating on 21in. TV receivers, and a few on 24in. models. There will be an increased number of combined radio and TV receivers, an inevitable and ultimate development. There is no reason for room space to be wasted on two separate receivers. Design and the present circuitry has not undergone any fundamental changes and there will therefore be no technical surprises at the show, changes being confined to cabinet styles. Some of the cabinets, we feel, are too contemporary and inartistic. Large receivers being supported on spindly and ungraceful legs. The art of the cabinet maker has not been made the best use of. There will be no projection receivers at the show. A new side show will be a television celebrity desk, a much larger theatre for the demonstration of VHF radio and a stand specially devoted to gramophone programmes with, of course, the inevitable disc jockeys. There is to be Independent Television Wonderland, by means of which viewers should learn more about ITV, and visitors will be passed through a series of displays ending up at the Personality Studio. All of the service departments will have exhibits. We are pleased to report that great improvements in the catering arrangements have been made, and this year there should be no more complaints. We shall, of course, publish a fully-illustrated report in our next issue.

NEXT MONTH—ANOTHER CONSTRUCTOR'S TV

NEXT month, we shall publish details of construction of a simple yet very efficient TV receiver which can be built quite cheaply from readily available components. We have received many requests for such an article, especially in view of the fact that certain components for our Supervisor are no longer available. In the meantime, readers should remember that we publish "Practical Television Circuits" which costs 15s. or 16s. 1d. by post, in which constructional details for a number of excellent receivers are given.—F. J. C.

Our next issue, dated October, will be published on September 19th

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The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Television." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed to: The Editor, "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of radio and television apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

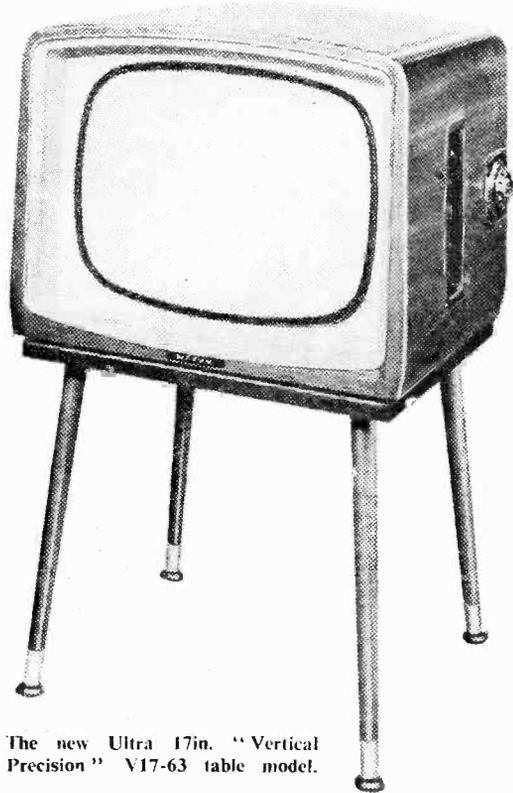
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TV at Earls Court

A PRELIMINARY REVIEW OF SOME OF THE EXHIBITS AT THIS YEAR'S RADIO AND TELEVISION SHOW

THIS issue, of course, goes to press a month in advance of the Radio Show at Earls Court, and several manufacturers have not yet released details of their 1959 programme.

There is no indication, however, that there will be any great changes of a technical character

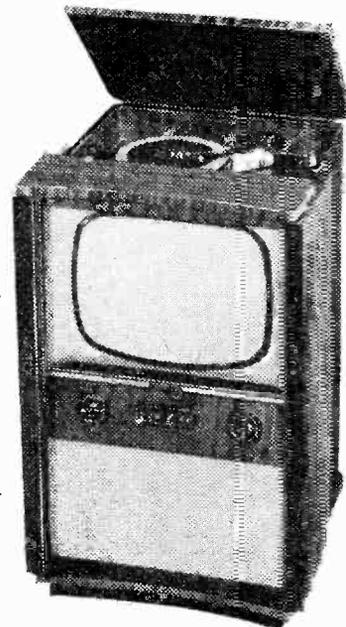


The new Ultra 17in. "Vertical Precision" V17-63 table model.

in next season's receivers, although cabinet styles continue to follow contemporary fashions, with a strong American influence. The 9in. tube has now passed, and the main demand appears to be for 17in. and 21in. receivers, although 24in. models will be available. We give below details which have come to hand at the moment of going to press.

Ultra Exhibits—Stand No. 20

Prominent among Ultra exhibits will be the newly introduced 17in. table model, type V17-63, shown here, incorporating the new Ultra features of "Vertical Precision"—designed to reduce "ragged edge" and give a steadier picture with less adjustment to controls. It costs 67 gns. Table optional, extra 2½ gns. Aerial optional, extra 12s. 9d. This model is also available with



(Right)

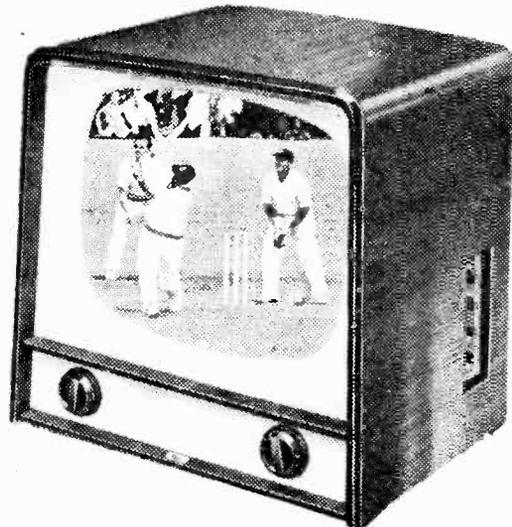
Ferranti Model TCG.1019 television receiver with VHF radio-gramophone.

V.H.F. radio built in, and the latest design of "Magic Eye" tuning indicator No. VR17-64, price 72 gns.

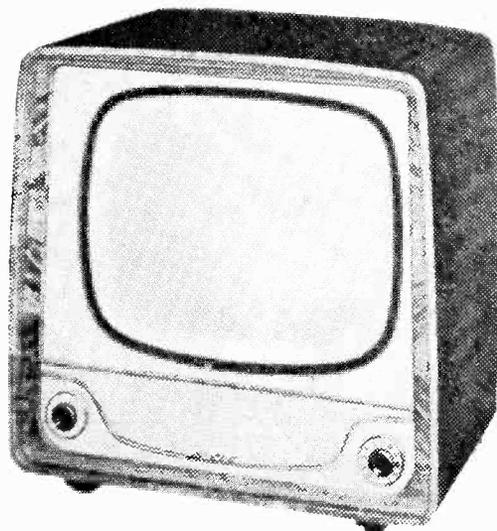
They are also exhibiting 14in. and 21in. table models, as well as a 17in. consolette model with V.H.F. radio and "Magic Eye" tuning indicator Type WR17-52.

Ferranti—Stand No. 21

Ferranti are exhibiting 14in., 17in. and 21in. television sets. The 14in. model, T.1001, incorporates many advanced and unique features which



The Pam Model 551, printed circuit 17in. table television.



The 1958 G.E.C. 17in. (BT.2155) table television.

will set a new high standard of viewing. It is housed in an attractive modern-style cabinet finished in selected walnut veneers. The chassis is of outstanding reliability with exceptional sensitivity. The aluminised tetrode cathode-ray tube with ion trap gives brilliant high-definition pictures. It costs 59 gns.

The TCG.1019 model, shown overleaf, is a 17in. multi-channel television receiver with V.H.F. radiogramophone housed in a handsome, floor-standing cabinet with full length doors. Refinements include "turret" tuning, automatic picture and sound control and flywheel synchronisation. It provides excellent reception of the BBC interference free V.H.F. radio transmissions and its four-speed record reproducer, with lightweight pick-up for all types of standard and L.P. discs, is concealed beneath the lift-up lid. The cabinet is finished in selected sapele veneers. It costs 120 gns.

There is the 21in. table receiver, Model T.1006, which combines all that is best in modern TV engineering. The trouble-free turret tuning enables you to change from programme to programme without complicated readjustment of the picture. It costs 89 gns.

The 21in. model, TC.1012, for big-screen viewing gives the new "bow front" look in a really compact console. It has a 21in. aluminised tetrode tube with 90 deg. angle of deflection. The cabinet is finished in selected walnut veneers and mounted on castors. It costs 105 gns.

Pam—Stand No. 6

This year Pam introduce a completely new range of television sets, and a few details are given below.

Model 550 is a compact and lightweight 17in. transportable television, designed for easy movement from room to room. Presented in a beautifully finished walnut veneered wrap-round cabinet with contrasting fascia, this receiver is for standard areas of reception, and gives a

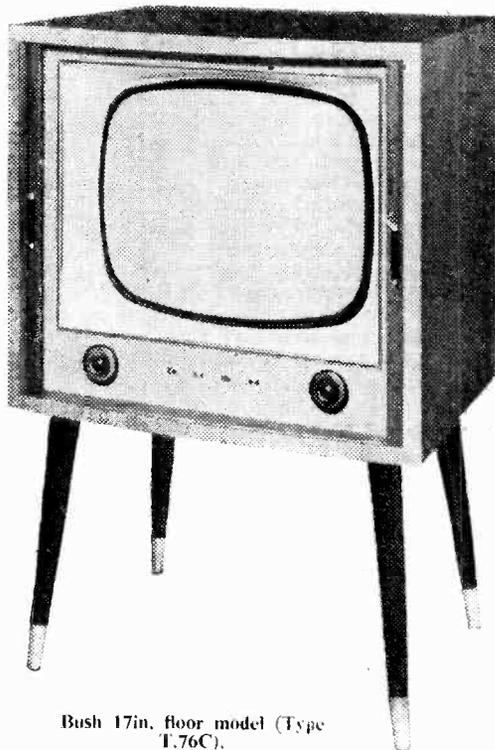
remarkable performance on a specially designed telescopic indoor aerial (optional extra 30s.). It has a 14-valve printed circuit chassis with an electrostatic focusing tube and tinted screen which gives excellent picture clarity. It costs 67 gns. (tax paid). Legs available 2 gns. extra.

Model 551, shown in the illustration, is a printed circuit 17in. table television with front controls and speaker. It is presented in a polished walnut veneered cabinet with a smart frontal grille cloth, and is for use in standard reception areas. The price is 69 gns. (tax paid). The F.M. version of Model 551 costs 73 gns. (tax paid).

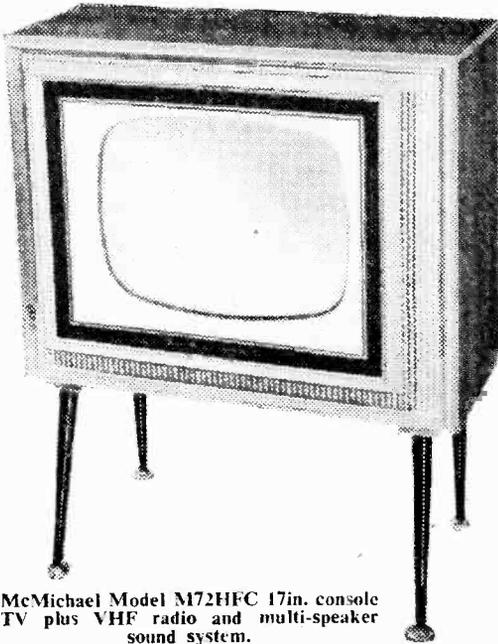
Also on view is the 21in. printed circuit console Model 521F, price 105 gns. (tax paid), and the 21in. console model 521CA, with full-length screen-protecting doors—with printed circuit chassis, price 110 gns. (tax paid).

G.E.C.—Stand No. 8

Making their first appearance at the Show are two new G.E.C. 17in. television receivers and a 21in. set with V.H.F. radio, whilst a new 14in. receiver is being introduced prior to the Show. One of the new 17in. sets (BT.2155), shown here, is a table model housed in a polished hardwood veneer cabinet. It uses an aluminised tube operating at 15 kV, and incorporates positive action synchronising and automatic picture control. The price (tax paid) is 69 gns., and conversion to a consolette can be made by means of a matching hardwood table (BT.186, 3 gns.). The other new 17in. model (BT.8149) is a consolette



Bush 17in. floor model (Type T.76C).



McMichael Model M72HFC 17in. console TV plus VHF radio and multi-speaker sound system.

cabinet using a standard chassis is Type T.75C, price 81 gns. (tax paid).

The 21in. receivers are restricted to one table type set with all controls and speaker at the side, while a 14in. set in a moulded case or, alternatively, a wood cabinet, is retained.

A receiver of particular interest is the "twin set" type TV.77, which makes its first appearance at the show. This consists of a 17in. fringe television chassis, together with a separate Bush V.H.F. radio "head." It is, virtually, two sets performing entirely different duties using one cabinet.

McMichael—Stand No. 42

Highlighted on the McMichael stand will be the advances made in TV design. There will be Model MP17 (The Voyager) 17in. portable TV plus V.H.F. radio, price 66 gns., tax paid; the Model M72T 17in. table model TV plus V.H.F. radio, price 69 gns., tax paid; Model M72HFC 17in. console TV plus V.H.F. radio and multi-speaker sound system, price 79 gns., tax paid; and Model M23HFC 21in. console TV plus V.H.F. radio and multi-speaker sound system, price 98 gns., tax paid. These models all introduce many new technical design features to give greater service and reliability.

Some of the features are easy finger-tip action controls on all models; new chassis design used for compactness and easy access to all components without removal from the cabinet; sockets are provided for use of a special telescopic aerial suitable for reception of BBC and I.T.A. television programmes and V.H.F. sound programmes in areas of good signal strength; and a new taper cabinet technique is introduced to achieve compactness and elegance.

in polished walnut veneer hardwood, with finger-light, sliding tambour doors.

A completely new 14in. table television (BT.1156) is announced by the G.E.C. Housed in an attractive moulded cabinet and employing a printed circuit technique, this model provides an extra-large picture due to the 90 deg. scan C.R.T. in push-through mask. Selling at 57 gns., including tax, it has an aluminised screen and operates at 13 kV.

Latest in the range is the 21in. twin high-fidelity loudspeaker table model (BT.3747) incorporating V.H.F./F.M. radio. Housed in a polished walnut veneer cabinet, it has an 18-valve high-sensitivity chassis and positive action synchronising. It costs 97 gns. (including tax).

Bush—Stand No. 27

On the Bush stand is shown a comprehensive display of television sets. The table models can be supplied with specially designed tables (at an extra charge), and floor type cabinets are this year much more compact, most of them being fitted with screw-in legs and roll-away doors.

All cabinet styling is attractively contemporary, but there are predominantly more sets with 17in. tubes than any other—17in. being unquestionably the popular size to-day. There is the 17in. Bush television, Type T.76C, with full specification (fringe) chassis, in a contemporary cabinet fitted with screw-in legs and roll-aside doors, price 86 gns. (tax paid). Available in the identical

 * **THE RADIO SHOW** *
 * August 27 to September 6 *
 * **OUR STAND No. 108** *

Valradio—Stand No. 61

Projection Television Receiver V5T will be demonstrated on this stand. This receiver is available for 405, 525 and 625 lines covering the British,

American and CCIR European television systems; the latter will receive the BBC experimental transmission on 660 Mc/s, using a Band 5 converter which will be available as soon as a regular television service is established on this band. Valradio have maintained continuous development on projection television, and this latest model incorporates the results of nine years experience in the manufacture, installing and servicing of projection receivers, which has produced a set of unique performance. The results produced compare very favourably with cine-projection.

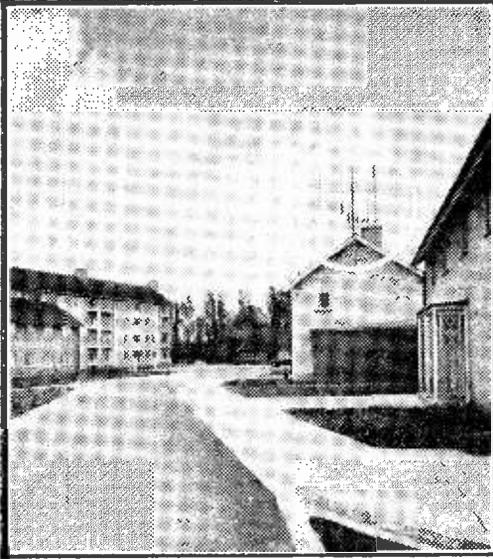
Belling-Lee—Stand No. 49

On this stand will be displayed a comprehensive range of aerials and aerial accessories for the reception of BBC and ITV television and V.H.F. radio programmes. Already many thousands of satisfied viewers now see with the "Golden V," the firmly established leader in the field of set-top aerials which will again be exhibited on this stand.

SHARED AERIALS

PROBLEMS WHICH ARISE WHEN
SEVERAL RECEIVERS OPERATE
FROM THE SAME AERIAL

by S. J. Jackson



This estate of 73 dwellings is supplied with BBC and ITV television signals from a common aerial system, seen ringed in the photograph.

AS we are frequently called upon by our readers to provide practical details of arrangements allowing more than one television or V.H.F.-F.M. receiver to be operated from a common aerial, we feel that the following article outlining schemes of this nature will have a wide general interest.

Now that aerials which have been exposed to all weathers for some five or six years are due either for replacement or overhaul, and with the advent of additional channels and V.H.F.-F.M. sound broadcasting, more and more people are coming to realise the advantages which shared aerials offer over individual aerials. In fringe areas, where complex multi-element arrays in duplicate are needed on shared chimney stacks of semi-detached dwellings, the advantage of a shared aerial system from the aesthetic angle alone is well worth consideration; in cases where both occupants of a semi-detached dwelling go in for BBC and ITV television and V.H.F.-F.M. sound, a shared chimney stack is often called upon to cater for six aerials, and these are often remarkably complicated pieces of metalwork where the signal is weak. With the talk of a third television programme, it would seem that the maximum number of aerials per semi-detached dwelling may shortly be increased to eight! This is economic folly, even at this stage, for £50-£60 worth of aerials are often seen supplying just two receivers, while in a street of fifty or sixty houses £2,000-£3,000 worth of aerials may be employed. Surely, the novelty factor of displaying aerials no longer follows—indeed, the

converse would represent more of a novelty factor in some fringe areas!

There is absolutely no need for individual aerials in heavily populated areas: hundreds of receivers can be supplied with excellent signals on all bands from a well sited master aerial. Signals, having a signal-to-noise ratio far superior than that given by indifferent individual aerials, are usually available at a much lower cost by way of a shared aerial system. Moreover, the master aerial can be positioned with regard to such things as interference, signal pick-up and local amenity, while the position for the individual aerial is invariably limited to the chimney stack or one of the walls of the house, which may be neither desirable technically nor aesthetically.

The Need for Matching

A television and V.H.F.-F.M. aerial is rather like a generator of electricity, it being actuated by the signals radiated from the transmitting aerials. However, the amount of energy that is conveyed to the receiver is to a large degree governed by the accuracy of the matching between the aerial and the receiver by way of the feeder cable. As with other things electrical, the maximum signal is developed across the receiver's aerial circuit when its impedance equals that of the aerial and feeder. Aerials, feeders and

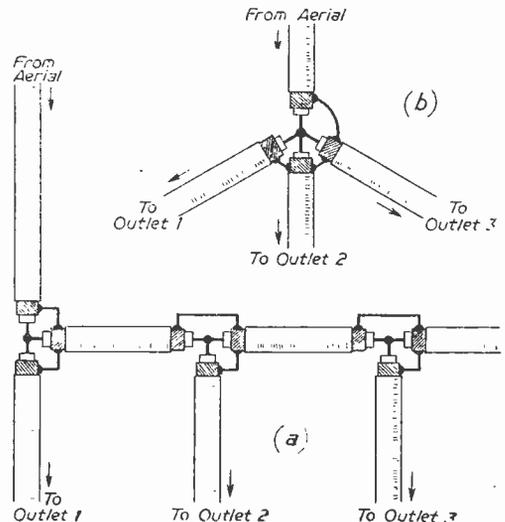


Fig. 1.—Neither of these arrangements should be used for operating more than one receiver from a single aerial.

receiver aerial circuits are all designed to match into a common impedance in the region of 70-80 ohms. All the problems are thus solved from the point of view of using an aerial with each receiver; it being just a simple matter of connecting one to the other through suitable feeder cable.

The trouble often starts when it is endeavoured to operate more than one receiver from a single

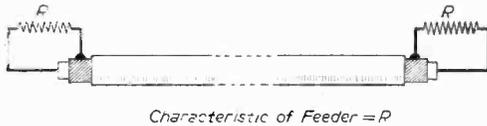


Fig. 2.—A correctly loaded length of feeder.

aerial; neighbours may wish to use their receivers on a common aerial so as to reduce cost, avoid interaction between aerials mounted on a common chimney stack and preserve the amenities as far as possible, or a second receiver may be installed in another room, so that one section of the family may view ITV while the other section views BBC. Whatever the motive, it is often thought necessary simply to connect in parallel the feeders supplying the receivers and the main signals from the aerial. Arrangements as shown in Fig. 1 are often utilised in the hope of gaining a good signal at each outlet, but they fail sadly. Let it be noted that both of these methods are entirely unsuitable for multi-receiver operation, and neither is consistent with successful reception.

In an area of very strong signal they may, if one is lucky, provide some sort of picture on all connected receivers, but if the receivers happened to be far removed from each other, ghosting and poor definition will almost certainly be troublesome. Standing waves will exist on the feeders, and slight movement of the feeders, particularly those connected direct to the receivers, will result in variation of signal strength; in some cases there is also the possibility that the receivers will exhibit the symptom of instability, especially at high settings of contrast.

All these adverse effects are caused by the resulting mismatch between the aerial and the receivers, as the receivers are simply connected in parallel across the aerial. The problem of mismatching alone results in the signal at each outlet being well below that at the aerial but, apart from that, the coupling and feed cables may be of critical length in terms of the wavelength of the signals, and this in itself may cause short-

circuiting of the signal across one or more of the outlet feeders. If both BBC and ITV signals are carried, then it is possible that the stub length of the cables may be critical on one station only, giving rise to the rather bewildering problem as to why the system carries one signal and not another.

Quite recently the author was called in to investigate a shared aerial system which had been installed in an hotel and which had never worked from the day of installation. While the aerial signal was something like 500 microvolts, there was only a signal of some 20 microvolts at each outlet—not enough to give a viewable picture on a modern receiver. The reason for the trouble was quickly located; each of the six feeders supplying the outlets in the various rooms was connected in parallel across the aerial feeder exactly as shown in Fig. 1(b).

Matching is essential all the way through, and since coaxial feeder (or, indeed, any R.F. feeder)

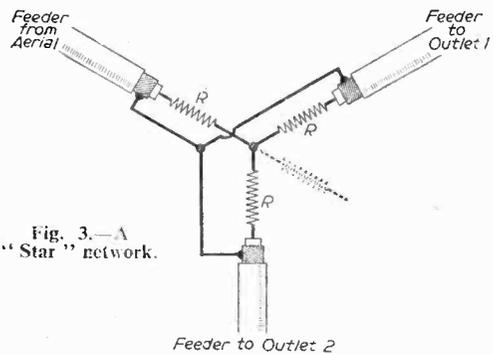


Fig. 3.—A "Star" network.

is curious in that it itself possesses a characteristic impedance, it has to be loaded at both ends with a resistance or impedance of a like value if it is to carry a signal evenly along its length, and to avoid it acting as a stub at certain frequencies, as already described. A correctly loaded length of coaxial feeder is shown in Fig. 2. Resistors R can, of course, be represented by the impedance of the aerial.

Matching Arrangements

Any number of feeders can be joined together and the matching maintained provided matching resistors are employed. For example, Fig. 3 shows how two receivers can be operated from a common aerial by the simple arrangement of three resistors R . This is often referred to as a "star" network for obvious reasons, and the number of outlets can be increased by the introduction of corresponding resistors from the centre point, as shown by the resistor in broken line.

The purpose of the resistors is simply that of that receivers will be connected at the far ends of each outlet feeder, it being assumed, of course, that receivers will be connected at the far ends of the feeders to load correctly the lines at the end. If receivers are not used on all the outlets, however, resistors of value equal to the line impedance must be connected in place of them.

(To be continued)

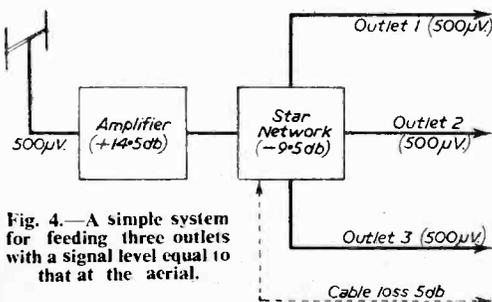


Fig. 4.—A simple system for feeding three outlets with a signal level equal to that at the aerial.

SINGLE LINE SCANNING

HOW FRAME AND LINE SCANNING WAS ACHIEVED BY THE EARLY SCOPHONY SYSTEM

THE real stumbling block with television is that the eye demands reception in two dimensions whilst the ear does not. In broadcasting, for instance, the different sounds which go to form connected speech follow each other in simple sequence. They are received, one may say, in "single-line" formation.

It is quite a different matter with the eye. The signal currents which carry the different light-and-shade values representing a picture certainly travel through the ether in simple sequence, but before they can be judged by the eye they must be assembled in proper order on the surface of a two-dimensional screen.

Similarly, at the transmitting end, the picture

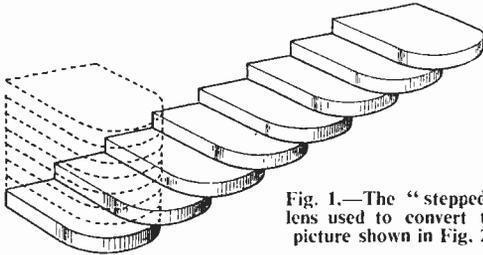


Fig. 1.—The "stepped" lens used to convert the picture shown in Fig. 2.

must first be broken up into a connected "line" of signal impulses before it can be fed into the ether. It is this business of cutting up and piecing together—a problem which does not exist in broadcasting that has created TV problems.

Scanning from a New Angle

In the old Scophony system of television Mr. G. W. Walton approached the problem of scanning from a new angle. Instead of cutting up the picture into a series of strips by means of a rotating disc, he employed a stationary lens to produce the same effect. Actually the lens con-

verts the usual square or rectangular surface into a new shape, which has the same light-and-shade values as the original picture, but is "spread out" into a single line. By transforming the picture from a two-dimensional to a one-dimensional form—without having to use any moving parts—the subsequent operation of scanning is greatly simplified.

In practice the picture to be transmitted is projected through a stepped or "echelon" lens of the kind shown in Fig. 1, which transforms it into the condition shown in Fig. 2. Each of the stepped surfaces on the lens handles a particular strip of the picture and throws each strip well to one side of its immediate neighbour, so that the result approximates to a single-line.

In this condition it is reflected on to the photo-electric cell by a small vibrating mirror which covers the whole "line" of the image in a single to-and-fro movement.

A first approach to the underlying idea is to be found in those well-known distorting mirrors where one sees oneself reflected either as a tremendously tall and thin figure or else as a flattened-out caricature. Pushed to the limit one can imagine how in this fashion a two-dimensional object can be reduced practically to a single-line image. In this form it is no longer necessary to scan the image both to and fro as well as up and down. A single traverse is sufficient, provided, of course, that at the receiving end a "compensating" mirror is used to convert the distorted image back into its original shape.

In Scophony television, the single-line equivalent of the original picture was called a "stixograph."

This is scanned by a small vibrating mirror, which reflects it back on to a photo-electric cell. As each point of the image falls on to the cell, it produces a corresponding electric current, which after amplification is fed to the aerial.

At the receiving end, a similar "echelon" lens is used to convert the "stixograph" or line image back into its original two-dimension shape.

Speech or Musical Frequencies

Mr. Walton has also developed a scheme for handling speech or musical frequencies on

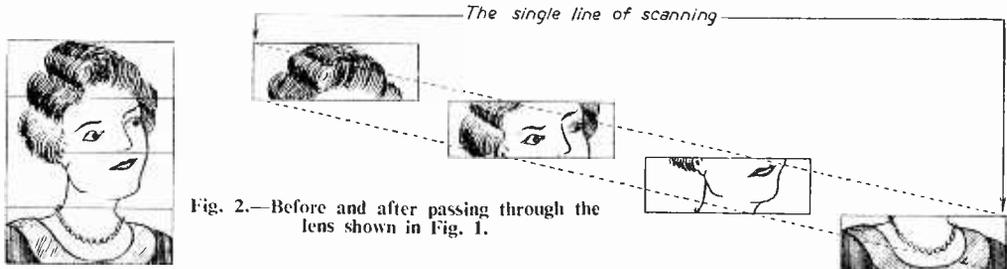


Fig. 2.—Before and after passing through the lens shown in Fig. 1.

verts the usual square or rectangular surface into a new shape, which has the same light-and-shade values as the original picture, but is "spread out" into a single line. By transforming the picture from a two-dimensional to a one-dimensional form—without having to use any moving parts—the subsequent operation of scanning is greatly simplified.

exactly the same lines, so that a combined sound and picture programme can be transmitted by the Scophony system.

Since the use of a stepped lens to produce a single-line image is an essential part of his system, it becomes necessary, first of all, to convert the speech frequencies into a form in which they can be handled "optically." In other words

they must be made visible before they can be passed through the lens. This is a very unusual procedure, since it involves transforming sound waves into light waves.

coil W, according to the position of the spark along the electrode.

Side-band Frequencies

To facilitate matters the microphone currents are first modulated on to a carrier-wave, so that they are converted into side-band frequencies which, although of a higher order of frequency, are still strictly

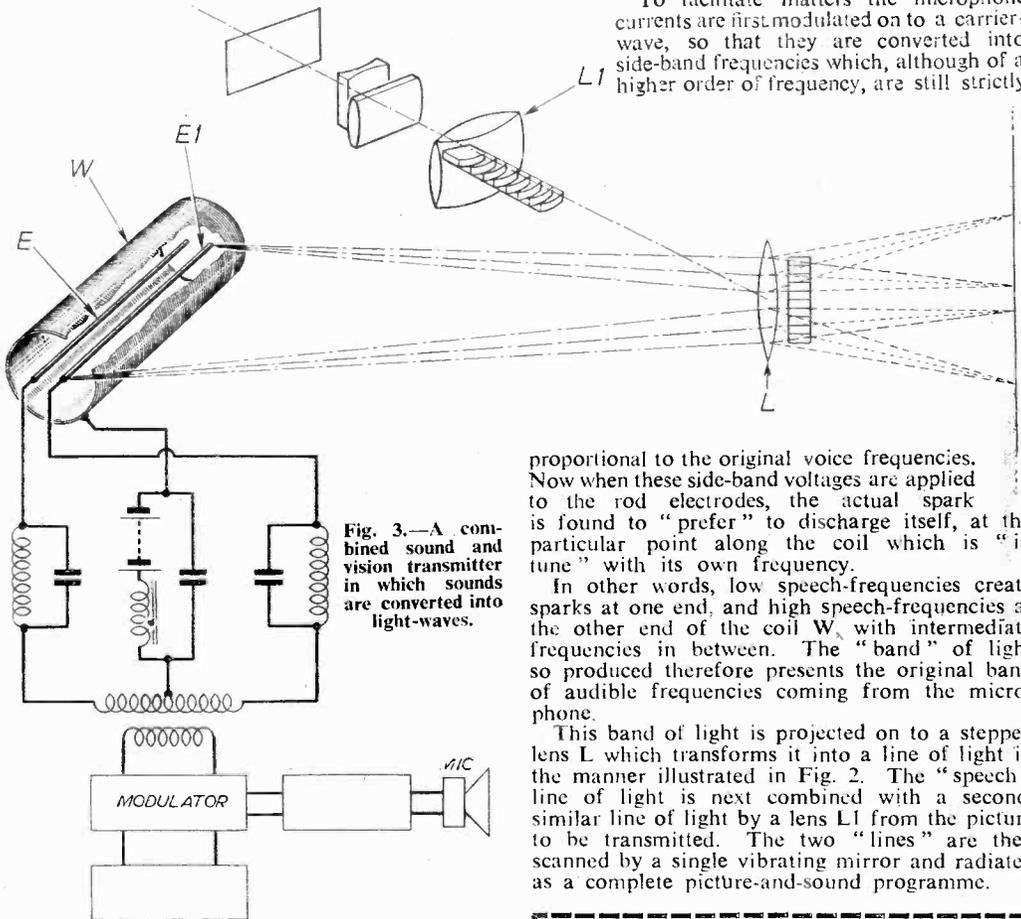


Fig. 3.—A combined sound and vision transmitter in which sounds are converted into light-waves.

proportional to the original voice frequencies. Now when these side-band voltages are applied to the rod electrodes, the actual spark is found to "prefer" to discharge itself, at the particular point along the coil which is "in tune" with its own frequency.

In other words, low speech-frequencies create sparks at one end, and high speech-frequencies at the other end of the coil W, with intermediate frequencies in between. The "band" of light so produced therefore presents the original band of audible frequencies coming from the microphone.

This band of light is projected on to a stepped lens L which transforms it into a line of light in the manner illustrated in Fig. 2. The "speech" line of light is next combined with a second, similar line of light by a lens L1 from the picture to be transmitted. The two "lines" are then scanned by a single vibrating mirror and radiated as a complete picture-and-sound programme.

Fig. 3 shows how it is done. The output current from the microphone M is used to create "sparks" across a pair of rod electrodes E, E1. The rods are first biased by a voltage to a point just short of that at which a spark discharge occurs. They are then in a "triggered" condition, so that the extra voltage applied from the microphone M is sufficient to cause a spark to pass.

But it is also necessary to preserve the different tone or audible frequencies of the microphone currents in their new "visible" form. It will not do to pass simply a spark. The sparks must be spread out or distributed along the length of the rods E, E1, so that they form a "band" of light which is equivalent to the original band of audible frequencies.

It will be noticed that the rods are surrounded by a long coil of wire W. Now when a spark passes, the discharge current will flow through a greater or lesser part of the inductance of the

NOW READY!

A BEGINNER'S GUIDE TO TELEVISION

By F. J. Camm
(Editor of *Practical Television*)

A Complete Course in 15 Lessons, with
Dictionary of Technical Terms
128 Pages—51 Illustrations

7/6 or 8/3 by post

from **The Book Publisher, George Newnes, Ltd.,**
Tower House, Southampton Street, Strand,
London, W.C.2.



A Marconi 3-tube image Orthicon camera.

ON Wednesday, 4th June, 1958, the official handing-over of the first Mobile Medical Colour Television Unit of its kind to be designed and manufactured in Great Britain took place at Marconi House, London.

On behalf of the manufacturers, Marconi's Wireless Telegraph Co. Ltd., Mr. F. N. Sutherland, C.B.E., General Manager of the company, presented a special key to Mr. R. Plizenmaier, Managing Director of Smith Kline & French Laboratories Ltd., who commissioned the manufacture of the vehicle. Mr. Plizenmaier then formally inspected the vehicle, accompanied by other senior officials of both organisations.

It is the intention of Smith Kline & French to place this mobile colour television unit at the free disposal of medical authorities in this country for use at conventions or similar

FIRST OF ITS KIND TO BE MANUFACTURED IN BRITAIN

functions. It will be used, for example, to televise in full colour, clinical procedures and intricate operations being carried out by specialist surgeons in order to demonstrate their methods to a large body of surgeons or students in a nearby hall. The system provides not only the facility of catering for a large audience, but also the benefits of an enlarged image.

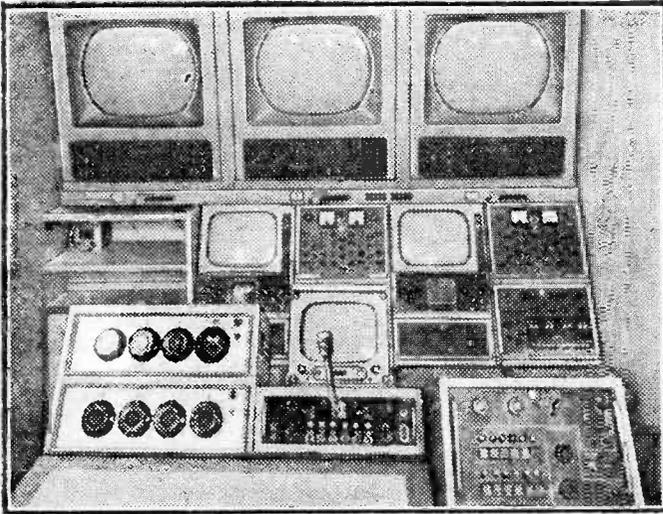
During each programme there is two-way communication between members of the audience and the doctor or surgeon. A moderator in the audience relays questions to the demonstrator who, by means of a small pendant microphone is able to make any observations to be heard by all in the auditorium.

In surgical demonstrations the compact colour camera is mounted on a mobile pedestal a few feet from the operating field and shoots horizontally at a tilted mirror suspended immediately above the operating field. The image is, of course, a mirror image but is corrected electronically in the camera. In medical demonstrations the camera normally shoots direct and no correction is required. A surgical or medical procedure in an area of about 1 sq. ft. can be magnified on the video screen to about 48 sq. ft. with all details of techniques, no matter how fine or intricate, clearly visible to the audience.

The vehicle itself weighs 8 tons gross, 2 tons of which is accounted for by the colour TV apparatus. It is divided into three sections, as explained overleaf:



A general view of the Mobile Medical Colour Television Unit.



General view of the monitor sets and control equipment in the vehicle.

Rear Compartment

This houses the apparatus racks, including the encoding equipment which combines the "red," "green" and "blue" signals from the camera into a composite signal of a type which can be carried, if required, over long distances via landline or microwave link. N.T.S.C.-type coding modified to British 405-line requirements is employed for use in this country; but the equipment is suitable for use with other line standards. The apparatus room compartment is normally staffed by one maintenance engineer.

Centre Compartment

This is the control room area, the nerve centre of the system. In it sit the technical director and vision mixer, two camera control operators and the sound mixer, a team working under the personal direction of the producer. In this room the respective outputs from the two colour cameras and the microphones are checked and integrated into the "programme" as seen and heard by the audience.

Three colour monitors, type BD.875, each employing a 21in. three-gun shadow mask type of colour tube, are in use in the control room—one for each camera channel and one acting as a line monitor. The black-and-white preview monitor uses an 8½in. picture tube, while the two picture and wave-form monitors each employ 14in. picture tubes and 5in. wave-form tubes. One particularly interesting feature is the arrangement whereby the colour monitors are underslung on a mono-rail system which enables them to be withdrawn into the control room proper for minor adjustments, to the forward compartment for major servicing or to be withdrawn completely if occasion demands.

Forward Compartment

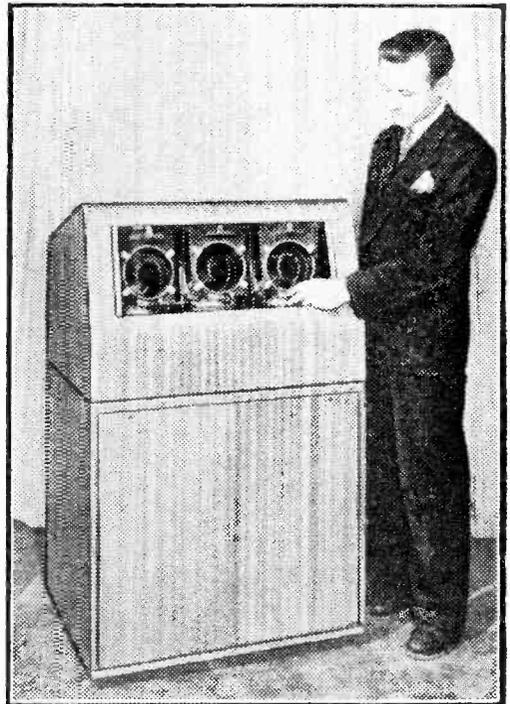
This, in addition to containing the driver's seat and controls (right-hand drive), provides access to the back of the camera control equipment and is also designed to give a useful servicing area.

The Colour Cameras

These are Marconi 3-tube image Orthicon cameras, type BD.848, the fundamental design of which is similar to that of the colour cameras supplied by Marconi's to the BBC for their experimental transmissions in colour, but incorporating various improvements in the light of subsequent research. The cameras are designed to operate via a single 88-way camera cable, two 100ft. lengths of which are carried on drums in the forward compartment of the vehicle, one end of each being permanently connected to the equipment. Two additional drums of 88-way cable, each carrying 250ft. lengths are also carried for use when the camera has to be used even further away from the vehicle.

Display Unit

The main display unit is a Marconi colour television projection unit, type BD.876. This provides a picture 8ft. × 6ft., viewed comfortably by approximately 300 people. A 21in. colour television receiver manufactured by Murphy Radio Ltd. is also provided as a second display unit, for use, if required, in an additional viewing-room.



The Marconi colour television projection unit.

TELENEWS



Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of June, 1958, in respect of television receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	Total
London Postal	1,596,193
Home Counties	1,020,294
Midland	1,322,482
North Eastern	1,328,944
North Western	1,155,005
South Western	643,220
Wales and Border Counties ...	476,721
Total England and Wales ...	7,542,829
Scotland	621,778
Northern Ireland	88,698
Grand Total	8,253,305

Closed Circuit TV

CLOSED circuit television was used in connection with a banquet at the Connaught Rooms, London, on July 19th, to join together 17,500 people at dinner in five different rooms. The main proceedings from the Grand Hall were televised and relayed to each room. This is the first time that closed circuit TV has been used in this way.

BBC Interview Studio

THE BBC's new television studio, in South Western House, Southampton, was brought into use on 30th July and now enables local interviews to be broadcast either on the BBC national television network or from the transmitter at Rowridge, in the Isle of Wight, only.

Picture and sound signals are relayed to the Rowridge site by a micro-wave radio link transmitter installed on the roof of the building and working in the

4.600 Mc/s band. When received the signals can be switched for local transmission or to London for distribution over the complete BBC TV network.

Burnhope Pilot Transmitter Aerial

WORK is proceeding on the aerial which will send out the first ITV signals from the I.F.A. site at Burnhope. The array comprises four channel eight horizontal dipoles stacked to give additional gain. It will be fixed to the side of the main mast about the 400ft. level. Owing to the low power available at this stage the inevitable losses in even a very low loss feeder preclude its use at greater heights. The pilot transmitter is expected to be on the air about mid-September.

"A Beginner's Guide to Television"

OVER 4,600 copies of the "Beginner's Guide to TV" were taken up by the booksellers on the first day of publication (July 20th) and repeat orders are received daily from all over the country. There is still time, however, for you to obtain a copy although it is obvious that the first edition will soon go out of stock.

Band III Channel

THE P.M.G. has stated that he will not publish the advice he has had from the TV Advisory Committee on the allocation of further channels in Bands 3. The P.M.G., however, has adopted a suggestion which will provide a first coverage of 98 per cent. and another Band 3

service with substantial national coverage.

TV in Scotland

THE P.M.G. was also asked to take steps which would enable the BBC to bring television to Sutherland and other Scottish counties, the populations of which are denied television because they are so small in numbers that the service would not pay. The reply was that the BBC, in view of its limitations on capital expenditure and its existing commitments, will not be able to start any extension of its TV service to the areas concerned before at least 1960.

TV Tubes in Australia

STANDARD cathode ray tubes are now being manufactured in Australia in quantities to supply the entire Australian market. Last year, over 100,000 tubes were produced. Off-standard tubes are not made in Australia. No licences have been issued for the import of standard tubes.

Training Student Apprentices

THE I.E.E. has recently published a report on the education and training of student apprentices. Copies are available from the Institute at Savoy Place, London, W.C.2, at 2s. by post.

BBC Television Centre

THE new BBC Television Centre is now under construction at the White City, London. Date of completion has not yet been announced.

TV Reception at Hastings

THE P.M.G. was recently asked whether in view of the low standard of TV recep-

tion in Hastings, he has considered erecting a satellite transmitter. The questioner was informed that there had been an improvement in reception in Hastings, following the increase in the power of the Crystal Palace transmitter last December. There is still difficulty, however, in some parts of the borough, and the possibility of using a satellite is to be considered by the corporation along with the claims from other areas.

BBC Folkestone Station

THE BBC low-power satellite TV transmitter at Crete Way Down, Folkestone, commenced experimental transmissions early in July. The transmitter is designed to work unattended, and is of a type developed by the BBC for improving reception over limited areas. It transmits in Channel 4 (61.75 Mc/s for vision, and 58.25 Mc/s for sound) using a directional aerial. As the transmissions are horizontally polarised, receiving aerials must be erected in the horizontal position.

Technical Details

THE new station transmits in Channel 4 (vision 61.75 Mc/s, sound 58.25 Mc/s), and uses a directional aerial so as to provide the maximum signal strength in the town. The transmissions are horizontally polarised, which means that receiving aerials will need to be erected in a horizontal position. It is expected that good reception will be provided for some 40,000 people living in Folkestone, but at some low-lying points in the shadow of the cliffs the signal will be weakened as a result of screening. Most viewers in Folkestone will find it worth while to tune their receivers to Channel 4, and to install horizontally mounted aerials designed for reception on this channel.

Viewers who are doubtful whether the new station will give better reception in their particular locality than is obtainable from the Crystal Palace station on Channel 1 should consult a local radio dealer. If the receiver is of the older type designed for Channel 1 only, some adjustment

by the dealer will be necessary to change it to Channel 4.

TV History

FOR the first time in TV history, publicity material with special music will be permitted during the test signal transmissions which precede the opening of a new independent station.

Southern Television has produced this new promotional idea in agreement with the Independent Television Authority.

Inter-spersed with the full power test signals which began on August 1st were transmissions of slides "starring" the "Running Man" advertising symbol of Southern Television urging the public to be ready on August 30th—the theme of the £50,000 regional campaign.

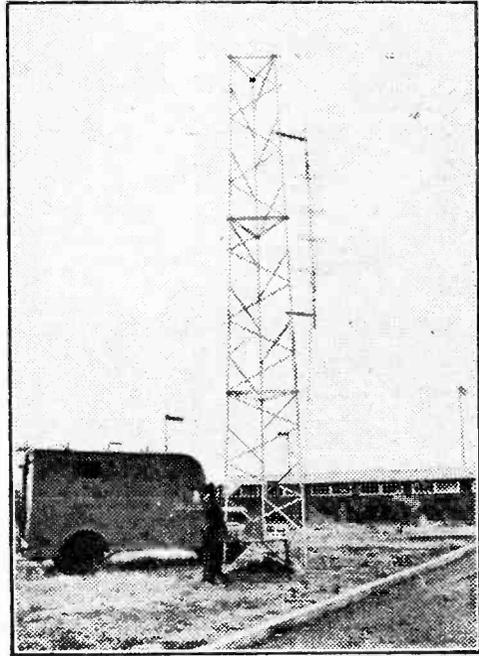
These slides were backed up by a full orchestral recording of "Southern Rhapsody," Richard Addinsell's lovely signature tune for the station. Eric Winstone, Director of Music, has cut the disc, which has an announcer's voice breaking in three times saying, "You are listening to 'Southern Rhapsody,' composed by Richard Addinsell and played by Eric Winstone and his Orchestra. This is the signature tune of Southern Television. Programmes begin August 30th."

The record will be played every half-an-hour during the test signals.

The full power signals (100 kilowatts E.R.P.) will be transmitted for 12 hours daily from 10 a.m. to 10 p.m. except on Sundays.

Technical Liaison

THE Department of Scientific and Industrial Research has



The Pilot Transmitter which will send out the first ITV signals at the I.T.A. site at Burnhope.

recently published a booklet entitled "Small Firms With Big Problems," and it shows how research institutions can help small firms unable to employ scientists and technologists. The booklet is available free from D.S.I.R. Lending Library Unit, 20, Chester Terrace, Regent's Park, London, N.W.1.

Third Television Network?

THE Post Master General has stated that no decision has yet been reached on the application made by the BBC and I.T.A. for alternative television programmes.

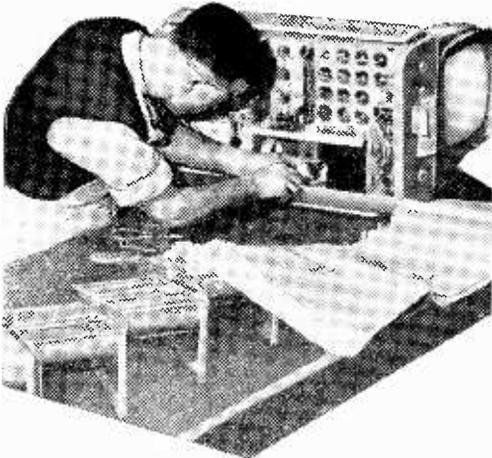
Dublin Radio Show

A TRIAL commercial TV service will not operate during the Dublin Radio and Television Exhibition to be held this year. The idea has been negatived by the Irish Minister for Post and Telegraphs. The Government proposes to take no action as regards the TV services until the Television Committee has issued its report.

A NEW SERIES

Analysing and Servicing TV Receivers

No. 1.—The Receiver Explained By "Diadem"



had not fully mastered the art of reading a television theoretical diagram, otherwise most of the questions could be cleared up by some technical knowledge and a careful study of the diagram. But to be fair to other querists not all problems can be solved by this method, as some sets have faults peculiar only to one particular model, and only the engineer with practical experience of this model could answer the unusual problem quickly, which may have taken him some considerable time to find out for himself when he first handled it.

It was, then, with this in mind the author decided to analyse the function of the most important components in all the main stages of a receiver, as it would not be much use telling the reader who has a frame cramping fault to test the frame amplifier feedback linearity coupling capacitor if he did not know where it was situated.

THE idea of the following article was prompted by reading the queries section in PRACTICAL TELEVISION. Similar types of questions are asked with great regularity month by month, so the author has written down as many faults of an everyday character as he could think of and collated them under 143 different headings. It was then realised that some of these readers were evidently newcomers to the television field, and

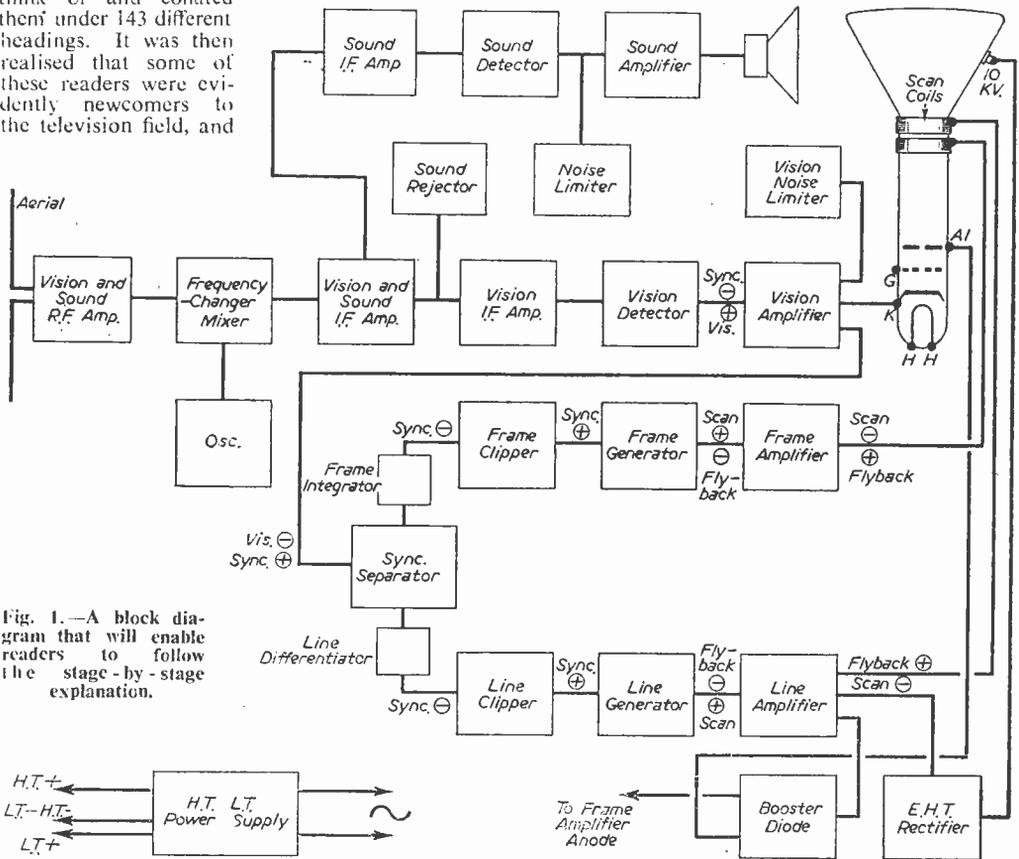


Fig. 1.—A block diagram that will enable readers to follow the stage-by-stage explanation.

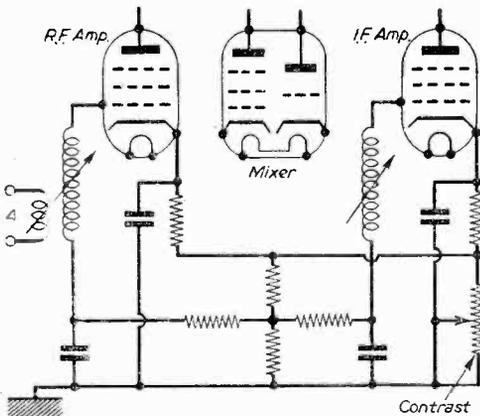


Fig. 3.—Method of controlling the I.F. and R.F. stages by a single control.

The Various Stages

To help readers service their old and new receivers, diagrams that are little seen these days will be reviewed as well as some of the later types. The stages to be reviewed with a list of faults at the end of each section are:

- The vision stages.
- The sound stages.
- The sync separator including fly-wheel and clippers.
- The line timebase, including how the thyatron works.
- The EHT supplies, including flyback,

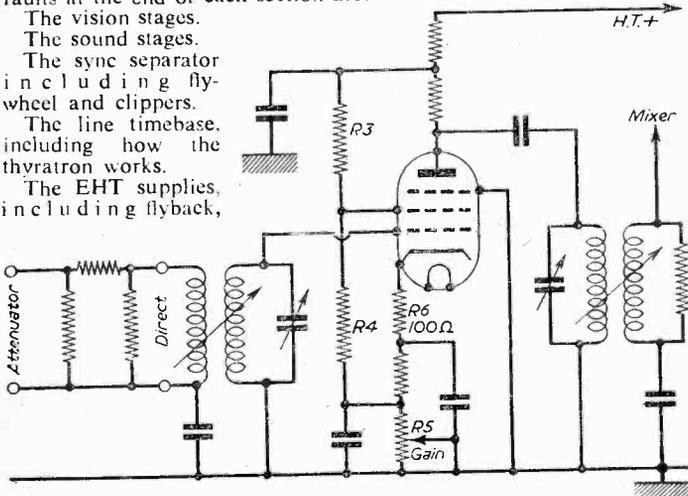


Fig. 4.—Another form of biasing.

- mains, ringing choke and R.F. EHT.
 - The frame timebase, including how the multi-vibrator and blocking oscillator work.
 - The cathode-ray tube and electromagnetic focus.
 - Projection receivers.
 - Electrostatic receivers including the Miller-transitron timebase.
 - The power supply and miscellaneous faults.
- If the reader uses the articles in conjunction with his own circuit diagram it should be possible to repair most receivers that have appeared during the last ten years.

The Block Diagram

A study of the block diagram (Fig. 1) will

enable newcomers to follow the stage-by-stage explanations as we proceed with the article. The polarity of the vision signals, sync pulses and timebase wave-forms are shown for the average receiver of magnetic C.R.T. and flyback EHT types. Divergencies of polarity exist, of course, but these will be explained as the article proceeds.

The R.F. amplifier is common to both vision and sound; the amplified signal is fed into the frequency changer stage, the resultant sound and vision I.F. signal is then further amplified: it is at this point we tap off the sound signal and pass it through a further sound I.F. amplifying stage before applying it to the detector; a noise limiting stage usually incorporated in the same glass envelope as the detector reduces any external interference and prevents it from reaching the sound output stage in any annoying proportions.

Now let us return to the sound and vision I.F. stage; a sound rejector coil is incorporated at this point, and only the vision signal passes on for further I.F. amplification. The signal is then passed to the detector stage, and in this case a positive-going video signal is fed to the video amplifier and its negative-going output feeds the tube cathode and any interference pulses arriving at the tube are clipped by the vision noise limiter valve.

Separation of Pulses

The positive-going synchronising pulses appearing at the video anode are fed to the sync separator valve along with the vision signal. The picture signal is then removed, only the line and frame pulses remaining. These negative-going pulses are then separated

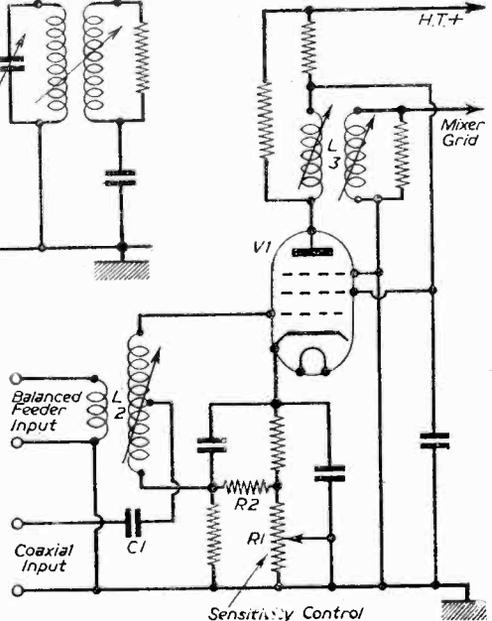


Fig. 2.—Input to the sound and vision R.F. amplifier.

from one another by a resistance capacity network called a differentiator and integrator, and to make sure these pulses are separated cleanly line and frame clippers are incorporated prior to the generators. But these clippers are optional. The sync pulse output from the clippers in this case are positive-going. These sync pulses originating in the studio lock the camera and the receiver to the correct frequency. The camera and receiver start scanning the scene at the same instant and are kept in step by a line pulse transmitted at the end of each line scan and a frame pulse at the end of each frame scan. When the line and frame generators are working correctly it is possible on arrival of these pulses to lock the generators to the transmitted frequencies of 10, 125 c.p.s for line and 50 c.p.s for frame by means of the hold controls. The hold control varies the frequency of the generators, as the control is rotated we come to a point when the generator frequency coincides with the transmitted frequency and the generator locks and the picture becomes intelligible.

Sawtooth Wave-form

The output from the generators is a sawtooth wave-form, this is fed to the amplifying stage. The wave-form is positive-going on scan and negative-going on flyback and the output from the amplifying stage is the reverse polarity of the above. This sawtooth wave-form is now fed to the scanning coils on the tube neck. The efficiency diode reclaims the energy which would otherwise be lost during the flyback, and the E.H.T. rectifier supplies smoothed D.C. for the tube anode. The H.T. supply is the conventional A.C. or A.C./D.C. supply. Newcomers who are contemplating altering their old receivers from soft valve thyratrons to hard valve timebases and rebuilding the timebases in general to enable a larger tube to be scanned, may find the timebase polarity markings which appear throughout the article helpful in avoiding disappointing results.

The R.F. Stage

The input to the sound and vision R.F. amplifier is arranged to suit either a balanced twin feeder cable or the more popular co-axial type. The signal is fed through the isolating capacitor C1 to the tapped secondary coil. The signals are then amplified by the valve and the amplified output appears across the R.F. transformer primary L3. This is a standard straightforward arrangement for most R.F. amplifiers. The only part of the circuit likely to puzzle newcomers is the numerous types of variable biasing networks available.

When in a strong signal area a gain control in the first stage is essential, this prevents overloading the mixer stage and causing cross modulation. R1 being variable allows the bias and hence the sensitivity of the valve to be adjusted according to the signal strength in the area from where the set is operated. This may seem a simple arrangement, but there are other factors to be taken into consideration; by adjusting R1 the characteristics of the valve, the input resistance and capacitance and the mutual conductance are altered. When

R1 slider is near the earthy end of its track the bias voltage is increased and the gain drops and there is a fall in input capacity, but the input resistance rises; this is good but unfortunately this alters the tuning of L2 and reduces the bandwidth which, in turn, causes a drop in picture quality. This trouble can fortunately be overcome easily by applying a very small bias to the control grid through R2, this helps to overcome the trouble and it reduces to negligible proportions the change in input capacity when adjusting R1 (Fig. 2).

Strong Signal Areas

In strong signal areas it is sometimes necessary to control the first I.F. stage as well as the R.F.

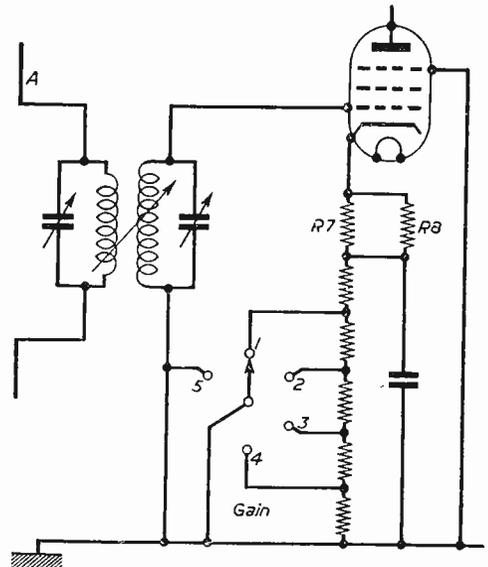


Fig. 5.—An aerial attenuator.

stage, and Fig. 3 shows how it can be done with a single control without introducing any of the undesirable effects mentioned in the previous paragraph.

Another form of biasing is shown in Fig. 4, it will be noticed there is no by-pass capacitor across R6. The gain control R5 is part of an H.T. potential divider R3, R4, R5; the gain of the valve is varied by the operation of R5 by varying its cathode bias, this results in a change in input impedance as mentioned previously, but this is neutralised by the negative feedback developed across R6.

The unusual arrangement in Fig. 5 is really an aerial attenuator, but it also acts as a semi-variable gain control by varying the cathode voltage in five steps. You will notice R7 and R8 are again un-bypassed.

(To be continued)

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(Concluded from page 8, August issue)

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Also on the control track are edit pulses spaced at one-field intervals at the bottom of the vertical synchronising lines. The edit pulses are recorded by the control track head and originate in the master control units as a derivative of the vertical synchronising lines.

Editing and Splicing

The latter part of the vertical synchronising signal represents a blanking time between television fields. The editing pulse marks where this blanking time appears. If the tape is cut and put back together during the blanking periods, there will be no roll-over on the television screen when the tape is played back. To make the editing pulses visible, a solution containing carbonyl iron is applied to the tape prior to making a cut. The iron particles adhere to the tape according to the magnetic pattern made by the recording, and clearly reveal the editing pulses. The tape is then put in a jig and the cut is made along the line in the video pattern which is marked by the editing pulse. Splicing tape is then applied to the back of the tape to hold the spliced ends together. After the splice has been made, the carbonyl iron particles wipe off easily.

Playback Switching

During replay, it is necessary to derive the amplified output signal from one head at a time, switching from one preamplifier to the next (at a moment in the transmission when minimum disturbance will be introduced into the reproduced picture), and later to demodulate the amplified r-f output of the playback heads. Electronic switching accomplishes this purpose.

A network of coincidence gates is employed with a "get-ready" signal sent to each gating tube in turn from the 240-cps photocell source; a "go" signal is delivered with precision to each gating tube from the television signal itself. Switching occurs only on the back porch of a horizontal pulse. Therefore it does not appear in the reproduced picture, even as a transient.

The multi-grid gating tubes pass the r-f signal



to their plate circuits only when each of two grids is raised to a predetermined level of bias. Thus the coincidence of two positive bias signals is used to trigger each of the four gates consecutively.

The photocell output is delivered to the sequential switcher, as well as to the servo amplifier control system. This 240-cps signal, whose phase is directly related to the instantaneous position of the rotating head drum, is fed through a vernier phasing control to a 90-degree lag network that controls two related channels in conjunction with the other signals. The same signal is continuously fed to a frequency doubler and to an in-phase network.

The in-phase 240-cps signal is clipped and fed to a phase splitter, which produces two signals, one in-phase and one 180-degrees out-of-phase. These two signals are applied to the gating tubes, the in-phase signal to one of the grids of gate 1, the opposite phase to one of the grids of gate 3. These are the same grids to which the amplified r-f from heads one and three is fed.

The same 240-cps signal, after passing through a 90-degree lag network, is similarly clipped, fed to a phase splitter, and applied to the control grids of gates two and four. In the same way, these gates receive the amplified r-f output of heads two and four at intervals of 90 and 270 deg.

Present Development

Performance of the "Videotape" recorder, in the form in which it exists in 1958, has been considerably improved over that obtained from the experimental unit first displayed in 1956.

The development of special tape, with surface

(Continued on page 77)

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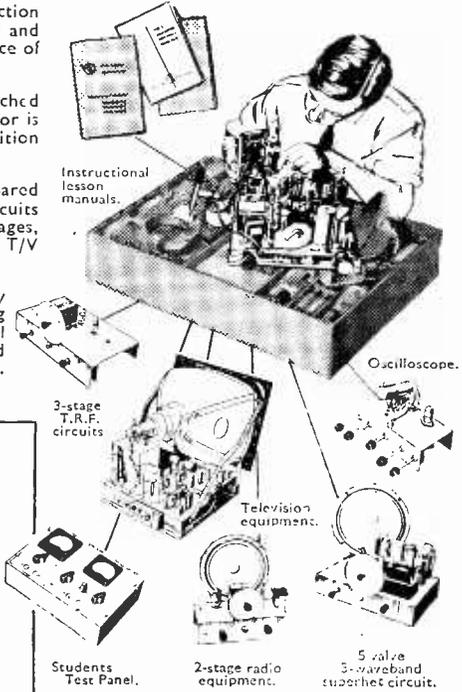
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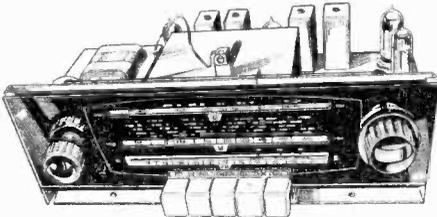


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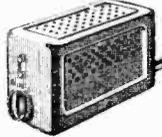


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	EF93 8/6	KTW63 7/6
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	ELC41 10/-	ML41 7/9
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	ELC43 10/8	MSP4 7/12/6
	ELC44 10/8	N37 18/1
	ELC45 10/8	N37 18/1
	ELC46 10/8	N37 18/1
	ELC47 10/8	N37 18/1
	ELC48 10/8	N37 18/1
	ELC49 10/8	N37 18/1
	ELC50 10/8	N37 18/1
	ELC51 10/8	N37 18/1
	ELC52 10/8	N37 18/1
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	ELC57 10/8	N37 18/1
	ELC58 10/8	N37 18/1
	ELC59 10/8	N37 18/1
	ELC60 10/8	N37 18/1
	ELC61 10/8	N37 18/1
	ELC62 10/8	N37 18/1
	ELC63 10/8	N37 18/1
	ELC64 10/8	N37 18/1
	ELC65 10/8	N37 18/1
	ELC66 10/8	N37 18/1
	ELC67 10/8	N37 18/1
	ELC68 10/8	N37 18/1
	ELC69 10/8	N37 18/1
	ELC70 10/8	N37 18/1
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	ELC82 10/8	N37 18/1
	ELC83 10/8	N37 18/1
	ELC84 10/8	N37 18/1
	ELC85 10/8	N37 18/1
	ELC86 10/8	N37 18/1
	ELC87 10/8	N37 18/1
	ELC88 10/8	N37 18/1
	ELC89 10/8	N37 18/1
	ELC90 10/8	N37 18/1
	ELC91 10/8	N37 18/1
	ELC92 10/8	N37 18/1
	ELC93 10/8	N37 18/1
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	ELC96 10/8	N37 18/1
	ELC97 10/8	N37 18/1
	ELC98 10/8	N37 18/1
	ELC99 10/8	N37 18/1
	ELC100 10/8	N37 18/1

PL38 27/10	UABC80	Z309 9/6	6BA6 7/6	6K7M 6/9	6J30L2 12/6	12Q7GT 7/8	30P12 12/6
PL81 8/6	Z359 9/6	6BE6 8/-	6K8G 8/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
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PY82 9/6	UCC80 23/-	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PY83 10/6	UCH81 11/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PZ30 20/11	UCL82 23/-	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN4DD	UCL83 25/9	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
27/10	UL41 10/8	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
15/-	UP85 10/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44	UP89 10/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
27/10	UR44 10/8	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN45	UL46 24/4	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
27/10	UL84 11/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN46 7/6	U66 20/11	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN200A	U78 27/10	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
4/-	U99 8/8	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	UY41 8/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	Q121 7/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	R16 27/10	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	VP13C 3/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	VP23 8/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	VP41 3/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	T41 24/4	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	TR25 27/10	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U10 10/8	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U14 10/8	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	(DW4) 50/0	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U32 8/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U39 8/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	(MU12) 14	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U25 15/-	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U26 13/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U27 27/10	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U35 15/-	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U36 8/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U39 14/8	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U40 17/6	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U44 11/4	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	
PEN44 15/-	U801 31/4	6D5 12/6	6M7 7/6	6J37 8/6	12Q7GT 7/8	30P12 12/6	

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smoothness much finer than that normally provided (or needed) in audio tape, specially formulated oxides of particularly good short-wave length resolution capability and improved mechanical characteristics have all combined to make possible the routine realisation of signal-to-noise ratios of 34 to 36 db, with occasional attainment of ratios as high as 40 db.

Head manufacturing techniques have also been refined, reducing the abrasion effect, both on the tape and on the heads, to the point where a substantial number of heads have proved usable well beyond the 100 hours which were originally considered a practical norm. Tape, too, is proving capable, under these improved conditions, of being reproduced many more times without deterioration, and of being recorded and re-recorded for an aggregate of well over the 100 passes of the revolving heads which at first were thought to be the practical maximum.

Head Deterioration

Deterioration in heads, due to wear, does not produce deterioration either in resolution, or in the linearity of gray-scale transfer; in fact, resolution improves slightly as heads wear and only the eventual increase in noise tells of the approaching end of the useful life of the heads.

The same is true of tape. Neither resolution nor gray-scale linearity is affected by the gradual abrasion of the tape which occurs in use. Instead, the signal-to-noise ratio slowly begins to deteriorate, signifying the end of the useful life of the tape.

Linearity of gray-scale is an inherent advantage of the video-tape recording process due to the modulation system used. Differential gain measurements typically give readings of under 10 per cent.; this remains constant being quite independent of head or tape condition. The live appearance of the video-tape reproduction is as much due to linear gray-scale transfer characteristic as to any other operating characteristic of the machine.

Resolution of better than 300 lines, with high contrast ratio, is readily obtained.

Tape Duplication

Experience with the recorder in daily network and station operation has established the practicality of making duplicate tapes from an original. While there is no method of making copies except by connecting one or more videotape units as recorders, while another is used as a replay machine, the number of copies which may be made in this manner is substantially unlimited.

First-generation copies of an original videotape

recording are deteriorated in hardly any visible way, resolution and gray-scale linearity being substantially identical to the original. (A slight rise in noise occurs, but if this is already well below visibility in the original the copy will appear virtually the same as the original.)

Adapting the Colour Accessory Unit

In developing the VR-1000 colour accessory, Ampex engineers made its attachment to the



The Ampex VR-1000 unit.

black and white machine as simple as possible. In the console, aside from a few minor resistor changes, no other modifications are necessary.

In the existing second rack a new switcher unit and processing amplifier will replace the original equipment. Additional components in the new third rack will include two power supplies, a burst separator and gate delay unit, a modulator-demodulator unit, burst lock oscillator, single channel generator, and a side-band converter. The customer must supply a 3.58 Mc/s signal at standard level and stability.

Output will be standard composite NTSC colour signal at standard level. Interlace of frequency components between Y and the L and Q signals will not be maintained.

After the colour accessory has been installed, the VR-1000 will record and reproduce either black and white or colour signals.

TELEVISION TROUBLES

Their Symptoms and How They May be Cured—2

By G. J. King

THE previous article under this title dealt with faults relevant to the timebase circuits of certain models of the Alba range, and in order to maintain ease of future reference and continuity of presentation, timebase faults will also be discussed in this article, but in

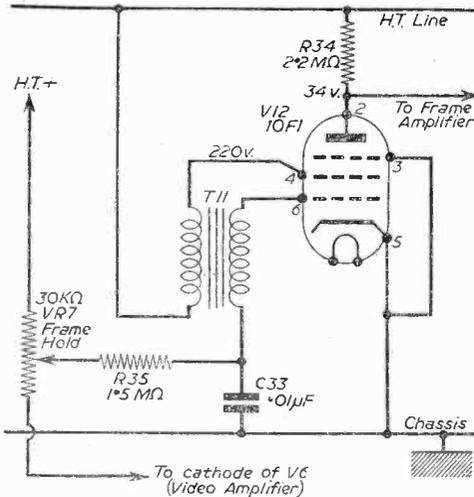


Fig. 1.—Circuit of the frame oscillator of the Baird 164.

relation to models of the Baird range. The idea is to deal with timebase faults which occur in receivers of popular make—running through the various models in alphabetical order—and then to follow on with the host of faults which occur in other circuit sections and which give rise to symptoms of an entirely different nature.

The alphabetical tie-up with regard to makes will still be adopted, but each model will be considered from the fault symptom under discussion independently. In this way it is possible to concentrate attention on a particular section of the circuit as applicable to the popular makes, and the reader will acquire a greater understanding of the associated fault symptoms which may enable him to correct a fault on a receiver that has yet to be considered in detail.

As faults in the sync separator section sometimes affect the build-up of the picture upon the screen and, in certain cases, may appear to originate from the timebase circuits themselves, faults in the sync separator, where applicable, will be embraced under the present heading of timebase faults.

Baird T164 Series

Frame Slipping.—On a number of these models it has been discovered that a poor frame lock, with the picture rolling slowly or locking lightly

with a wide, dark, horizontal band across the centre, is caused by a winding fault in the frame blocking oscillator transformer T11. It is usually the secondary winding which goes high-resistance, but if either the primary or the secondary deviates from 550 ohms and 280 ohms respectively, the transformer should be replaced if the fault is present.

Short-circuited turns in either the primary or secondary of this transformer may also cause the symptom, and if adjacent turns are shorting a simple resistance check may not reveal the trouble. In this case a definite indication of short-circuited turns is obtainable by measuring the A.C. frame voltage across the secondary winding with a 20,000 ohms-per-volt instrument. A reading of some 150 volts represents the normal condition, while a reading considerably below this figure should lead to transformer replacement. A meter with a sensitivity lower than 20,000 ohms-per-volt should not be used, as it will damp the circuit and give a false reading. Transformers for this model are obtainable from Direct TV Replacements, Ltd., through a dealer.

As a temporary repair, a 2 megohm resistor can be connected between pin 6 of the 10F1 frame oscillator valve and chassis, but, whilst this will improve the frame hold, the faulty transformer will distort the frame sync pulses and considerably impair the interlace.

If the speed of the slipping frame can be considerably altered by the frame hold control, but it still rolls slowly when the control is at the

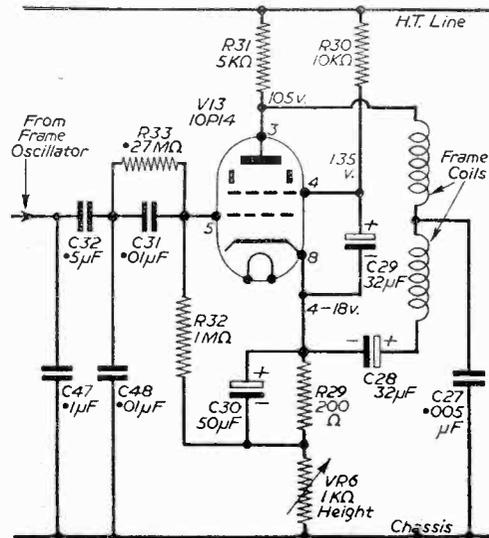


Fig. 2.—Frame amplifier circuit of the Baird 164.

end of its range, the trouble is invariably caused by an increase in value of the 1.5 megohm resistor which is connected to the slider of the control. This resistor is R35 on the circuit diagram of the frame oscillator in Fig. 1.

Insufficient Height.—This symptom may be caused by the value increase of the 2.2 megohm resistor (R34) in the anode circuit of the frame oscillator valve (V12), though impaired emission of the valve itself is sometimes responsible. However, if the voltage at the anode of the valve is approximately as indicated on the diagram in Fig. 1, the trouble should be sought in the frame amplifier stage, the circuit diagram of which is given in Fig. 2.

A frequent cause of the trouble here is low emission of the frame amplifier valve (V13) 10P14 or deterioration of the electrolytics C29 and C30. It will be seen that the frame coils are RC coupled to the anode of the frame amplifier valve, and, although partial failure of the electrolytic coupling capacitor C28 would promote the symptom, this component usually goes open-circuit completely and cuts off the frame altogether. It is quite a simple matter to check this part by shunting it with another electrolytic whose value is approximately the same; the correct value capacitor should, of course, be installed if replacement is proved necessary. The coupling resistor in the anode circuit rarely gives trouble, but if the anode voltage is low and the screen and cathode voltages normal, bearing in mind that the voltage readings given on the circuit are dependent on the setting of the height control, then the resistor is probably guilty, and in need of replacement.

Poor Frame Linearity.—There is no variable form control on this model, but if the frame linearity is far from satisfactory attention should be paid to the components associated with the control grid circuit of the frame amplifier valve. If the coupling capacitor C32 loses its insulation, a positive voltage from the frame oscillator valve anode will be reflected on to the control grid circuit of the frame amplifier valve, which will result in severe frame distortion and possibly a fold-over at the bottom of the picture; in this case, the voltage at the cathode of V13 will be above that indicated on the circuit.

If the remaining components in the grid circuit are free from fault, cramping at the bottom should lead to a check of the H.T. voltage and the emission of V13.

Trapezium-shaped Raster.—This symptom, usually troublesome on earlier types of the Baird 164 and 165, is caused by short-circuited turns in the deflector coils as the result of chemical action between the sponge retaining ring and the enamel insulation of the wire. This trouble is avoided in later versions by the incorporation of a polythene disc between the deflector unit and the sponge ring.

Lack of Width.—If the H.T. voltage is reasonably normal (230 volts on the cathode—pins 1 and 8—of the U801 H.T. rectifier with 230 volts on the anodes), the trouble most likely lies somewhere in the line oscillator/amplifier stage, the circuit of which is given in Fig. 3. The symptom is often promoted by R27 increasing

in value, and this can be quickly checked by measuring the voltage on the screen of V14 (pin 4)—if the voltage is below 76 volts, the resistor should be replaced.

Low emission of the line valve (20P1) is another cause of the symptom, but in sets which have been in continuous service both the U801 and the 20P1 often need replacing to secure the original full line scan. The artifice of shunting the line deflector coils with a 50-100 pF mica capacitor, as a means of decreasing the EHT and increasing the width should be practised only as a last resort. If the width is well below normal and the smaller components are in good order, the line transformer is usually to blame. This should be replaced with the modified version, which is now available; in this case, slight modifications to the line timebase circuits are also demanded.

Line Hold Control at the End of Range.—This symptom sometimes signifies that the 20P1 is in need of replacement, but if the trouble is caused by slight alteration in the characteristics of this valve, improved balance of this control can be achieved by connecting a capacitor between the control grid (pin 5) of the 20P1 and chassis, as shown in broken line in Fig. 3; also ascertain that R28 and VR5 are of correct value.

Sluggish Oscillator.—If the receiver is switched on with the aerial disconnected or in the absence of a signal, the line oscillator may fail to operate until the circuit is in some way disturbed. Fig. 3 shows that the line sync pulses are fed to the valve screen, and these under normal conditions incite oscillation and bring the generator into action.

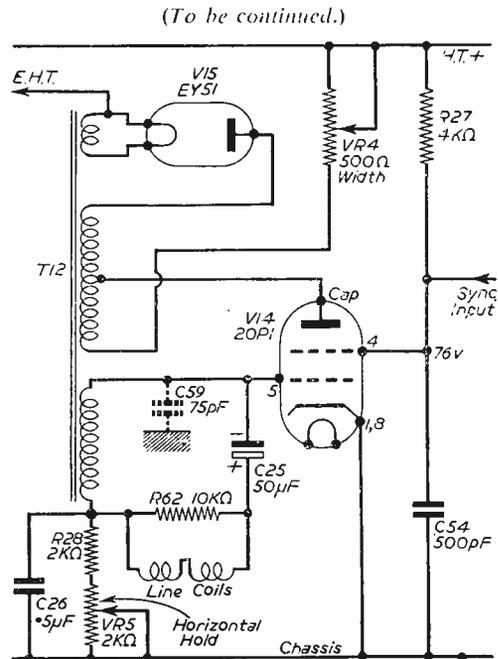


Fig. 3.—A circuit diagram of the line timebase of the Baird 164 series.

Cathode Ray Tubes for Co



THE VARIOUS TYPES AND HOW THEY WORK

abroad, in an effort to find one which is satisfactory for reproducing a colour television picture as distinct from its monochrome counterpart. While it is known that the provision of a colour television service is not imminent, various international conferences have deliberated on the form and standards which this service will adopt when it starts. This, of course, is quite apart from the established colour service which is now operating in the U.S.A.

Three-gun Shadow Mask Tube

As a prelude to that, considerable attention has been devoted to the development of a cathode ray tube which will do justice to the colour television service and show a received picture possessing hue, chrominance and luminance comparable to the

SOME years ago a prominent member of the radio industry described a cathode ray tube as a glass bottle full of emptiness. The modern version of this device used for television picture reproduction does not fall into this category with its precision-made, complicated electrode system and flawless glass bowl container exhausted to a high degree of vacuum. Still more does the term complication apply when attention is turned to the several forms of cathode ray tube which have passed through various stages of development, both in this country and

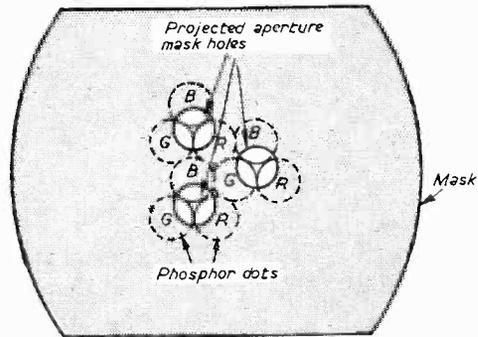


Fig. 3.—The colour grains seen through the shadow mask.

original scene being televised. One of the most successful has been the three-gun shadow mask tube (Fig. 1), produced originally by the Radio

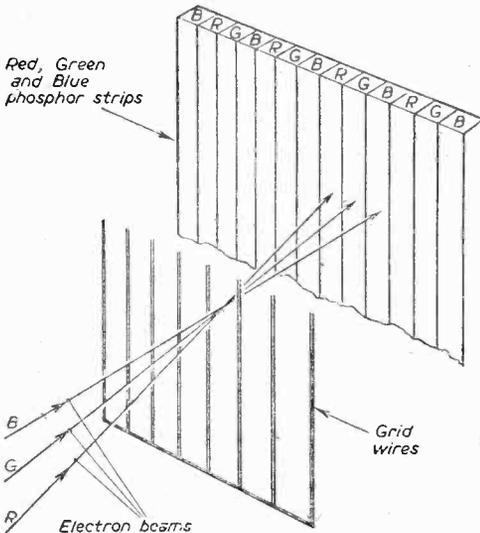


Fig. 1 (Left).—Lawrence three-gun tube.

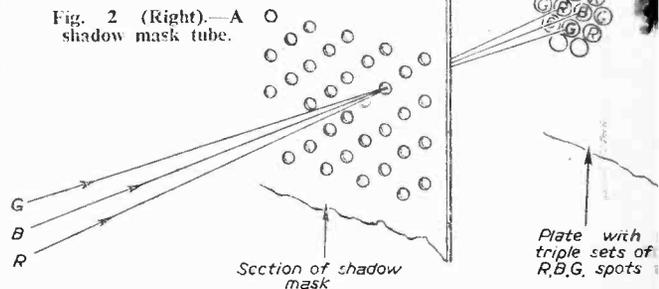


Fig. 2 (Right).—A shadow mask tube.

Colour Television

By H. J. Barton-Chapple, B.Sc.

Corporation of America. Many readers of this journal may be familiar with its structure, but in view of its importance it is as well to review briefly its main features.

In this tube there are three guns, or sources of

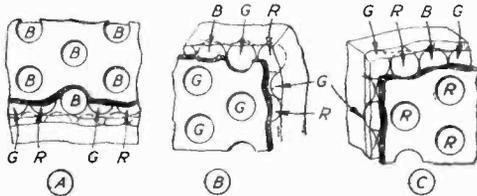


Fig. 4.—Arrangement of the colour dots on the screen.

electrons, mounted in a fairly narrow glass neck. They are so orientated that the three beams converge on a minute hole in a very thin perforated

Green response for no volts on grid

Red response for +ve volts on grid 'A'

Blue response for -ve volts on grid 'A'

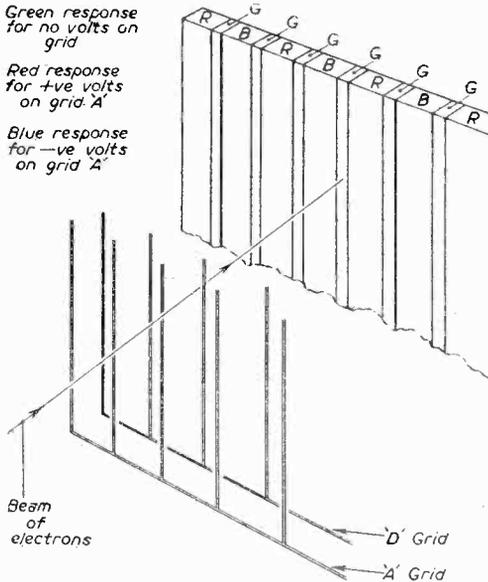


Fig. 5.—Lawrence single-gun tube.

metal sheet. This serves as a mask and is mounted a short distance behind and away from the face of the tube which serves as the viewing screen (Fig. 2). Each tiny hole in the shadow mask has associated with it an area on the phosphor screen made up of three red, blue and green dots whose centres are located at the corners of an equilateral triangle (Fig. 3). The purpose of the mask, as its name implies, is to prevent the electron beam modulated by the red areas of the original picture from impinging on the areas

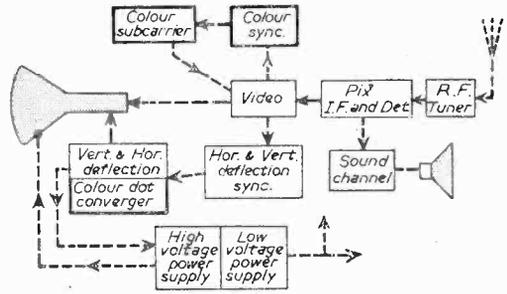


Fig. 6.—The elements of a modern TV colour receiver.

comprising blue or green phosphors. Similarly, blue and green beams are guided on to their correct dots for the excitation of the proper phosphors (Fig. 4).

The structure is very ingenious, the number of triangular phosphor elements depending on the definition of the picture and due to the dot structure this cathode ray tube needs special circuits for controlling the dynamic convergence of the beams over the face of the tube. Great care has also to be exercised to eliminate or neutralise the effects of the earth's field.

Lawrence and Chromatron Tube

The next cathode ray tube of interest for colour television is called the Lawrence or Chromatron tube. In the single-gun type (Fig. 5) the face of the tube is made up from a series of strips of red, blue and green phosphors, but there are twice as many green strips as any other colour and they are interleaved to give the strip formation of red, green, blue, green, red, green, blue, green, etc. These strips will obviously fluoresce when the beams of electrons, formed from a gun of such a design that it gives a sharp focus at a

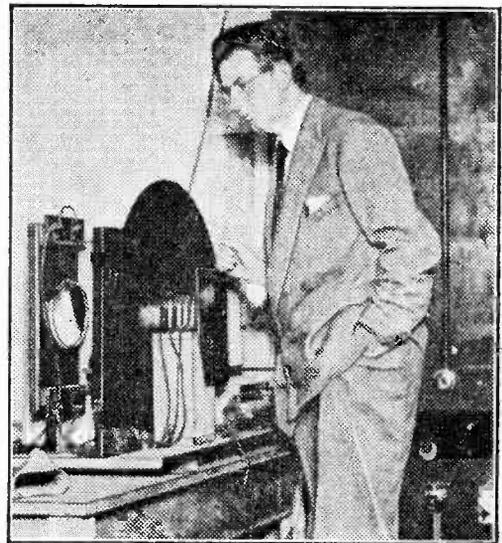


Fig. 7.—Baird with a 1928 colour TV receiver.

relatively low acceleration voltage, just strike the strips.

Parallel to this screen and a short distance behind it is a grid of wires, and this grid is so mounted that there is an accurate alignment with the phosphor strips. The grid serves to compress the electron beam, act as an accelerator to increase picture brightness and finally to deflect the beam so that it strikes the correct colour

tion at that moment (remembering that the beam is simultaneously carrying out its scanning action) with reference to the negatively charged wire. For blue fluorescence the voltage applied to the pair of grids is reversed.

At the same time the colour television input signal from the receiver has to be switched to ensure that when the beam is on any particular strip then the intensity of the colour spot is in

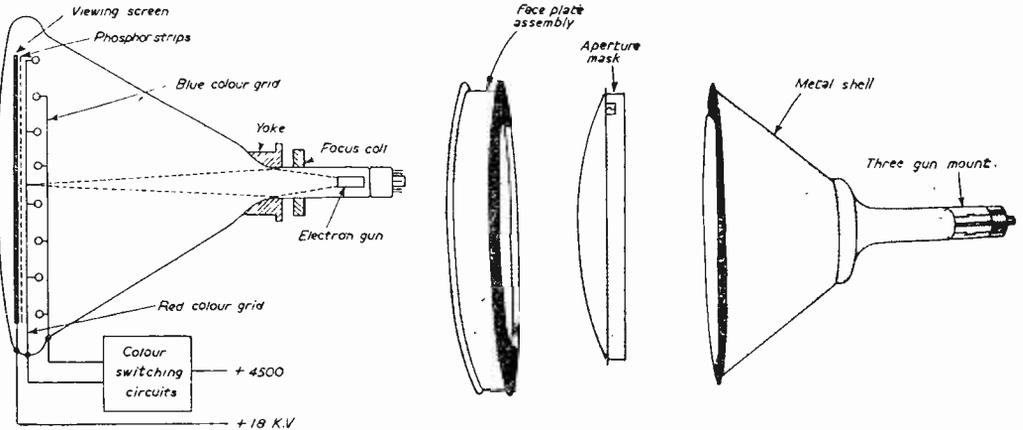


Fig. 8 (Right).—The Chromatron colour tube. (Left) The R.C.A. colour tube dissected.

strip corresponding to the colour modulation signal from the transmitter.

The wires in the grid are split into two groups so that there are two sets of alternate wires and the colour signal deflecting voltage is applied across the two sets of coplanar grids. When no voltage is applied to the grids the electron beam passes between them and strikes the green phosphor strip. To give red fluorescence a deflecting voltage is applied to the two sets of grid wires and the electron beam is deflected to the left or to the right depending on its instantaneous posi-

tion. If two wires touch there would be a complete loss of picture.

Single-gun Lawrence Tube

In addition to this single-gun Lawrence tube, a three-gun version has been developed and here the need for the high switching voltage necessary for the single gun version is avoided. Once again the phosphors are deposited on the inner face of the cathode ray tube in strips, but there is an equal number of strips of each colour arranged in a red, green, blue, red, green, blue, etc., formation. A wire grid is mounted near the back of the tube face with the wires parallel to the phosphor strips, but this grid only provides a focusing action. The three beams from the cathodes are made to converge on the space between the wires and form three colour images simultaneously. Again grid sag must be avoided, but in this case if two wires touch, the picture is not lost but a black line appears on the screen at the position of short circuit. On the other hand this three-gun version of the Lawrence tube is capable of providing a colour television picture of high luminance.

Baird's First Demonstration

It was exactly thirty years ago that Baird gave the first demonstration of colour television using a triple spiral apertured disc as the receiver, with

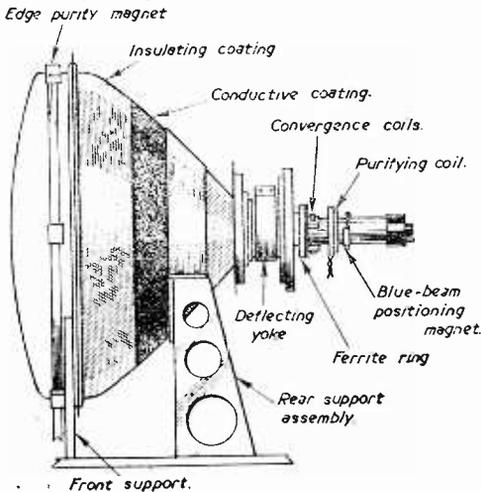


Fig. 9.—A sketch showing a modern colour tube with all the essential parts identified.

a neon lamp to provide the red section of the picture and a helium and mercury vapour tube for the blue and green colours (Fig. 11). A commutator switched the lamps alternatively in circuit, one-third of a revolution for the neon lamp viewing and the remaining two-thirds for the other lamp. The results were, of course, crude when viewed in the light of present day practice brought about by the enormous advance in electronics but what is not generally known is that during the later war years Baird demonstrated a new form of cathode ray tube for colour television.

Telechrome Tube

He called it the Telechrome and developed one form of tube for a two colour system and another for a three colour one. In the case of the former, two cathode ray beams modulated

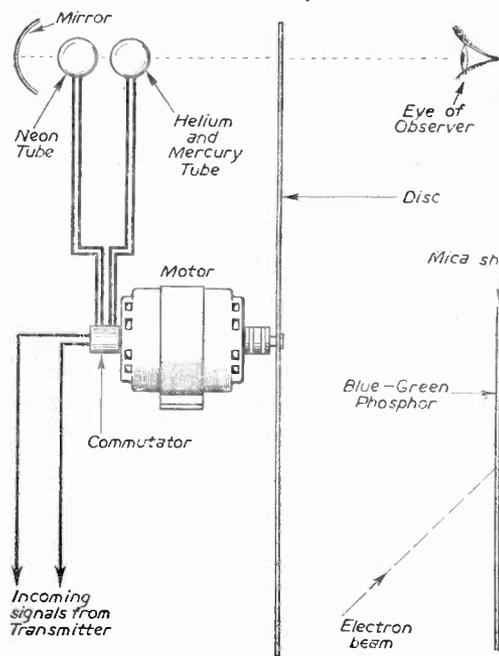


Fig. 11.—1928 system for colour television.

by the appropriate incoming colour signal voltage were made to impinge on the opposite sides of a thin mica screen mounted in the glass envelope. One side of this screen was coated with an orange-red phosphor and the other with a blue-green phosphor (Fig. 12). This dual combination of phosphors had formed on them their own respective pictures which were seen simultaneously, one on the front of the mica screen and the other through it. By being superimposed in this way the resulting picture was one complete in natural colour. This tube was demonstrated in conjunction with a special form of colour television transmitter which Baird had developed.

In the case of a television signal with three separate colour signal modulations, three electron

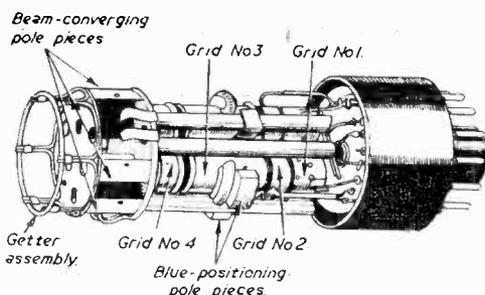


Fig. 10.—A sketch of the "gun" assembly of a modern colour cathode ray tube.

beams were employed. The flat front face of the thin mica sheet was coated with the red phosphor but the back of the mica was ridged. The set of ridges facing one way were coated with the green phosphor and the other set with the blue phosphor. The three sets of colour television images were, as before, viewed simultaneously by looking at the flat face of the mica sheet. The demonstration of this Telechrome cathode ray tube took place in the late summer of 1944, but bomb damage to Baird's laboratory and ill health—he died in June, 1946—prevented him from fostering this development to a successful conclusion.

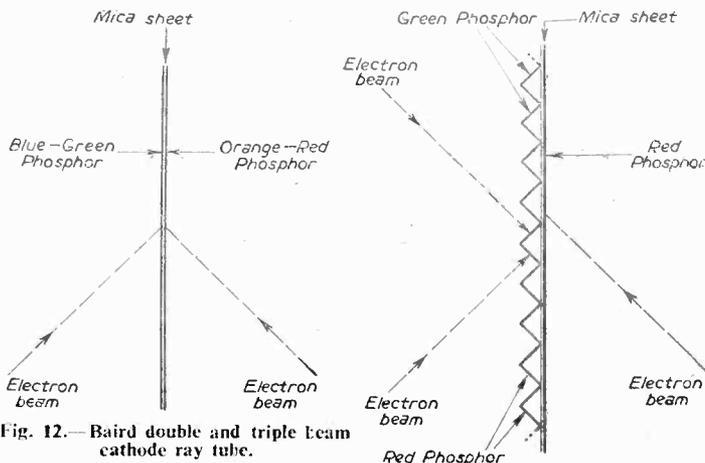


Fig. 12.—Baird double and triple beam cathode ray tube.

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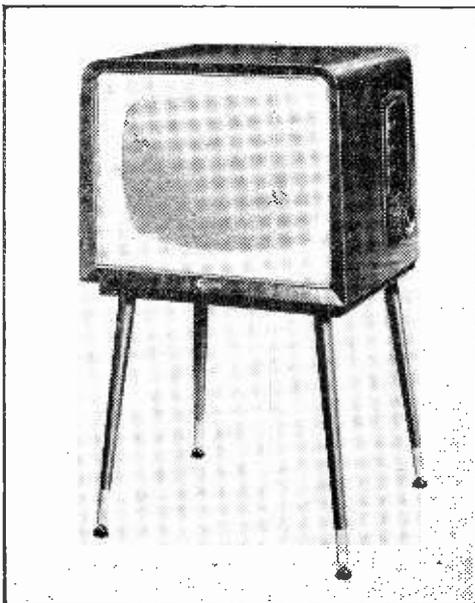
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THE SECOND ARTICLE OF A SERIES REVIEWING THE LATEST RECEIVERS. THIS MONTH WE DEAL WITH FERGUSON AND HIS MASTER'S VOICE RECEIVERS

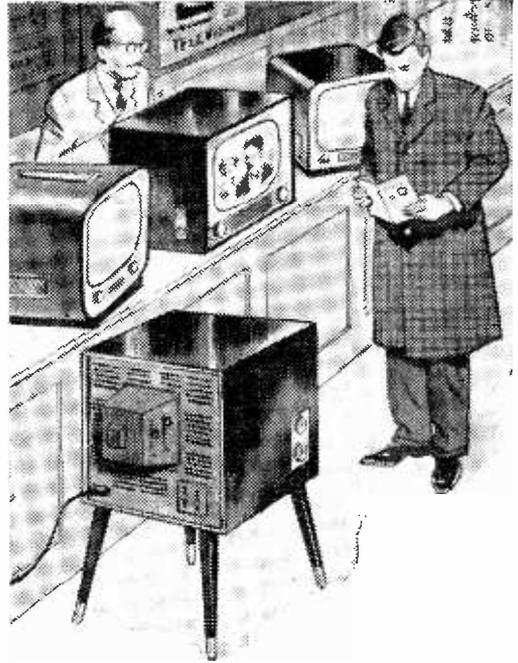
FERGUSON FULL RANGE MODEL 305T

THE Ferguson 305T is a 17in. "Full Range" receiver incorporating new technical features to provide first-class reception in "difficult" areas.

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The Ferguson "Full Range" Receiver Model 305T.



interference spots or bands to an acceptable level. In addition, both timebases have been newly designed and provide adequate scanning power and EHT for the tube.

The picture tube is the latest Mullard aluminised 17in. rectangular all-glass, flat screen 90 deg. deflection angle type. A thin film of aluminium behind the phosphor coating of the tube face considerably increases the brightness of the picture.

Printed wiring is used in the construction and assembly of the sound channel of this receiver. Maximum accessibility to all components has been achieved by the use of a vertical chassis for the receiver assembly.

The receiver is turret-tuned for all available BBC and I.T.A. programmes. The exclusive Ferguson "Channel-Lite" selector switch allows immediate choice of any desired channel—the channel number remains illuminated and serves as a pilot light.

A specially designed stand for this receiver is available as an optional extra.

Specification

Ferguson Model 305T is a 17in. table model housed in an attractive walnut veneered cabinet. A turret-tuner unit for reception of all BBC and I.T.A. programmes is fitted and all technical refinements are employed to ensure best possible results in fringe areas.

Voltage Range.—200 to 250 volts A.C./D.C. mains. In the case of A.C. operation the receiver is intended for a nominal 50 c/s supply, but is suitable for supplies not locked to the National Grid system.

(Continued on page 87)

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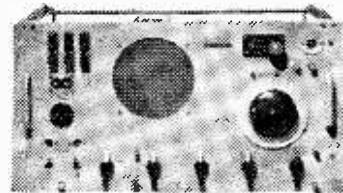
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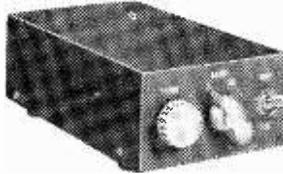
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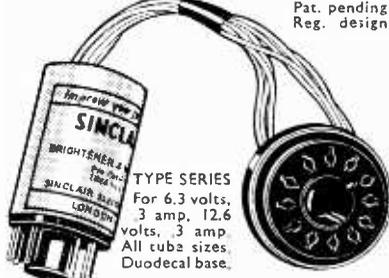
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Picture Tube.—The receiver utilises flat screen 90 deg. deflection angle, 17in. rectangular all-glass picture tube. An ion trap is incorporated to give longer life. The tube is operated on a final anode potential of 16Kv which, together with the aluminised screen and the combination of grey face plate and tinted filter, ensures a brilliant picture having adequate contrast ratio for daylight viewing.

Cabinet.—The cabinet is attractively styled and is finished in a highly polished walnut veneer with metal trim.

Dimensions.—19½in. wide × 16½in. high × 18½in. deep.

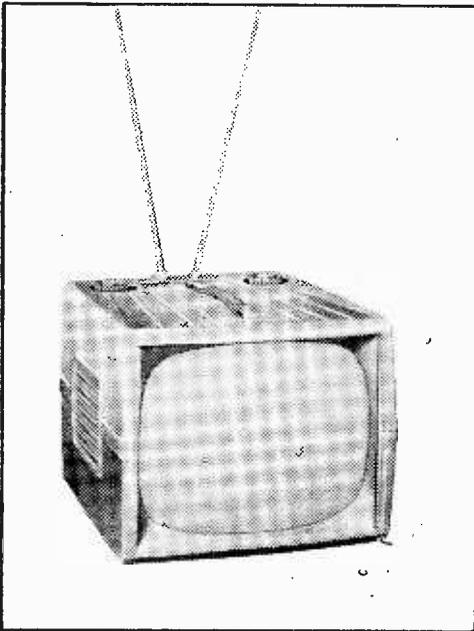
FERGUSON TRANSPORTABLE MODEL 45T

THE Ferguson "Forty-Five" 14in. Model 45T represents a new achievement in transportable television.

The latest type Mullard 14in. aluminised, rectangular, all-glass, electrostatically focused, 90 deg. deflection angle picture tube, the combination of grey face plate and tinted filter, together with the new style presentation, gives up to 20 per cent. larger viewing area than on previous 14in. receivers.

A feature of outstanding importance is the provision of two inbuilt 6-section telescopic aerials which will ensure good results in areas of reasonably strong signal strength. Where signal strength is low, an external aerial should be used.

The receiver is turret-tuned for all available BBC and I.T.A. transmissions. Controls are situated on the top of the cabinet.



The Ferguson Transportable Receiver Model 45T

The exceptionally well-designed moulded cabinet completely encloses the picture tube, and in order to reduce weight to an absolute minimum all chassis metal work is of aluminium.

Specification

The receiver is a 14in. transportable model housed in a moulded cabinet. A turret-tuner is fitted for reception of all available BBC and I.T.A. transmissions. Two telescopic inbuilt aerials are provided and will ensure adequate results in areas of reasonably strong field strength. Special measures have been taken to reduce weight on this model including the use of aluminium for all chassis metal work.

Voltage Range.—200-250 A.C. mains and 220-250 D.C. In the case of A.C. operation the receiver is intended for a nominal 50 c/s supply, but is suitable for supplies not locked to the National Grid System.

Aerial.—The receiver is equipped with two 6-section telescopic aerials mounted on ball joints to ensure optimum signal pick-up without rotation of the receiver. In areas of low signal strength an external aerial will be required.

Mains Controls.—These are situated on the top and consist of two concentric pairs. Combined "On/Off" switch and volume control with brightness and concentric channel selector and fine tuner control. Inside a hinged flap, also on top of the receiver, access is obtained to horizontal lock, vertical lock, contrast, gain and mains voltage adjustment.

Pre-Set Controls.—Height is adjustable by means of a screwdriver through the rear of the cabinet. The following controls are available on removal of the bottom half of the cabinet for use on setting up the receiver.

Frame linearity (main); frame linearity (top of picture); focus and centring. Width is normally set at the factory and is adjustable in three steps.

Channel Selection.—By adjustment of the channel selector switch, the receiver can be immediately tuned to any of the existing BBC and I.T.A. channels. The tuner is fitted with coils for five Band I channels and four Band III channels and, should reception ever be required on another Band III channel, the appropriate set of coils can readily be fitted.

Vision Channel.—The cascode R.F. stage in the turret uses a specially developed double triode valve giving a high gain with low noise. Two vision I.F. stages together with an automatic gain control circuit are used. A non-adjustable vision spot suppressor is provided to reduce interference spots or bands to an acceptable level.

Sound Channel.—Two sound I.F. amplifiers provide adequate sound sensitivity to match the vision gain and delayed A.G.C. is fitted, together with a non-adjustable noise suppressor.

Timebases.—A special circuit is used to ensure reliable interlace of the frame scan and frame flyback suppression is included to reduce the possibility of flyback lines showing on the picture. A newly developed flywheel circuit is used to reduce line tear in fringe areas and a special line hold control is fitted to obtain the correct setting. Both timebases are of a new type

designed in order to provide adequate scanning power and EHT for the 90 deg. picture tube used in this receiver.

Picture Tube.—This receiver utilises an electrostatically focused, 90 deg. deflection angle 14in. rectangular, all-glass, picture tube. An ion trap is incorporated to give longer life. The tube is operated at a final anode potential of 13.5Kv which, together with the aluminised screen and combination of grey face plate and tinted filter, ensures a brilliant picture having adequate contrast ratio for daylight viewing. The picture tube is of a new type and, together with the new type presentation, gives a viewing area of up to 20 per cent. larger than on previous 14in. receivers.

Cabinet.—The cabinet is moulded in two parts in a thermosetting material. The weight of the chassis is directly taken on the carrying handle in order to reduce the possibility of cabinet breakages.

Dimensions.—14½in. wide × 12½in. high × 16½in. deep.

HIS MASTER'S VOICE MODEL 1866

A "FULL RANGE" Receiver.—For first class reception of all available BBC and I.T.A. programmes, even in difficult areas.

Electrostatic Focusing.—Gives consistent reception without the need of any adjustment.

Keyed A.G.C.—For freedom from fading and flutter.

Vision Spot Suppressor.—Adjustable to reduce interference spots or bands.

An Aluminised Tube.—To ensure a brilliant picture, with adequate contrast ratio for daylight viewing.

Speaker.—Front-facing 6in. elliptical speaker of special type.

Modern Style Cabinet.—Walnut and sycamore veneers, golden coloured metal embellishments and hard, durable high gloss Polyester finish combine to provide an unusually handsome cabinet. Fold-back doors secured firmly in closed position by a special magnetic device. Complete with contemporary style legs.

Electrostatic focusing, keyed automatic gain control and flywheel synchronisation are some of these features which assure reliable performance in regions which are subject to weak signals or undue local interference. The reduction of interference spots or bands to an acceptable level is achieved by the use of an adjustable vision spot suppressor, and both timebases have been newly designed and provide adequate scanning power and EHT for the tube.

In the sound channel of this receiver printed wiring is used for complete reliability. A vertical chassis for the receiver assembly ensures maximum accessibility to all components.

This "His Masters Voice" hall-mark receiver is turret-tuned for all available BBC and I.T.A. programmes. The selector switch, conveniently placed on the front of the cabinet, allows immediate choice of any desired channel.

The contemporary legs are designed as an integral part of this receiver.

The H.M.V. Model 1866 is a 17in. Console

television fitted with turret-tuner unit for reception of all available BBC and I.T.A. programmes. All the latest technical refinements are incorporated to ensure reception of the highest possible quality under widely varying conditions, and the receiver is equally suitable for high signal strength areas and fringe areas.

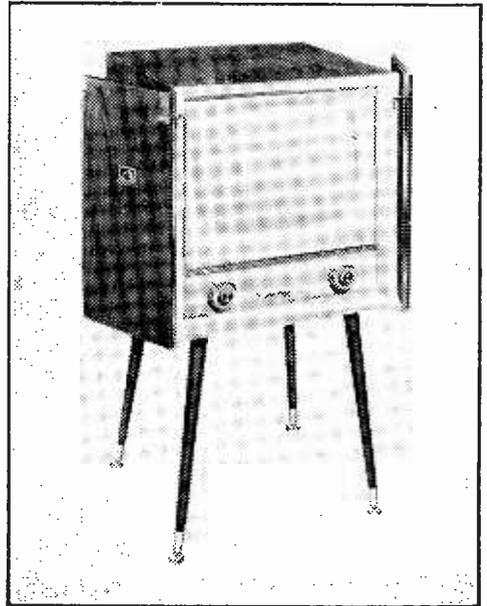
Two Band Reception.—Immediate tuning to any one of the existing BBC or I.T.A. channels is provided by the channel selector switch. This tuner is equipped with coils for five Band I channels and four Band III channels. The appropriate set of coils can be readily fitted if reception of another Band III channel is required.

Cathode Ray Tube.—A flat screen 90 deg. deflection angle, 17in. rectangular all-glass picture tube is used. Longer tube life is made possible by the use of an ion trap. Aluminised screen, grey face plate and tinted filter combine to ensure a brilliant picture with adequate contrast ratio for daylight viewing. The tube operates at a final anode potential of 16Kv.

Electrostatic focusing ensures "constant focus" without any separate focus control and provides adequate spot size over the entire picture area.

Cabinet.—Walnut veneers on top, sides and doors. Sycamore front and golden coloured fret. The combination of beautiful decorative wood finished with golden coloured metal embellishments is further enhanced by a special Polyester finish which is hard, durable and of extremely high gloss.

Another special feature is the fold-back doors. To preserve the clean lines of this cabinet these doors are not fitted with handles, but are held firmly in the closed position by a special magnetic device. The cabinet is supplied complete with a specially designed stand.



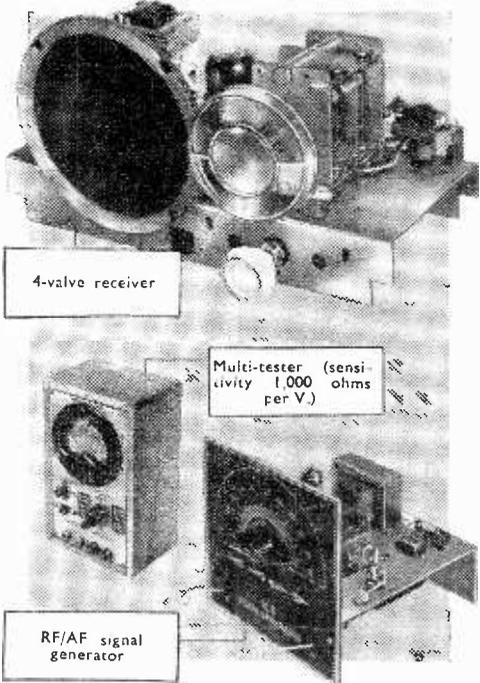
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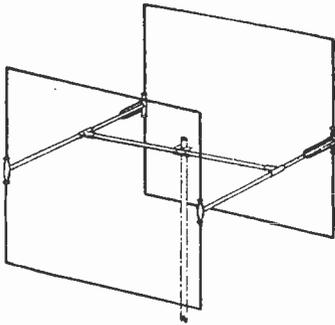
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UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

Picture Page

THE very first regular live television feature in the world was probably *Picture Page*. This became very popular with the small and somewhat exclusive band of television set owners in 1937. Pioneer work by BBC producers and technicians, operating in the limited confines of the original Alexandra Palace studios, devised a format which was in its way the picture counterpart of the ever popular *In Town Tonight* of sound radio. Joan Miller was an attractive girl at a telephone switchboard who "put you through" to the person being interviewed.

The Television Magazine Format

IT is worth while remembering that these pioneer transmissions took place before television got going in the U.S.A. as a regular public service. The 405 line high-definition system had only just superseded the mechanical systems of 240 lines. The Emitron television camera was in a primitive form, requiring high-powered lighting, and the producer was limited to dissolving from one camera to another—direct cuts were not possible. As a matter of fact, many programmes were produced using one camera only. Notwithstanding all the progress that has been made with production techniques, studios, cameras and equipment, the original *Picture Page* style of production emerges again and again in the regular magazine items on both BBC and I.T.A. *Panorama* is a direct descendant with its scope enlarged by film and slide interpolations, and the occasional introduction of short debates on controversial matters. BBC's *Tonight* and I.T.A.'s *Today* are also related both to

Picture Page and to the sound radio's *In Town Tonight*. The modern tendency for these magazine items is towards a more documentary approach.

"The Suspect"

IT was the presence of Joan Miller in the cast of the BBC play *The Suspect* that recalled memories of the early days of *Picture Page*. In this play Joan once more proved that she was a first-rate actress of great emotional power, playing the part of a woman who, earlier in her life, had been suspected of being a murderess. Having kept the knowledge of the early tragedy from her grown-up son, she is ever anxious that her past will not mar his marriage or his future career. She succeeds in convincing both her son's future father-in-law and the television audience of her innocence. It was a case of acting within acting, a severe task for any actress. The sting came in the fade-out of this excellently produced play, when an unexpected twist in the story once more set the audience wondering about her innocence of the crime. Joan Miller injured a leg during one of the rehearsals of this play, but, nevertheless, carried on to give a very fine performance on the night of the transmission.

Captions

CAPTIONS play a part (*We disagree.—Ed.*) in the make-up of television programmes. Their most familiar form is the printed title at the beginning of a feature and the roll-up cast title at the end, which are often superimposed on live scenes. But certain of the live documentary items call for intermediate titles of elaborate kinds, particularly those concerned with maps and statistics. Specialist departments have been organised to cope with captions by the BBC and one or two of the

I.T.A. companies. Alfred Wurmser, of the BBC, has received an award for his effective cartoon titles and continues to make creative contributions to both live and filmed BBC features. The mechanical forms of cartoon titles, seen in such programmes as *Facts and Figures*, succeeds in making subjects interesting which would otherwise be dull. The caption machine used on many television stages is more or less of a standard pattern, with electric motor controls. One of the television cameras is wheeled up to it and it is operated quickly and easily without much bother. Drawings and photographs can also be dealt with on an apparatus called "Balop," which sometimes has two or three isolated "stages" to hold opaque drawings or photographs, as distinct from slides or film strips. The lens of a Vidicon camera can be pointed at any one of the stages via semi-transparent mirrors. Dissolving effects are achieved by fading-in or out the lighting inside each little "Balop" box. This arrangement is more popular in the U.S.A. than here, where the use of transparencies or glass slides is becoming more and more the standard method. But the "Balop" is a useful piece of equipment when mechanical moving effects are required on drawings and diagrams. The name "Balop" by the way, was evolved from the first improvised apparatus of this kind, which was mainly made up of optical components manufactured by the American lens firm, Bausch and Lomb, for a device called a "Balopticon."

The Linden Tree

FAMILY plays are generally popular fare, and there are few playwrights who can convey the family atmosphere better than J. B. Priestley, who seems to be equally at home with any

particular scale in the social strata that he decides to tackle. In *The Linden Tree*, an A-TV play, he chose as his background the home of a professor at a university in a rather dull provincial town. Old Professor Linden is set in his ways and refuses to accept retirement, in spite of the pleas of his anxious wife and family, and threats from the university authorities. Outdated in this age of streamlined educational systems, he holds on even to the point where his wife decides to leave the town and him. Told thus, the story sounds thin, but the superb character drawing by John Phillips as the Professor and Irene Browne as his wife held one's sympathy and attention to the end, which, by the way, was rather abrupt and unsatisfactory. Nevertheless, J. B. Priestley's dialogue seems to convince one even in the most unlikely turns of a plot, so well do the words help the actors in their characterisation. Production and technical qualities of *The Linden Tree* were first-class and that important item—the diction of the players—was obviously watched by the director, Lionel Harris.

Diction

I MUST confess that the subject of clear diction is one of my hobby horses. The modern trend for actors to "throw away" lines in a manner that is supposed to be "natural," seems to me to be most unfortunate. If a line of dialogue is written and spoken, then it should be heard by viewers, even if the loudspeakers are in the sides of their sets and are muffled by the window curtains! If a play depends chiefly upon its dialogue, such as Shaw's wordy *You Never Can Tell*, then it is all the more important that the actors speak clearly and that the microphones are given a fair chance of getting good positions. Unfortunately, the diction of some of the artistes in this Shaw play completely failed to register. The result was boredom, purely due to unintelligibility. Some actors seem to be able to project their voices very clearly, even when speaking quite softly. The dropping of syllables, too, is an unfortunate habit. Yet some actors and, also, the younger actresses, contrive to drop them right and left.

often reversing the meaning of their lines. The very word "unfortunate" can become "fortunate" with bad diction.

The Third Television Programme

IT can't be long before the decision will have to be made as to who is to run the third alternative programme. The I.T.A. claims that the four existing major companies could provide seven-day alternative commercial programmes on two channels in the London and Manchester regions, leaving two channels at Birmingham for two new major I.T.A. programme organisations. But many people think that the BBC should have an opportunity of providing the third alternative programme. The new Television Centre at the White City, plus existing studios at Lime Grove, Hammer-smith, Ealing and the provincial, Welsh and Scottish regions, gives plenty of space for expanded operation. The question is—would the revenues from television licences at the present price be sufficient to pay for a second BBC TV programme? It ought to be, judging by the constantly increasing numbers of TV licences issued. The greatest problem, however, would not be shortage of cash, but of ideas, scripts and funny jokes. Even with two programmes running, there isn't enough really original material available.

Southampton

THE South Coast and Southampton has come into the television picture in a big way suddenly. The BBC's

regional centre and Southern Television's studio, both at Southampton, have been opened almost at the same time, the BBC opening a month ahead of the I.T.A. station. Local transmitters for both are in the Isle of Wight at Rowridge and Chillerton Down respectively, and both will for the most part take their respective network transmissions from London. Southern Television's studio is a converted cinema, situated low down by Northam Bridge, and a high tubular scaffolding tower has been erected for microwave links for outside broadcasts. It has two stages, a main one 62ft. × 50ft. and an interview studio 30ft. × 22ft. E.M.I. C.P.S. cameras are being used in the studio and on a mobile television truck. Brighton just about comes on the fringe of this I.T.A. area, but this resort is already well served by the small satellite BBC transmitter on Truleigh Hill. Further east, in Sussex and Kent, BBC reception has been generally very good. I.T.A. transmissions begin to fade in parts of Kent and East Sussex—but this will be remedied in due course with a new transmitter near Folkestone. It won't be very long before at least two programmes will be available in almost every part of Great Britain, and in some areas that overlap there will be a choice of up to five transmissions, though the programmes may be identical most of the time. We are likely to see some curious aerial ironmongery on the roofs of homes of viewers who want to "collect" the largest possible number of TV stations!

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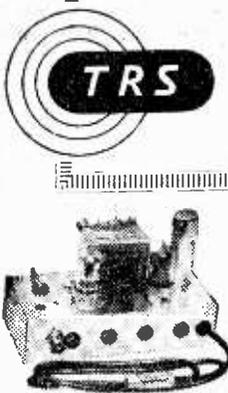
THE value of closed-circuit television for remote observation in the atomic energy field has long been recognised. The Atomic Energy Authority was among the first users of this equipment in Britain and to-day many television channels are at work in the Authority's establishments. It is, therefore, natural that when a need arises for inspection in areas of high gamma flux, where direct viewing is impossible, the use of television is considered. Now scientists and engineers of the Authority have designed a

mechanical "hand" with a television "eye" for removing spent radio-active cartridges from the inside of atomic piles of the type used at Windscale. Marconi's Wireless Telegraph Company have supplied the television channel for the machine, which has been manufactured by Sir W. G. Armstrong Whitworth Aircraft Ltd. to A.E.A. design.

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3Z4	9/6	35L6	10/6	EP91	8/6	PL82	10/6
6AV6	8/6	EAB80	9/6	EL41	10/6	PL83	11/6
6X7	8/6	EB91	8/6	EL84	11/6	PS90	9/6
6K8	8/6	EP41	10/6	EM85	11/6	PY81	9/6
6Q7	8/6	ECV83	9/6	EY51	12/6	PY82	8/6
6N87	8/6	ECV84	12/6	EY86	14/6	PY83	10/6
6V6	7/6	ECV80	12/6	EZ40	8/6	U22	8/6
6X4	7/6	ECF82	12/6	EZ80	8/6	U25	12/6
6X5	7/6	ECV42	10/6	EZ81	8/6	UCH42	10/6
7C3	9/-	ECH81	10/6	MU14	8/6	UF41	10/-
7Y4	8/6	ECL80	12/6	PCV84	10/6	UL41	10/6
DAF96	9/-	ECL82	12/6	PCF80	10/6	UY41	8/6

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1RS, IT4, 1RS, 1S4 or 3S4, or 3V4 ... 27/6
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Carr. and Ins., 12/6.

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84/16450 v. T.C.C.	5/-
16/450 v. B.E.C.	3/6
16/500 v. Dub.	4/-
16/16450 v. T.C.C.	5/6
16/3250 v. B.E.C.	6/6
16/3250 v. B.E.C.	6/6
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84/8450 v. Dub.	3/-
84/16450 v. T.C.C.	4/6
84/16450 v. Hunt	5/-
16/450 v. B.E.C.	3/6
16/500 v. Dub.	4/-
16/16450 v. T.C.C.	5/6
16/3250 v. B.E.C.	6/6
32/350 v. B.E.C.	4/-
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Contemporary style, rexine covered cabinet in black and brown with cream interior. Size 18 1/2 x 13 1/2 x 8 in., fitted with all accessories, including speaker baffle board and plastic fret. Space available for all modern amplifiers and autochangers. Unique record player mounting board 14 x 12 in.
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200/250 v. A.C. Modern circuit with High Gain EL84 output and double wound Mains Transformer, variable tone and volume controls, wired and tested with 6in. Speaker and O/P Trans. complete with knobs and drilled ready to fit Baffle Board in above cabinet. Only £3.12.6. Carr. & Pack. 2/6.

2-VALVE AMPLIFIER Mk. 2
200/250 v. A.C. Specification as above but a higheridelity and greater output (approx. 3 watts) is obtained by using latest Twin Stage Triode-pentode Valve EC152 and negative feedback Tone Control. Complete wired and tested as above £3.19.6. Carr. & Pack. 2/6.

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Units now available :-

"DUAL BAND"

- ★ Co-ax Inputs for Bands I and III.
- ★ I.T.V.—amplified.
- ★ B.B.C.—amplified.
- ★ Single Output to Receiver.

Price £9.10/3 C.W.O. or C.O.D.

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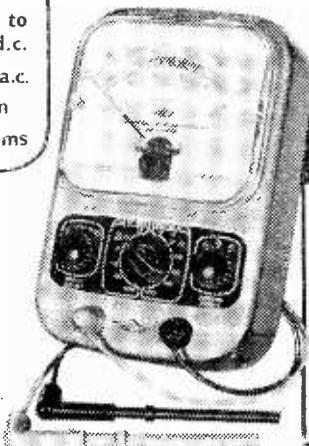
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CORRESPONDENCE

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).

SERVICE DATA

SIR,—In view of the difficulty in obtaining circuit diagrams and servicing data from manufacturers could you not devote space each month to requests for such data so that readers who may be fortunate enough to possess it can help other readers by letting it out on loan? This would be an extra service provided by your journal which already does so much for readers.—P.B. (Cheltenham).

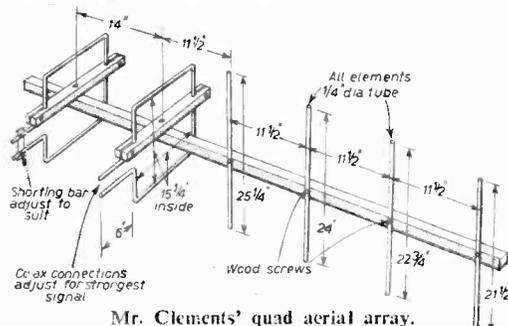
HOME-BUILT SETS

SIR,—Would it not be a good idea to invite your readers who have designed and built TV receivers to contribute construction articles complete with photographs, circuit and wiring diagrams, list of components, etc.? There must be many hundreds of such receivers in use at the present time and many of us like to experiment.—A. P. (Kenton).

[We have on many occasions invited readers to submit such designs and we are always glad to give careful consideration to articles so submitted. Where possible we should like to borrow the receiver so that we may test and photograph it. In the interests of other readers, it is essential that the receiver lives up to its claims.—ED.]

QUAD AERIALS

SIR,—I was very interested in the article on quad aerials, as I have been using an aerial of this type for Band III channel 9 for several months with excellent results.



Mr. Clements' quad aerial array.

My array which is in the loft consists of square diode and reflector with 6in. matching stubs, and four straight directors, all supports being made of wood. I was using a standard straight eleven yagi, but the quad gives me superior signal strength. I have drawn a rough sketch, which may be of assistance to your readers.—G. CLEMENTS (Bucks).

THE COMPONENT POSITION

SIR,—Several of the firms who a few years ago made up special components for home-built

TV receivers have now deserted the market and as a result certain vital components are difficult to obtain. Here is a chance for skilled constructors to design and market such components as side-lines. The question of purchase tax does not occur with some items but even when it does, you are entitled to make up to £500 worth a year and sell them free of purchase tax, although you must keep proper books and consult your local income tax inspector so that he can ensure that the £500 limit is not exceeded. Incidentally, there are large numbers of 9in. tubes still on the market and although set manufacturers have mainly deserted this size, it would satisfy large numbers of people. How about a design for a 9in. tube?—A. JOHNSTONE (Welling).

[There are several such designs in our "Practical Television Circuits" which costs 16s. 1d. by post.—ED.]

ITV OR BBC?

SIR,—You recently stated that more people are now looking in to ITV than to BBC programmes and I think the BBC have admitted this. This merely proves that there are more people interested in flapdoodle than in intelligent programmes. The ITV programmes, in my view, do not appeal to people of reasonable intelligence. I have never bought a thing as a result of the "spot" items, and the cheapjack nature of some of the advertising would put an intelligent person off anyway. In my view, the BBC programmes are the better, and they claim the major part of my viewing time and that of my family. In this rock-and-roll, skiffle, and be-bop age, one can understand ITV gaining ground since their programmes appeal largely to the person incapable of understanding really intelligent programmes. It would be as logical to argue that as more people attend football matches than cricket matches, football is a better game.—P. J. WATSON (Cheam).

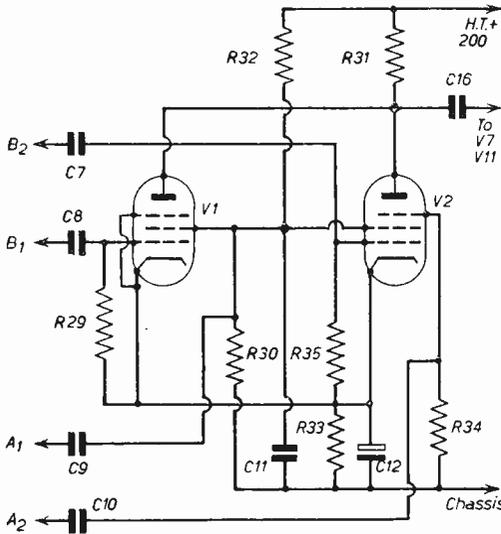
SERVICE DATA

SIR,—I was interested to read in the correspondence page of August issue PRACTICAL TELEVISION, the reply to the reader received from Messrs. Ekco in regard to service data. I would like to point out a case which I had, and highly praise the firm (Marconiphone). I had given to me by a friend, an old TV VT53DA, not working. I sent details of fault to Marconiphone sales and service department, who not only sent me a report of what the fault was, and where to look for it, but also sent me a service book covering about 12 different models, and informed me that they would be interested to know if I cured the fault which I did with the help of their information, fault being an open circuit slider. I sent price of service data by return post. At a later date I asked for some information regarding changing the tube of this set from a 10in.

to a 12in. they readily supplied full information on how to do this. I must conclude by saying I think this is one firm which deserves the highest praise and I hope you can print this.—A. J. SIMMONDS (Bexley).

PATTERN GENERATOR

SIR.—With reference to your article in the June issue of PRACTICAL TELEVISION, I would like to offer the following modifications to your circuit for pulse gating network. The valves used



Mr. Paterson's modified circuit for pulse gating network.

are EF50s which can be controlled by either the control or the suppressor (g_2) grids. Thus simplifying the problem of mixing two signals in the one valve. The circuit is given above.—A. PATERSON (Glasgow).

HORIZONTAL AERIALS

SIR.—“Serviceman” in his article on “Horizontal Aerials” makes a number of statements which may be misleading to the readers the article is intended to help.

For instance it is an error to say that with a vertical multi-element yagi “the acceptance angle is wider than when mounted in a horizontal plane” and “differences in the pick-up pattern around the back of the aerial and side lobes make certain types less effective against ghosts.” In fact the polar diagram in the plane of the elements of a yagi aerial will always have narrower forward and backward lobes than the polar diagram at right angles to the plane of the elements. This means that a yagi used for the reception of a horizontally polarised transmission will have a narrower acceptance angle in the horizontal plane than the same aerial used for a vertically polarised transmission. “Serviceman” can easily prove this for himself, by considering that a yagi aerial is akin to a system of half wave-length radiating elements, when it will be

apparent that the azimuthal directional response of a vertically polarised aerial will be represented by the vector addition of the azimuthal responses of the elements themselves. The polar diagram in a plane at right angles to this can be found by multiplying by the response, at right angles, of the elements themselves. It is well known that the radiation pattern of a half wave-length element in the plane of the element is approximately proportional to $\cos \theta$ where θ is measured from the direction of maximum radiation. Therefore, if the polar diagram of the vertical aerial can be represented by a function $r\theta$, the polar diagram for the horizontal yagi will be $r \cos \theta$. Two important conclusions to be drawn from this are:

1. $\cos \theta$ only equals unity when $\theta = 0$ deg. or 180 deg. and falls to zero when $\theta = 90$ deg. Thus with both polarisations the aerial will have the same forward gain but the acceptance angle will be narrower for horizontal polarisation.

2. Because $r \cos \theta = 0$ when $\theta = 90$ deg. or 270 deg. there will be no side radiation from a horizontal yagi.

These facts reverse the suggestions of the article and are incompatible with the diagrams illustrated in Fig. 3.

It is perhaps worth mentioning in passing that Fig. 1 disagrees with itself because (a) and (b) should have the same back/front ratio as they are sections through the same aerials directional response.

It is also misleading to say that “conventional types of combined aerial such as ‘H’ types with ‘fishbones’ added are impractical due to the stations not being co-sighted.” A short recourse to elementary geometry will show that the locus of a point subtending an angle of 30 deg. to two transmitters 4 miles apart will be two circles of about 4 miles radius extending to the sides of the line joining the transmitters. The farthest point at which it is possible to subtend 30 deg. will be about $7\frac{1}{2}$ miles from the transmitters. Applying this to the Newcastle area it will be apparent that few “H” aerials are used inside these circles and therefore no problem arises. Even if an “H” aerial with five Band III elements was used it is obvious that correct orientation for the Band III signal would result in a negligible loss on Band I, without resorting to independent orientation of the two separate parts, because of the broader directional response at the lower frequency. In the heavily populated areas—Newcastle, South Shields, Sunderland, Durham, etc.—even smaller angles will be subtended by the two transmitters and all that will be necessary is to orient correctly the whole “H plus 5” array to obtain the optimum condition for adequate signal de-ghosting. If “Serviceman” is still convinced that separate orientation is required then how does he propose to effect this in his own suggestion of a “double V?”—SENIOR RESEARCH ENGINEER.

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By F. J. CMM

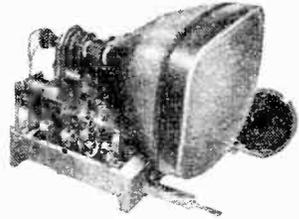
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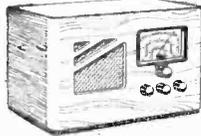
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5 valve (octal) superhet, 3 wave band receiver. Can be adapted for your gram. p.u. at a little extra cost. A.C. size: 9 1/2in. x 20 1/2in. x 11 1/2in. Two A.C./D.C. sizes: 9 1/2in. x 18 1/2in. x 11 1/2in. 9in. x 20 1/2in. x 12in. Wooden cabinets. Ins. carr., 4/6. Please state mains and size required when ordering.



PLESSEY SOUND & VISION STRIP, 25/6. Superhet. Not tested. I.F.'s 10.5 Mc/s sound, 15 Mc/s vision. 8 valve basis (6-6E1's and 2-6D2s, not included). Size: 8 1/2in. x 5in. x 4 1/2in. high. Post and Packing, 2/6. The Turret Tuner plugs directly into this chassis.

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POWER PACK & AMPLIFIER, 19/6. Output stage 6V6 with O.P. trans. Smoothed H.T. 350 v. 250 mA. 6.3 v. at 5 A. 22 v. at 3 A. 6.3 v. at 4 A centre tapped. Less valves. Free drawings. Ins. carr., 5/6.

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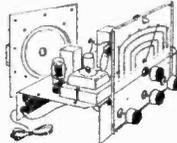
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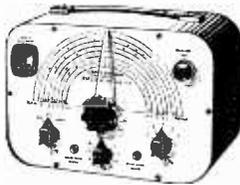
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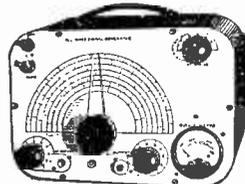
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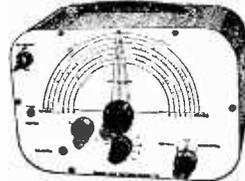
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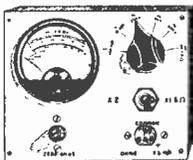
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EKCOVISION T231/F

During daylight and sunny periods I am unable to see the picture, and as the night grows darker so the picture improves, but is not perfect. The sound is excellent.

When I adjust my contrast and brightness the picture becomes vivid and negative.—G. W. Harrison (Wigton).

Your C.R.T. is low emission, but sounds as if it will take a low capacity 13 volt boost transformer. This should be connected to pins 1 and 12, after having removed the yellow and orange wires and shorted them together. Mains for the booster can be taken between chassis and voltage flylead "A," whilst flyleads C and D should be shifted to 10 volts higher.

REGENTONE T21

When I decrease the contrast and brilliance controls to get a black and white picture EHT discharge occurs making a loud crackling sound; when I advance the controls the noise stops, and the picture, although of good definition, is not black and white. I have recently renewed the EY86.

When I first switch on, the line transformer makes a frying sound for a few seconds.—J. Monte (Nr. Manchester).

View the inside of the receiver in a darkened room in order to establish the point of discharge. You may find that it is originating from a lead connected to the EHT circuit. In this case, the lead should be replaced if the insulation is perished and moved clear of the metal tube support. A badly-made soldered connection will evoke a discharge, as also will excessive dust around the EY86 and tube EHT connector.

In view of your remarks concerning the line output transformer, there is a possibility that the winding insulation in this component is failing, but an out-of-sync line timebase gives the same noise from the transformer. The slightly impaired

contrast ratio may well be caused by diminishing emission of the picture tube.

SHARED AERIAL

Is it possible for three television sets to be operated from a common aerial (BBC and I.T.A.), and if so, what particular method or connections are required?

The particular case is a three-family house in this district.—A. G. Payne (Tenbury Wells).

Any number of receivers can be operated from a common aerial system, but the losses incurred owing to the maintenance of matching and to avoid interaction between outlets call for the use of an amplifier. An article on this subject is featured in this issue, see "Shared Aerials."

TRUE VUE MODEL A33

I've had an excellent picture which has suddenly gone very dark, but can still be seen in a darkened room, the sound is perfect, the line, frame, focus and contrast controls react as before, the brilliance control brightens the picture very slightly.

I was advised to change the wired valve U37 on the EHT transformer and the KT36 in the screened cage and the N37 next to it which I did, and I've had a bright picture twice, but not good quality. Now on switching on a few times I am back to a dark picture again. Could you advise me if the tube is at fault.—H. Griffiths (Liverpool, 4).

We are of the opinion that the tube is losing emission. However, it would be as well to check the video amplifier circuit, especially the anode load resistor (the tube cathode is fed from this point.)

PYE MODEL VT-4

This model has automatic picture control which has given me very good service for over three years. While viewing quite recently the picture went very dull and could hardly be seen and when I switched off, a white line appeared across the screen followed by a white spot which gradually died away after a few seconds. I tried again the following evening, but no adjustment of any kind would bring the picture back again and when I switched off, the same line and spot appeared again. Do you think it is the tube that has gone and, if so, what is your opinion about having it "re-blown," which I think is the trade name for re-conditioning tubes?—F. B. Cooper (Birmingham, 26).

Before discarding your tube we suggest you check the setting of the ion trap magnet on the end of the tube neck. This should be adjusted to maximum brightness. If you have a meter also check that the C.R.T. heater is dropping 6.3 v. If it is considerably less you have probably a shorted heater on the C.R.T.

Re-gunned tubes have not been marketed long enough for us to give an opinion on their life.

PYE FV1

On switching on sound comes on normally, but the picture forms very slowly with a distorted raster, the picture being very dim. After about ten minutes the raster is the correct shape, but the picture strength fluctuates from dim to bright and

I have to alter the contrast and brightness controls to keep a viewable picture, this condition improves after about an hour, but is still present to a lesser degree. The line and frame holds are very sensitive.

All valves have been checked and are right, and a new EY51 has been fitted.

The voltage on the tube first anode is down to about 350 v., the cathode about 65 v. and the grid about 30 v.—A. J. Wetherall (Ealing).

From your description we would say that the fault is in the tube itself. Raster distortions can be produced by a glass charge, in conjunction with a low emission cathode. We suggest you try a boost transformer for the tube heater and re-set the ion trap magnet for maximum brightness.

PHILCO 17in. CONSOLE

In the evenings during the winter months and also, to a lesser extent, during the peak periods on summer evenings, black bands gradually broaden on each side of the picture; the picture loses its quality and sometimes disappears altogether.

I have had repair specialists in; they suggest that the fault lies in the electricity supply, but can make no recommendations to overcome it. Away from peak periods the picture is first class.—H. A. Butler (Co. Durham).

This model is rather sensitive to mains voltage variations, and the diagnosis of the technicians would appear to be accurate. Unfortunately, there is no simple remedy as the trouble lies in the electricity distribution system. However, the local authority is obliged to maintain a constant voltage within stipulated tolerances; so we would suggest that you direct your attention to this concern, demanding that a prolonged voltage test be arranged on the strength of the trouble with the television.

We would mention, however, that voltage fluctuations aggravate the trouble when the H.T. rectifier or line amplifier valve is weak.

ULTRA 15-60

My set produces sound on vision on the high notes. By turning the sound right back the interference ceases. Can you please inform me what steps to take to remedy this? The set is tuned to Channel 3 with an "X" aerial, and I have tried reducing the signal strength but with no effect on my sound on vision.—W. J. Shorter (Wilts).

If the sound on vision effect disappears when the volume control is retarded, suspect a microphonic vision valve. Tap the 30F1, 6D2 and 30FL1 valves in turn. One will show the symptoms on the screen when tapped and this will be the microphonic valve.

EKCO TC196

Recently the set has been converted for I.T.A. Channel 10 using a 12-channel Ekco Turret Tuner

with two separate aerial socket entries. At times I am getting quite a bit of pattern interference consisting of vertical wavy lines through the picture when using Channel 10. I have found that this cannot be removed using the fine tuner. Can you please inform me if this can be eliminated by any adjustment to the set or the tuner or any other method; or would this be due merely to lack of signal strength.—R. E. Hudd (Bristol).

The bonding between tuner and chassis is via the braiding of the coaxial lead and this is sometimes inadequate. We advise you to try an independent wire in addition between the metal parts of the tuner and chassis near the former mixer.

REGENTONE MODEL 173T

During the last three months, when the set has been turned on, for the first 15 minutes everything is satisfactory. The picture then closes in for lin. bottom and sides. The width control, even when turned on fully, does not eliminate this fault. The height control eliminates the black mark at bottom but stretches the picture at top. When the picture closes in after 15 minutes it is a good 12in. picture and not distorted. Two or three days ago the set was switched on, it came on and then both sound and vision went off. All valves, with the exception of the EY51, light up.—W Brown (Stockton-on-Tees).

We suggest you check the following valves: EY51 for heater continuity; 20P4, U301 and 10C2 (situated near the left-hand corner of the flat-type metal rectifier in the centre of the chassis) for emission. Your dealer will make these tests for you. Replace any faulty or very low emission valve. If the valves are in good order the trouble probably lies in the line output transformer in the form of short-circuiting turns. The previous symptom (before the receiver failed completely) is probably caused by a worn H.T. metal rectifier (type 14AR1282).

INVICTA 126

The fault with my receiver is the inability to maintain line hold. By adjusting the pre-set hold inside it is possible to keep it sometimes for one or two nights' viewing, at other time it lasts only for a few hours. The PCF80 line oscillator has been changed, also valves in the tuner unit.—P. Stimson (Kilburn).

You should check the PL81 and its screen dropping resistor (as V14c, etc.). If the fault persists, check the 25 mfd. (cathode PCF80) capacitors, the metrosil and the M3 sync clipper located on the base of the chassis. The wiring may be traced down to these components.

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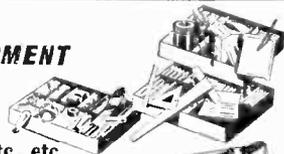
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Save 30% on all outdoor aerials and fittings. Example: Double Five Array costs only 70/-. Self-contained Band III Pre-amplifiers only 60/-. Converters 80/- complete. Fringe Area Super Low-loss Co-axial, 1/4 yard. Reconditioned T.V. Tubes, 6 months' guarantee, 12" £11/10/-, 17" £15/-, 21" £21/0/-, C.W.O. carriage 10/- extra. Tubes delivered in 24 hours all parts U.K. S.A.E. FOR FULL LISTS.

G. A. STURANCE

North Wrexall, Nr. Chippingham, Wilts. Tel.: Marshfield 236.

AUCTIONS**EVERY THURSDAY AT 11 a.m.**

Sales by private treaty.

DAILY 9-5.30. SATS. 9-5 p.m.

Over 500 TVs from £3 working, 10/- not. Radios, gramms, washing machines, fridges, vacuum cleaners, typewriters.

EASTERN AUCTION MART

Whitehorse Lane, Stepney, London, E.1

FOR SALE

PRACTICAL AERIALS, outdoor Band III folded dipole, fitted insulator, reflector 3 directors, 1/2 in. dia. alloy, bolts, assemble to your own boom, alloy, wood, etc. Send 19/- P.O. S.A.E. queries. 165, Beoley Rd., Redditch, Worcs.

MAINS RADIO IN YOUR CAR, complete unit runs 200/250 AC/DC radio, television, tape recorders, etc., from 12v. battery, perfect, cost £25, 80/-; stamp full details. **SCIENTIFIC PRODUCTS**, Cleveleys, Lancs.

HOW TO USE EX-GOV. LENSES and Prisms. Nos. 1 and 2, 2/6 ea. Vertical Enlarger Plans for 35mm. to 3 1/2 in. sq., 3/6 ea. Optical Condensers and Achromatic Lenses to suit, 3/- Lists. S.A.E. H. W. ENGLISH, Rayleigh Rd., Hutton, Essex.

VALVE CARTONS by return at keen prices. Send 1/- for Sample range and list. J. & A. BOXMAKERS, 75a, Godwin St., Bradford, 1.

T.V. ON PARAFFIN without mains, by means of the famous Briggs & Stratton engine-driven generator, 230 volt A.C. 250 watts. Ideal for radio, television, portable toos and drills and floodlighting. Price only £40 each, carriage paid. **GREEN ACE MOTORS LTD.**, 301/3, Norwich Rd., Ipswich.

TELEVISION BARGAINS: 9in., seen working, £7/10/-; 17in., £37/10/-; new 17in. Sets. 59 gns. Aerials and Co-ax cheap. **CLAYTON'S**, of Church St., Chalvey, Slough.

AMAZING OFFER—Originally £40/£100 each. Ekco, Pye, H.M.V., Marconi, Philips, Murphy, etc., 9/10in. Televisions, complete, not working, 50/- each; carriage paid; immediate dispatch. 12in., £55/5/-; 15in., £9; Philips 17in. Projection Televisions, £9/15/-, **TOMLINS**, 127, Breckley Rise, London, S.E.23.

CO-AXIAL CABLE, unbeatable offer. 8d. a yard air spaced.

TELEVISION TABLES cancelled order. 20" x 20", 18" legs, 4-quartered veneering, veneered both sides, in medium oak, walnut and supele. Unrepeatable offer while stocks last. 39/-, carriage 3/6.

MARSHALLS
FOR
TELEVISION131, ST. ANN'S ROAD
TOTTENHAM, N.15.

Phone: STAmford Hill 3267.

FOR SALE (continued)

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

EVERYTHING FOR THE AMATEUR.—Write for our new List catering for Home Engineers, Hi-Fi Fans, Tape-recording Fans, etc. Probably the most comprehensive in the trade. Price 1/-, R.H.S., 155, Swan Arcade, Bradford, 1.

100 BAYS of brand new adjustable steel Shelving, 72in. high x 34in. wide x 12in. deep, stove enamelled, dark green; sent unassembled, 6-shelf bay, £3/15/-; sample delivered free; quantity discounts. **M. C. BROWN, LTD.**, Eagle Steelworks, Heywood, Lancs. (Tel.: 69018.)

SECONDHAND TELEVISIONS, 9in. to 21in., all makes; faulty and working. **WILKINSON'S**, 146a, Goldhawk Rd., Shepherds Bush, 4379.

ELECTRIC CONVECTOR HEATER 99/6

A.C./D.C. Switched for 1 or 2 kW. Illuminated grille. Size 16" x 18" x 7 1/2" deep. Ins. carr., 10/6.

CAR RADIO AERIALS 6/9

Plated. Whip antennae. 50" long collapsing to 11". One-hole fixing. Post 1/-.

DUKE & CO., 621-3, Romford Road, MANOR PARK, E.12. I.L.F. 6001-3.

WANTED

VALVES WANTED, ECL80, EY51, EY66, PL81, PCF80, and all Miniature Types, U25, 10C1, 10C2, 10E1, etc. SZG, 6K8G, 6V6G, brand new only; prompt cash by return. R.H.S., 155, Swan Arcade, Bradford, 1.

IMPORTANT—Valves wanted, new, loose or boxed; same day payment. **ROBERT**, 414, Whitefoot Lane, Bromley, Kent.

ALL TYPES OF VALVES WANTED, PL81, ECL80, EY51, U25, PCF80, PZ30, U801, etc. etc. Best cash price by return. **STAN WILLETT'S**, 43, Spion Lane, West Bromwich, Staffs. (Tel.: WES 2392.)

SERVICE SHEETS

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

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.

ENGINEER has complete range Radio/T.V. Service Sheets, 4/- each; s.a.e. State Model No. required; c.w.o. **L. BRENNER**, 23, Meadow Close, Barnet, Herts.

SERVICE SHEETS for sale. Radio 3/-, Television 4/-. All makes. **SULTAN RADIO (PT)**, 23b, Albert St., Tunbridge Wells, Kent.

SERVICE SHEETS, Radio, T.V., 5,000 models. Lists 1/-. S.A.E. enquiries. **TELRAY**, 11, Maudland Bk., Preston.

EDUCATIONAL

MATHEMATICS for T.V. Course. 24/-, **TUTORIAL MATHEMATICS**, 260, Buchanan St., Glasgow.

FREE! Brochure giving details of Home Study Training in Radio, Television and all branches of Electronics. Courses for the Hooby Enthusiast or for those aiming at the A.M.B.R.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.

STUDY RADIO, TELEVISION AND ELECTRONICS with the world's largest home study organisation—**I.C.S.** Courses for the enthusiast and for those seeking examination qualification. Brit. I.R.E., City and Guilds, R.T.E.B., etc. Build your own equipment with Practical Radio Course. Write to-day for free book: **INTERNATIONAL CORRESPONDENCE SCHOOLS**, 71, Kingsway, (Dept. 516), London, W.C.2.

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. PF53, London, W.4. (Associated with H.M.V.)

INCORPORATED Practical Radio Engineers home study courses of radio and T.V. engineering are recognised by the trade as outstanding and authoritative. Moderate fees to a limited number of students only. Syllabus of Instructional Text is free. The Practical Radio Engineer's Journal, sample copy 2/-, 6,000 Alignment Peaks for Superhets, 5/9. Membership and Entry Conditions booklet, 1/-, all post free from the **SECRETARY, I.P.R.E.**, 20, Fairfield Road, London, N.8.

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.

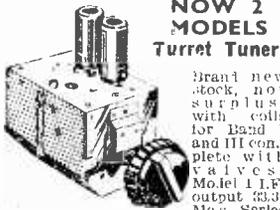
11+
EXAMINATION

Write for **FREE 24-page GUIDE** and Test stating age of child to The Registrar (Dept. M.7).

MERCER'S
CORRESPONDENCE COLLEGE,
67 Wimpole Street, London, W.1.

PROPERTY

BERRYLANDS (Surbiton). Adjoining station in a fully built-up area, parade of spacious shops with 2 floor upper parts just constructed. To be let or sold. Trades already reserved Grocer and Provision Merchant, Greengrocer, Ladies' Outer- and Underwear, Shoe Repairer, Tobacconist and Confectioner, Dyers and Cleaners, Retail Builders' Merchant and Pet Shop. Full details: **MESSRS. WHIDDINGTON**, Chartered Surveyors, 133, High Street, Teddington. (KINGston 1216/1/8.)



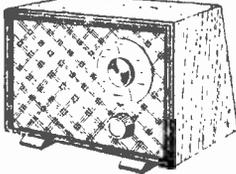
NOW 2 MODELS Turret Tuner

Brand new stock, not surplus, with coils for Band I and II complete with valves. Model I.I.F. output 33.3 Mc.s. Series output 16.19 Mc.s. Parallel heaters. With instructions and circuit diagram, 79.6. With knobs 3/6 extra. post. and insurance 2/6.

All-Mains Amplifier

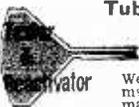


Powerful three-valve mains amplifier ideal for dances, parties, etc. Complete less chassis, cabinet and speaker (available if required—data 1/6 (free with parts). Price 19/6, plus 2/6 post and insurance.



The Skysearcher

This is a 2-valve plus-metal receiver set useful as an educational set for beginners, also makes a fine second set for the bedroom, workshop, etc. All parts, less cabinet, chassis and speaker, 19/6. Post and ins., 2/6. Data free with parts or available separately, 1/6. 3-valve battery version also available at the same price.



Tube Tester and Re-Activator

We can supply all the main components for making this unit which will not only test Cathode Ray Tubes but also will re-activate them, supplied complete with full instructions. Price £3, plus 2/6 post and ins.

A.C./D.C. Multimeter Kit

Ranges: D.C. volts 0.5, 0.50, 0.100, 0.500, 0.1000. A.C. volts 0.5, 0.50, 0.100, 0.500, 0.1000. D.C. milliamps 0.5, 0.100, 0.500, Ohms 0.50, 0.00 with internal batteries. 0.500, 0.00 with external batteries. Measure: A.C. D.C. volts, D.C. current and ohms. All the essential parts including metal case, 2in. moving coil meter, selected resistors, wire for shunts, range selector, switches, calibrated scale and full instructions, Price 19/6, plus 2/6 post and insurance.



SUPER SENSITIVE (2,000 O.P.V.) MULTIMETER KIT

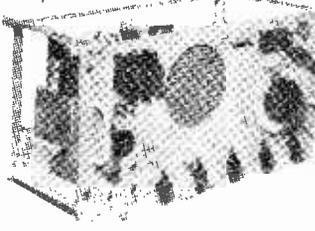
17 ranges including D.C. volts to 1,000 v., A.C. volts to 1,000 v., D.C. milliamps to 500, ohms to 2 meg., capacity and inductance. All the essential parts, including metal case, selected resistors, wire for shunts, selected switches, calibrated scale and instructions, 32.6, plus 2/6 post and ins.

Medresco Hearing Aid

As supplied by National Health, completely overhauled and in good working order with six months guarantee. Only £21.5.0 plus 2/6 post and ins. Complete with earphone and new ear plug but not batteries, these can be supplied as an extra for 5/- per set. Instructions showing how to convert to pocket radio available free if requested.

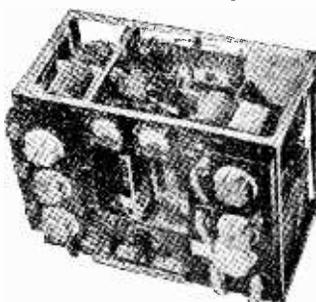


Short Wave Communications Receiver R208. 10/- Down



This is a super short wave receiver covering 5-30 metres (10-60 mc/s). Uses 6 valves, Has I.F. stage, 2 I.F. stages B.F.O. etc. Muirhead instrument drive, two internal power packs, mains and battery vibrator pack. Complete with own P.M. speaker. Provision for phones and speaker muting. Complete in metal transit case; size approx. 24 x 18 x 12; weight 70lb. Suitable A.C. mains, 100-250 and 6 volt battery. In perfect condition, practically unused. Tested before despatch and guaranteed. Handbook free with each. Price £8/19/6, carriage and insurance 15/-. Or 10/- deposit, plus 15/- carriage, and 15 weekly payments of 10/-.

Famous Transmitter Virtually Given Away



The famous R1154—unused but slightly soiled and not tested. Covers 200-500 kc/s, 3-5.5 Mc/s and 5.5-10 Mc/s. Has unique "click stop" mechanism (7 stops) and permits selected frequency to be held, returned to, etc. Hartley oscillator, power amplifier, keying and speech. Wonderful breakdown value meters, relays, switches. Complete with valves—real gain at 23.6, plus 10/- carriage.

Huge Ministry Purchase R.1155—yours for £2 down

Frequency 75 kc/s to 18 Mc/s, 10 valves, metal case, robust receiver, cost over £50 to make—will give years of service, very little used. Price £10 or 5 payments of £2.

(Curr. & transit case 15/- c.)



Band III Converter

Suitable for Wales, London, Midlands, North, Scotland, etc. All the parts including 2 EF80 valves, coils, line tuner, control condensers, and resistors. (Metal case available as an extra.) Price only 19/6, plus 2/6 post and insurance. Data free with parts or available separately 1/6.



Motor Snip

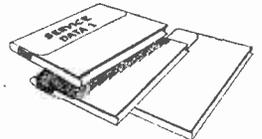
Miniature motor 2 1/2in. long x 1 1/4in. diameter, laminated poles and armature. Separate windings for reversing. Operates off 20-30 v. D.C. or off A.C. mains through stepdown transformer. Original cost at least £3 each. Snip price for one month only 6.6, plus 1/6 postage and insurance.



Unused and Boxed Valves

0Z4	9/-	6F5	9/6	7B5	12/6
1A4	9/-	6F6	7/6	7C7	12/6
1A6	9/-	6F7	12/6	7D5	9/6
1F7	12/6	6F8	9/6	7D8	9/6
1L6	8/6	6F32	10/6	7H7	8/6
1L6A	8/6	6G5	7/6	7K8	12/6
1N56	3/6	6H6	2/6	7R7	10/-
1LD5	3/6	6J5	5/6	7S7	10/-
1T4	7/6	6J7	6/-	12H6	8/6
1R5	7/6	6K6	7/-	12SK7	8/6
1S6	7/6	6K7	7/6	12SJ7	8/6
1T5	8/-	6L5	9/-	12SK7	8/6
2A5	12/6	6L6	9/-	25B5	12/6
2A6	12/6	6L7	10/7	26	10/6
2A7	12/6	6N7	8/6	27	10/-
2D3C	5/-	6R7	8/-	28D7	3/6
2X2	4/6	6S7	9/-	31	7/6
3A4	7/-	6SA7	8/-	32	7/6
3D6	5/-	6SG7	8/-	34	12/6
3Q4	7/6	6SH7	8/-	39/41	10/-
4D1	2/6	6SJ7	8/6	41	9/6
5U4	8/-	6SK7	6/-	42	8/-
5Z1	12/-	6SL7	8/-	43	10/-
5Z1	9/6	6SN7	7/6	57	10/-
6A6	12/6	6SQ7	9/-	58	10/-
6AG5	6/6	6SS7	9/-	71	9/6
6AC7	8/6	6T7	12/6	75	12/6
6A9	10/-	6TH3	12/-	77	8/-
6B1	5/-	6U5	8/6	83	12/6
6B7	10/6	6V6	8/6	84	8/6
6B3	4/-	6X5	7/6	807	6/6
6BQ6	12/6	6Y6	9/-	954	3/6
6C4	8/6	6Y6	9/-	954	3/6
6C8	6/6	6Z5	15/-	1825	10/6
6C9	5/-	7A2	12/6	805	80/-
6D3	6/6	7A7	9/6	913	80/-

T.V. Service Sheets



100 sheets covering the most popular post-war Televisions by leading makers—Cosson, Ekco, Ferguson, Etc. etc. £1 post free.

Cabinet Snip



This fine cabinet as illustrated but less control knobs is available this month at special snip price of 12/6 plus 3/6 post and insurance. Size is 13 1/2 in. x 9 in. x 4 in. and it is nicely covered in two tone I.C.I. fabric.

This Month's Specials

Wire ended Neon Lamp. Midget size as used in mains tester, dozens of applications, 2/- each.
Instal Those Extra Power Points. Big purchase of 7,029 3-core cable enables us to offer this at a real bargain price of 37/6 per 50 yd. coil. 100 yd. coil 75/-, carriage free.
Hi-Fi Snip. Massive (weight approximately 8 lb.) output transformer Parmeko—primary 4,000 ohm centre tapped, secondary 15 ohm, unrepeatable at 17/6, plus 2/6 post.
Electrolytic Condenser. 500mf, 50 v. with mounting clip, 2/3.
Screened Cable. Rubber covered flexible with metal braiding, ideal for microphone or gramophone extensions, 4d. per yd. 30/- per 100 yds.

Chassis Assembly



Superhet Chassis, 3-waveband, coloured scale, scale pan, etc. Scale size 14 1/2 in. x 3 in. Chassis size 15 in. x 15 in. x 2 in. Price 9/6, plus 1/6 post.

For Your Lab

Resistance substitution boxes are great time savers and you really cannot have too many of them. Here, then, is an opportunity to acquire these at a very low rate. Our R.S. kit, available for only 8/6, plus 1/6 postage, comprises a 50 w. precision variable resistor, six 2-3 watt fixed resistors, one 6 position switch, two knobs, and instructions. This unit, when made up, will give an infinite variability over the range 100 ohms to 2 meg.

Yours for 10/- down and 17 weekly payments of 10/- or cash price £8.10.0



The latest, most up-to-date Record Player made by the famous B.S.P. Company. Using Hi-Fi Crystal Pick Up and fitted with every modern device. Definitely a record changer which will give years of trouble-free music. Not surplus but the current model. Price £8.10.0 or Terms.

Build this 17in. T.V. in an evening

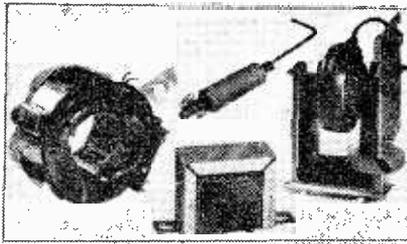
Undoubtedly the most up-to-date televisior for the home constructor. You can build it in an evening and the set when finished will be equal to a factory made equivalent.

- All miniature valves and metal rectifier.
- 12-channel turret tuner.
- Multivibrator time bases.
- Ferrox cube, E.H.T. and scan coils.

The building cost (less tube) is only £39.10.0, plus 10/- carriage and insurance. Or £5 down and 28 weekly payments of £1. All parts guaranteed twelve months.

Full information and data free with parts or available separately, price 3/6.

FOUR ITEMS FOR PRICE OF ONE



This set of modern T.V. parts is equally suitable for modernising an old televisior or for building into a new one. Suitable for wide angle 14in. or 17in. tubes using E.H.T. or 12-14 kV. The four items comprise: (1) Line output E.H.T. transformer. (2) 70° scanning coils on ferrite yokes. (3) Width control with ferrite core. (4) Frame output transformer. With these parts we also give free, complete circuit diagram of a modern televisior which uses them. We offer the whole lot at the price of the Line output transformer only, namely, 57/6, plus 2/6 post and insurance.

THIS MONTH'S SNIP

Multi-Purpose Mains Transformer

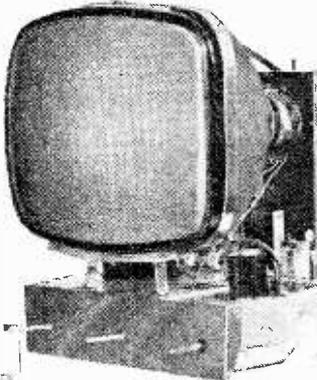
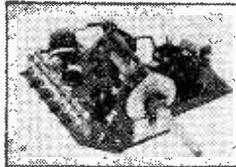
Heavy duty construction, must have cost at least £3 to make. Offered at a snip price of 14/6.

- Specification—
Primary Standard 230 v.; 50 c.p.s. screen to sep. terminal.
Secondary 1. 660 v.-200 mA. centre tapped.
Secondary 2. 80 v.-100 mA.
Secondary 3. 23 v.-750 mA.
Secondary 4. 7 v.-5 amp. centre tapped.
Secondary 5. 5 v.-3 amp.

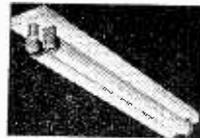
In addition to the above secondaries there is a window space which will allow extra L.T. windings to be put on. The winding ratio is 2 1/2 turns per volt. Weight of transformer is 12 lb., size approximately 6 in. x 4 1/2 in. x 4 1/2 in. Connections all brought out to terminals on bakelite panel. We have only 500 of these, so order at once to avoid disappointment. Non-callers add 3/6 postage please.

Coil Pack Snip

Covers the Medium Waveband 205-550 metres and two short wavebands 35-120 metres and 13-42 metres, for 465 k/c. I.F. Extremely well made, supplied complete with diagram of connections. Only 9/6, plus 1/6 post and insurance.

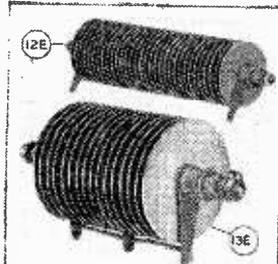


FLOUORESCENT LIGHTS



These are complete fluorescent lighting fittings. Built-in ballast and starters—stove enamelled white and ready to work. Ideal for the kitchen, over the work-bench and in similar locations.
Single 40. 4 ft. 3 in. long, uses a 40 watt tube.
Twin 20. Uses 2 20-watt standard tubes.
 Price for either type 39 6. with tubes. Carriage and ins. up to 150 miles 5/6, up to 250 miles 7/6.

Rectifier Bargains



Selenium rectifier type 1-500 v. 1 amp half-wave, easily rebuilt into full wave or multiple type, contains 30 35 mm. discs. Price 8/6, plus 1/6 post.
 Type 2. 36 volt 9 amp, easily rebuilt into six full wave charger rectifiers suitable for 6 or 12 volt batteries at 3 amps, contains 24 84 mm. discs. Real bargain at 19/6, plus 1/6 post.

THE TRANSISTOR 8

A superb little portable receiver which is also loud enough and sensitive enough to be a car radio. All parts, prepared chassis, 8 selected transistors, 7 in. x 4 in. elliptical speaker and handsome carrying case—supplied for £11.10.0, or 10/- deposit and 24 weekly payments of 10/-.

ELECTRONIC PRECISION EQUIPMENT, LTD

Post orders are dealt with from Eastbourne, so for prompt attention please post your orders to 66, Grove Road, Eastbourne, marked Department 7.

- | | | | |
|---------------------------------------|-------------------------------------|--|----------------------------|
| 42-46, Windmill Hill, Ruislip, Middx. | 66, Grove Road, Eastbourne, Sussex. | 29, Stroud Green Rd., Epsbury Park, N.4. | 266, London Road, Croydon. |
| Phone: RUISLIP 5780 | Half day, Wednesday. | Phone: ARChway 1049 | Phone: CRO 6558 |
| | | Half day, Thursday. | Half day, Wednesday. |

EDDY'S (Nottm.) LTD.

DEPT. P.T.
172, ALFRETON ROAD,
NOTTINGHAM

SPECIAL BARGAIN

B.S.R. MONARCH 4-SPEED AUTO-MATIC CHANGER COMPLETE, with high fidelity "turnover head." Capacity of 10 Records. Plays 12, 10 and 7" mixed in any order. £6.45, 13 and 19 p.p.m.

For A.C. mains 100-520 volts. Exclusive MAG-DISC selector gives quietest and quietest change over.

With full instructions.

Brand New £6.19.6. Post & Packing 5/- extra.

MIDGEO BATTERY ELIMINATORS to convert all types battery portables to mains operation. 57/8 each. 2/6 post, etc. Smaller than H.T. battery alone. (Please state make and model number.) New and boxed.

ACOS CRYSTAL MIKES. 1st Price £2.10.0 our price 29/11, plus 2/- post & packing. Excellent for tone recorder, amplifiers, baby alarms, etc. Brand New and boxed.

NEW METAL RECTIFIERS, FULLY GUARANTEED

RM1	6/11	WX3	3/6	14A183	5/78
RM2	7/3	WX4	2/6	14H30	3/4 6
RM3	8/3	WX6	3/6	14RA128C	
RM4	18/6	14A83	17/6	14RA128C	
RM5	23/6	14A97	24/6		18/6
W4	3/6	14A100	2/6	14H128B	
W3	3/6	14A124	27/6		23/-

ACOS CRYSTAL TURNOVER PICK-UPS. (2 Sapphire stylus). 29/11, post, etc., 2/6 extra. Brand New and boxed.

25 x 25 mfd CONDENSERS. Midget. 1.3 each. Brand New.

ACOS MIKE INSERTS, 4/11 each. High quality. Can be used for tape recorders, baby alarms, musical instruments, etc. Post and packing 8d. extra. Brand New.

THROAT MIKES, 1/-, post 6d. extra. Could be used for electrifying musical instruments.

SURPLUS NEW AND GUARANTEED VALVES

All tested before despatch. C.W.O. or C.O.D. only.

1D5	10/6	7H7	8/-	CY31	12/11	EL41	10/6
1R5	7/11	7S7	9/11	DAF6	12/11	EL42	10/6
1S5	7/3	7Y4	7/11	DAF6		EL41	9/-
1T4	6/11	10F9	11/6			9.6EY51	10/6
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6CB9	7/6	19A05	10/6	ECC84			14/6
6P1	13/11	25A6G			8/11	PL33	19/6
6F9	12/6		12/11	ECC85		PL42	9/6
6J5G	2/11	25L6GT			8/11	PL73	10/6
6K7G	2/11		9/11	ECP83		PY99	8/6
6K8G	7/11	25Z4G			12/6	PY81	8/6
6L6G	6/11		9/11	EC142		PY82	8/6
6L8	11/6	35A5	10/6		10/6	TDD4	12/6
6Q7G	8/11	35W4	8/6	ECC30		UAP2	
6SNTGT	13/24	35Z4	7/6		13/6		10/6
	5/11	807(B)	3/9	EF41	9/6	UB190	9/6
6SK7GT	7/11	807(USA)	3/9	EF42	12/6	UC142	9/6
				EF50	4/11	UF41	8/6
6YCG	5/11	954	1/6	EF50CR		UF42	14/6
6X4	6/6	955	1/6		7/-	UJ41	9/6
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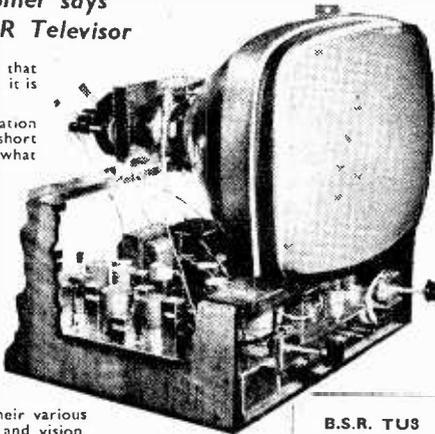
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