

THE "SIMPLEX" MAGNETIC MODEL

# PRACTICAL TELEVISION

AND TELEVISION TIMES

EDITOR  
F. J. CAMM

A NEWNES PUBLICATION

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FEATURED IN THIS ISSUE

E.M.I. Colour  
Surplus TV Valves  
Modifying the  
Responser Unit

Fault Symptoms  
Using the 5CPI  
Pages from a TV  
Engineer's Notebook

# Prices slashed at Wholesale

**INDICATOR UNIT TYPE 166**  
With VCR-97 tube and valves, 7 VR91 (EF50), 4 VR54 (EB34), 1 VR116, 1 VR92 (EA50), etc. Dim. 20in. x 18in. x 9in. Used good condition.  
ASK FOR D/H885 **£3.19.6** each CARRIAGE PAID

**INDICATOR UNIT TYPE 168**  
As above, but less tube and valves.  
ASK FOR D/H85A **£1.12.6** each CARRIAGE PAID

**INDICATOR UNIT TYPE 62**  
With VCR-97 tube and valves, 16-VR65-CV118 (SP61), 2-VR54 (EB34), 2-VR92 (EA50), etc. Dim. 18in. x 18in. x 11in. Wgt. 42 lbs. In original wood case.  
ASK FOR D/H528 **£3.19.6** each CARRIAGE PAID

**INDICATOR UNIT TYPE 62**  
As above, but in used, good condition. Loose stored.  
ASK FOR D/E774 **£2.9.6** each CARRIAGE PAID

**INDICATOR UNIT TYPE 305**  
BRAND NEW. REF. 10QB/6504. With tubes, VCR-524A, VCR-525 and valves 7-VR34 (EF50), 2-VR54 (EB34), 6-VR92 (EA50). Dim. 12in. x 7in. x 18in. Wgt. 30 lbs.  
ASK FOR D/H493 **£3.19.6** each CARRIAGE PAID

**INDICATOR UNIT "A.S.B." SERIES (U.S.A.)**  
Contains 5BP1 C.R.T. With mu-metal screen 3/8BS7, 2/6SH7's, 6AG7, plus H.V. conds., etc., metal case 18in. x 8in. x 8in. All controls brought to front panel beside viewing screen.  
ASK FOR D/E776 **£3.19.6** each CARRIAGE PAID

**INDICATOR UNIT TYPE 6**  
With VCR-97 Tube and valves 4-VR91 (EF50), VR54 (EB34), 3-VR92 (EA50), VR78 (D1), etc. Dim. 18in. x 8in. x 7in. Wgt. 21 lbs. In original wood case.  
ASK FOR D/H524 **£2.19.6** each CARRIAGE PAID

**INDICATOR UNIT TYPE 6H**  
With VCR-97 Tube and valves 4-VR91 (EF50), VR54 (EB34), 3-VR92 (EA50), VR78 (D1), etc. Dim. 18in. x 8in. x 7in. Wgt. 22 lbs. In original wood case.  
ASK FOR D/E777 **£4.9.6** each CARRIAGE PAID

**POWER UNIT TYPE 285**  
Ready made for T.V.  
A.C. Mains. Input 230 v. 50 cps. Outputs, E.H.T. 2 kv. 5 ma., H.T. 250 v. 150 ma., L.T. 633 v. 10 a. and 8.3 v. 8 a. Fully smoothed and rectified with valves VU120, 5U4G, VR91 (EF50), plus conds., resistors, etc.  
ASK FOR D/H947 **£4.19.6** each CARRIAGE PAID

**ALSO AVAILABLE. POWER UNIT TYPE 285**  
As above, less valves. Slight internal damage. Transformer O.K.  
ASK FOR H947A **£1.19.6** each CARRIAGE PAID

**R.F. UNIT TYPE 24**  
In Original Carton  
With valves 3-VR65 (SP61), etc. Range 20-30 mcs., switched tuning. Dim. 9ins. x 7 1/2in. x 4 1/2in. Wgt. 1 1/2 lbs.  
ASK FOR D/H830 **10/-** each POST 1/6 EXTRA

**R.F. UNIT TYPE 25**  
In Original Carton.  
Range 40-50 mcs., otherwise as R.F. 24.  
ASK FOR D/H874 **12/6** each POST 1/6 EXTRA

**R.F. UNIT TYPE 27**  
With Broken-Dial Variable Tuning  
Range 65-85 mcs., valves 2/VR135 (EF54), VR137 (EC52), etc. Dim. and Wgt. as R.F. 24.  
ASK FOR D/E771 **£19.8** each POST 1/6 EXTRA

**RECEIVER UNIT R3601**  
Ref. 10DB/9337  
With valves 2 VR138 (EF54), VR137 (EC52), 5 VR65 (SP61), 4 VR92 (EA50), VR91 (EF50), 6V6G, VU38A (R3), etc. I.F. 13mcs. Dim. 18in. x 9in. x 8in. Wgt. 38 lbs.  
ASK FOR D/H483 **39/6** each CARRIAGE PAID

**ION TRAP MAGNET ASSEMBLY**  
Mfg. Superlus  
Type IT/6 by Elac for 35 mm. tube neck.  
ASK FOR D/H913 **2/6** each EXTRA

**CO-AXIAL CABLE**  
Any length 52 ohms, 12 mm. dia. Price 5d. per yard. Minimum 12 yds. at 5/-, post 1/- extra.  
ASK FOR D/H987.

**REPRINTS FROM "PRACTICAL TELEVISION"**  
Components Price List Free on Request.  
The "Beginner's Receiver," modifying the R370A ... .. 1/6

April to July:  
The "Beginner's Timebase" ... .. 1/6  
Argus Television; data and blueprint, 2/6

**CIRCUITS AVAILABLE** at 1/3 each.  
ASR55/7, 3, type 62, R1355, R.P. 24, 25, 27 and R3601.

**PLEASE NOTE.**—Carriage and Postal Charges refer to the U.K. only. Overseas freight, etc., extra.

Order direct from:

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**Volume Controls** 80 ohm COAX  
Midget Bristan type. Standard 1in. diam. Long spindles. Guaranteed 1 year. All values 10,000 ohms to 2 Meg-ohms.  
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4- 1/2  
COAX PLUGS ... 1/2  
SOCKETS ... 1/2  
LINE CONNECTOR 1/2  
OUTLET BOXES ... 4/6 8d. yd.

**BALANCED TWIN FEEDER** per yd. 6d. } 50  
**TWIN SCREENED COAX FEEDER** per yd. 1/5 } 50  
**OHM COAX CABLE** 3d. per yd. 70 ohm  
TRIMMERS, Ceramic, 30, 70 pf., 9d.; 100 pf., 150 pf., 1/3; 250 pf., 1/6; 400 pf., 1/9.  
RESISTORS.—All values: 1 w., 4d.; 1 w., 6d.; 1 w., 8d.; 2 w., 1/-; 1/2 w., 1/6; 3/4 w., 2/6.

**WIRE-WOUND RESISTORS**—Best Makes Miniature Ceramic Type 3 w., 15 ohms to 4 k., 1/9; 10 w., 20 ohms to 6 k., 2/3; 15 w., 30 ohms to 10 k., 2/6; 5 w. Vitroline, 12 k. to 25 k., 3/-.  
**WIRE-WOUND POTS, 3 WATT, FAMOUS MAKES**  
Pre-set Min. 1/4. Type Standard Size Pots, 24in. All values 25-ohms to 30k. All Values, 100 ohms to 30 k., 3/-; 50 k., 4/-; 50 k., 5/6; 100 k., 6/6. Ditto Carbon Track 50K. 5/6 W EXT. SPEAKER

**TRANSFORMERS**—Best Makes Miniature, tapped primary, 4/9.—Tapped small pentode, 3/9.  
**L.F. CHOKES** 10 h. 65 ma., 5/-; 20 h., 150 ma., 12/6; 15 h. 100 ma., 10/6. **SIMPLEX** 10 h 150 ma., 10/6.  
**MAINS TRANS.**—Made in our own workshops to high grade specifications. Fully inter-locked and unimpregnated. Heater Trans., tapped min., 0-200 v./250 v. 6.3 v. 11 amp., 7/6; 12 v. 75 amp., 7/6; 6.3 v. 3 a., 10/6; 300-0-330, 80 ma., 6.3 v. 4 a., 5/2 v. 2 a., ditto 300-0-330 ditto 250-0-250, 21/-.  
**VIEWMETER**, auto type, 35/-; Teleskop, 30/-; Ltry, 30/-.  
**CONTR.** 30/-, simplex (modified with 4 v. tap), 35/-.  
**TV. AERIALS.** Aerialite etc. full range all channels in stock. Interior loft type Inv. T., 13/6 etc. etc.

**TYANA.**—Midget Soldering Iron, 200(220) v. or 230(250) v., 14/11. Triple Three Type, with detachable bench stand, 18/6. Solon Midget Iron, 12/6.  
**TAG STRIPS.**—2- or 3-way, 2d.; 4- or 5-way, 3d.; 6-way, 4d.; 0- or 10-way, 6d.; 28-way, 1/3.  
**ENAMEL OR T.C. WIRE.**—1/2 in. 14 to 20 s.w.g., 2/-; 22 to 28 s.w.g., 2/6; 30 to 40 s.w.g., 3/6  
**XTAL DIODE.**—Sensivity 0.2-4 type, 3/6; R.R.

Phones (S. G. Brown) or H-grade Amer., 15/6 pair.

**SIMPLEX TELEVISION.**  
Detailed price list available.

STAGE 1. VISION AND SOUND.	STAGE 3.—POWER SUPPLY
7 Valves ... 30/-	2 Resistors ... 4/-
12 Resistors ... 3/-	5 S.T.C. Rectifiers ... 2/6
16 Condensers ... 9/-	5 Condensers ... 23/6
2 Potentiometers 6/-	1 Choke ... 10/6
7 Coil formers with cores ... 4/6	1 Mains Trans. Tapped 4 v. and 5 v. ... 35/-
4 Valveholders ... 4/6	
Sundries (with undrilled chassis) ... 22/6	
<b>STAGE 2.—TIMEBASE</b>	<b>STAGE 4.—C.R.T. NETWORK</b>
6 Valves ... 29/-	1 Condenser ... 6d.
20 Resistors ... 10/-	4 Potentiometers ... 10/-
15 Potentiometers 8/6	Sundries ... 3/6
5 Potentiometers 12/6	
6 Valveholders ... 2/6	<b>COMPLETE SIMPLEX KIT</b> (less tube) 12 gns.
Sundries ... 1/6	Drilled Chassis, Screens etc., 17/6, or 10/- extra with KIT or Sundries (Stage 1).
<b>VCR97 TESTED &amp; GUAR.</b> £2 (P. & p., 2/-).	

**NEW VALVES ALL GUARANTEED**

1R5	8/-	6K8	9/-	6AC7	8/6	EP91	9/6
1R5	8/-	6BG6	12/6	6C92	12/6	EV51	12/6
8/-	6P25	15/-	6B16	10/6	PT51	13/6	
154	8/-	6Q7	5/6	6R2524	10/6	PY80	11/6
384	9/-	6SL7	9/-	80	9/-	SP81	10/6
3V4	8/-	6SN7	11/-	EA50	2/-	SP81	8/6
2X2	5/6	6U6(Y038)	11/6	EB91	7/6	U22	8/6
3V4	10/6	6V4	8/-	EB33	9/6	EC150	12/6
6Z4	9/-	6X5	5/-	EP33	9/-	EP50	10/6
6AM6	9/-	VT127	11/6	EP50	11/6	EA47	12/6
6AT6	10/6	40	9/-	Equip 5/6	EC42	12/6	
6HM6	3/6	12AT7	10/6	British 7/6	MU14	8/6	
6J5	7/6	U23	12/6	5yl. Red 10/6	EP55	12/6	

Huge Stock B.V.A. Valves at 1951 low tax prices.

**TV. PRE-AMP.**—Channel 1, easily modified to other channels or converter use. Midget chassis 6in. x 3in. x 1 1/2in. Complete with coax. lead, plug and EF-42 valve. Brand new (boxed). Listed £3/15/-. Special clearance, 27/6, p/p. 1/6.

P. and P., 6d. £1 orders post free. Lists 3d. ALL TRANS. P. & P. 1/- extra please.

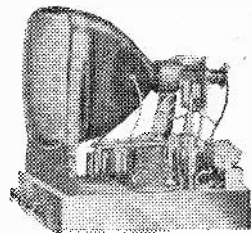
**T.R.S. RADIO COMPONENT SPECIALISTS**  
307, Whitehorse Road, West Croydon.

**C.R.T. HEATER ISOLATION TRANS.** Ratio 1:1.25 Low leakage winding with 25% exc. boost, 2 y. 10/6; 4 y. 10/6; 6.3 v., 10/6; 12 v., 10/6; 150 ma. 250 v. 10/6; 250 v. 10/6; 300 v. 10/6; 350 v. 10/6; 400 v. 10/6; 450 v. 10/6; 500 v. 10/6; 550 v. 10/6; 600 v. 10/6; 650 v. 10/6; 700 v. 10/6; 750 v. 10/6; 800 v. 10/6; 850 v. 10/6; 900 v. 10/6; 950 v. 10/6; 1000 v. 10/6; 1050 v. 10/6; 1100 v. 10/6; 1150 v. 10/6; 1200 v. 10/6; 1250 v. 10/6; 1300 v. 10/6; 1350 v. 10/6; 1400 v. 10/6; 1450 v. 10/6; 1500 v. 10/6; 1550 v. 10/6; 1600 v. 10/6; 1650 v. 10/6; 1700 v. 10/6; 1750 v. 10/6; 1800 v. 10/6; 1850 v. 10/6; 1900 v. 10/6; 1950 v. 10/6; 2000 v. 10/6; 2050 v. 10/6; 2100 v. 10/6; 2150 v. 10/6; 2200 v. 10/6; 2250 v. 10/6; 2300 v. 10/6; 2350 v. 10/6; 2400 v. 10/6; 2450 v. 10/6; 2500 v. 10/6; 2550 v. 10/6; 2600 v. 10/6; 2650 v. 10/6; 2700 v. 10/6; 2750 v. 10/6; 2800 v. 10/6; 2850 v. 10/6; 2900 v. 10/6; 2950 v. 10/6; 3000 v. 10/6; 3050 v. 10/6; 3100 v. 10/6; 3150 v. 10/6; 3200 v. 10/6; 3250 v. 10/6; 3300 v. 10/6; 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# VIEWMASTER LARGE SCREEN CONVERSION

Enjoy a 14, 16 or 17 inch screen on your Viewmaster.  
All WB. Components as specified.

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|--------------------------------|------------------------|
| 1 Line transformer. W/B 113.   | 1 Ion trap (Optional). |
| 1 Frame transformer. W/B 114.  | 1 B.12.A Base.         |
| 1 Pair Scanning coils W/B 115. | 1 K3/100 rectifier.    |
| 1 Width control. W/B 116.      | 1 K3/40 rectifier.     |
| 1 Linearity control. W/B 117.  | 1 6CD6 Valve.          |
| 1 Heater transformer. W/B 119. | 1 6U4 Valve.           |
| 1 Focus magnet. W/B 118.       | 3 Sundry resistances.  |
|                                | 9 Sundry condensers.   |



**THE COMPLETE PARCEL INCLUDING VALVES**  
**£9.3.8d.** Carriage 3/6d. extra.

### CATHODE RAY TUBES

For Use with The Viewmaster

- 14 Inch. Mullard. MW36-24. £19 9s. 3d.
  - Brimar. C14FM. £20 10s. 1d.
  - 16 Inch. English Electric. T501 £22 4s. 10d.
  - 17 Inch. Mullard. MW43-64. £23 12s. 8d.
  - Brimar. C17FM. £24 13s. 6d.
- Carriage and insurance 15/- per tube extra.

Viewmaster Wide  
Angle conversion  
booklet and full  
details  
Price 3/6 Post Free

## LASKY'S RADIO,

LASKY'S (HARROW ROAD), LTD.,  
370, HARROW ROAD, PADDINGTON, LONDON, W.9.  
Telephones: CUNningham 1979-7214.  
Hours: Mon. to Sat. 9.30 a.m. to 6 p.m.; Thurs. half day,  
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All goods fully insured in transit.

# RADIO SUPPLY CO. (LEEDS) LTD.

Dept. N.,  
32, THE CALLS, LEEDS, 2.

Post Terms C.W.O. or C.O.D. NO C.O.D. under £1. Postage 1/- extra under 10/-; 1/6 extra under £1; 2/- under £3. Open to callers 9 a.m. to 5.30 p.m. Sats. until 1 p.m. S.A.E. with enquiries, please. Full list 5d.; Trade List 5d.

## R.S.C. MAINS TRANSFORMERS (FULLY GUARANTEED)

Interleaved and Impregnated. Primaries 200-230-250 v 50 c/s Screened.

**TOP SHROUDED DROP THROUGH**

250-0-250 v 70 ma. 6.3 v 2.5 a.	12/11
200-0-200 v 70 ma. 6.3 v 2 a. 5 v 2 a.	14/11
350-0-350 v 60 ma. 6.3 v 3 a. 4 v 2.5 a.	15/11
350-0-350 v 60 ma. 6.3 v 2 a. 5 v 2 a.	17/6
250-0-250 v 100 ma. 6.3 v 4 a. 5 v 3 a.	21/9
350-0-350 v 100 ma. 6.3 v 4 a. 5 v 3 a.	21/9
350-0-350 v 150 ma. 6.3 v 4 a. 5 v 3 a.	27/9

**SMOOTHING CHOKES**

250 ma 3 h 100 ohms	11/9
100 ma 10 h 200 ohms Potted	8/9
80 ma 10 h 350 ohms	5/6
60 ma 10 h 400 ohms	4/11

**CO-AXIAL CABLE (in.)**

75 ohm 14/36	74 yd
Twin Screened Feeder	10d yd

**TV. PREAMPLIFIER.**—For Fringe Areas.  
Brand New. Complete with 6F13 valve.  
Only 22/6.

**FULLY SHROUDED UPRIGHT**

250-0-250 v 60 ma. 6.3 v 2 a. 5 v 2 a.	16/9
Midget type 21-3-3in.	23/9
250-0-250 v 100 ma. 6.3 v 4 a. 5 v 3 a.	23/9
250-0-250 v 100 ma. 6.3 v 6 a. 5 v 3 a. for R1375 Conversion	29/9
300-0-350 v 100 ma. 6.3 v 4 a. 5 v 3 a.	23/9
350-0-350 v 70 ma. 6.3 v 2 a. 5 v 2 a.	18/9
350-0-350 v 150 ma. 6.3 v 4 a. 0-4-5 v 3 a.	29/11
350-0-350 v 250 ma. 6.3 v 6 a. 4 v 8 a. 0-2-6 v 2 a. 4 v 3 a. for Electronic Engineering Televisor	69/6
425-0-425 v 200 ma. 6.3 v 4 a. C.T. 6.3 v 4 a. C.T. 5 v 3 a.	47/9
450-0-450 v 250 ma. 6.3 v 6 a. 6.3 v 6 a. 5 v 3 a.	69/6

**SELENIUM METAL RECTIFIERS**

RM2 125 v 100 ma. 4/9; RM4 250 v 250 ma. 11/9; RM3 125 v 120 ma. 5/9; G.E.C. 300 v 250 ma. 12/9; 120 v 40 ma. 3/9; 6/12 v 1 a F.W. 5/9; 250 v 50 ma. 5/9; 6/12 v 2 a F.W. 9/9; 250 v 60 ma. 7/9; 6/12 v 4 a F.W. 14/9.
--

**BATTERY SET CONVERTER KIT**  
All parts for converting any type of Battery Receiver to A.C. mains 200-250 v 50 c/s. Supplied 120 v 90 v or 60 v at 40 ma. Fully smoothed and fully smoothed L.T. of 2 v at 0.4 a to 1 a. Price including circuit 49/9. Or ready for use 8/9 extra.

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**SILVER MICA CONDENSERS.** Most values 5d. ea. 3/9 doz. one type.

**VOL. CONTROLS** (standard long spindles). All values, less switch, 2/9; with S.P. switch, 3/9; with D.P. switch, 4/6.

**ELECTROLYTICS.**—Tubular 8 mfd 450 v. 1/11; 16 mfd 450 v. 2/11; Can 8-8 mfd 450 v. 3/11; 8-16 mfd 450 v. 3/11; 16-16 mfd 450 v. 4/11; 32 mfd 350 v. 2/11; 32 mfd 450 v. 4/11; 32-32 mfd 350 v. 5/6; 32-32 mfd 450 v. 5/11; 64 mfd 450 v. 3/9; 60-100 mfd 350 v. 7/6.

**SPECIAL OFFERS.**—Midget Mains Trans. Primary 220/240 v 50 c/s; Secs. 275-0-275 v. 70 ma. 6.3 v 2 a. 5 v 2 a. 12/9. Output Trans. 5,000 to 3 ohms, 2/9.

**EX-GOVT. BLOCK PAPER CONDENSERS.**—4 mfd 500 v. 2/9; 4 mfd 1,000 v. 4/9; 4 mfd 1,500 v. 5/9; 4 mfd 2,000 v. 7/9; 8-8 mfd 500 v. 7/9; 0.1 mfd plus 0.1 mfd 8,000 v common negative isolated. 11/9; 0.5 mfd 2,500 v. 2/11; 1.5 mfd 4,000 v. 5/9.

**EX-GOVT. SMOOTHING CHOKES.**—50 ma 5-10 h ... 2/9  
100 ma 10 h 150 ohms Tropicalised ... 6/9  
150 ma 10 h 150 ohms ... 11/9  
250 ma 10 h 150 ohms ... 14/9  
250 ma 10 h 50 ohms ... 14/9

**EX-GOVT. MAINS TRANSFORMERS**  
Primaries 230-250 v 50 c/s 4 v 2.5 a. 4/9; 4 v 6 a (High Ins.) 7/9; 48 v 1 a. 9/9; 400 v C.T. 150 ma 4 v 6 a. 6.3 v 6 a. 6.3 v 0.6 a. 4 v 6 a. 4 v 3 a. 5 v 3 a. 4 v 3 a. 5 v 2 a. 22/9; 300-0-300 v 120 ma 4 v 1 a. 17/6; 855-775-690-0-690-775-965 v 500 ma. 29/6; 610-0-610 v 150 ma. 300-0-300 v 150 ma. 1220 v 350 ma. 29/6; 450 v 200 ma. 6.3 v 5 a. 29/6; 400 v 200 ma. 6.3 v 5 a. 29/6.

**EX-GOVT. AUTO TRANSFORMERS**  
0-110-190-230 v 100 watts. 49/6; Double Wound 230 v to 15-10-5-0-195-215-235 v or reverse 500 watts. 29/9; 10-0-200-220-240 v to 10-0-275-295-315 v 1800 watts. 69/6; Double Wound 230 v to 230 v (tapped every 11 volts) 58/6A. 66/15-

**EX-GOVT. E.H.T. SMOOTHERS**  
02 mfd 8000 v. 1/11; 25 mfd 4000 v (Block). 4/9; 5 mfd 3500 v. 3/6.

**R.F. UNITS TYPE 26.**—Brand new. Cartoned. 39/6, plus cart. 2/6.

**BATTERY CHARGERS.**—For mains 200-250 v 50 c/s. Outputs for charging 6 v or 12 v at 1 amp. In strong metal case. Only 19/9. Above can also be used for electric train power supply.

**BATTERY CHARGER KITS.**—Consisting of attractive Green Crackle Case. Transformer P.W. Rectifier. Fuse. Fuse holder. Tag strip. Grommets. and Circuit. For mains input 200-230-250 v 50 c/s 6 v 2 a. 25/9; 6 v or 12 v. 2 a. 31/6; 6 v or 12 v. 4 a. 49/9. Any type assembled and tested for 6/9 extra.

**FILAMENT TRANSFORMERS**  
All with 200-250 v 50 c/s Primaries; 6.3 v 1.5 a. 5/9; 6.3 v 2 a. 7/6; 0-4-6.3 v 2 a. 7/9; 12 v 1 a. 7/11; 6.3 v 3 a. 9/11; 6.3 v 6 a. 17/9.

**CHARGER TRANSFORMERS**  
200-250 v 0-9-15 v 1 a. 11/9; 0-9-15 v 3 a. 16/9; 0-9-15 v 4 a. 18/9; 0-9-15 v 6 a. 22/9.

**OUTPUT TRANSFORMERS**

Standard Pentode 5000 to 3 ohms	4/9
Standard Pentode 78000 to 3 ohms	4/9
Standard Pentode 10,000 to 3 ohms	2/11
Small Pentode 5,000 to 3 ohms	3/9

**E.H.T. TRANSFORMERS** 200-230-250 v

2,500 v 5 ma. 2-0-2 v 1.1 a. 2-0-2 v 1.1 a. for VCR97, VCR517	36/6
---	------

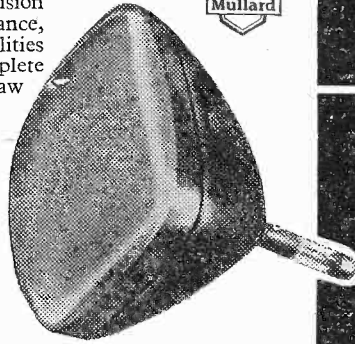
# Your set deserves a Mullard

## LONG=LIFE TV TUBE

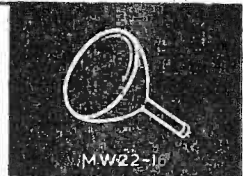
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### MULLARD LONG LIFE TUBES FOR HOME CONSTRUCTORS

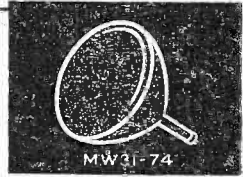
MW22-16	...	...	9 inch circular screen.
MW31-74	...	...	12 inch circular grey-glass screen.
MW36-24	...	...	14 inch rectangular grey-glass screen.
MW41-1	...	...	16 inch circular screen. Metal cone.
MW43-64	...	...	17 inch rectangular grey-glass screen.



MW43-64



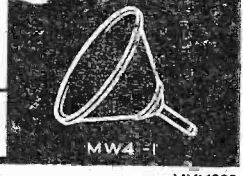
MW22-16



MW31-74



MW36-24



MW41-1

MVM790

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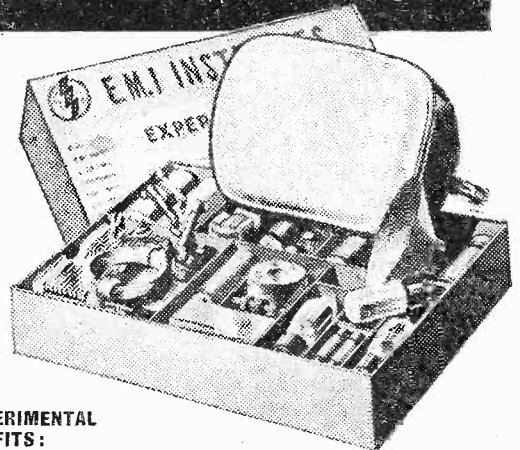
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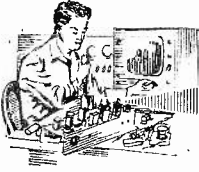
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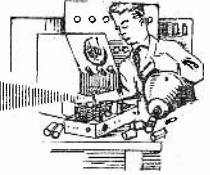
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# Practical Television



## & TELEVISION TIMES

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EVERY MONTH

DECEMBER, 1954

## Televiews

### PROGRESS OF COMMERCIAL TV

NOW that the country is committed to commercial TV and programmes are due to start next year the controversy surrounding this thorny subject no longer revolves around whether it is necessary or desirable; it has become a political issue, intensified by the announcement that the programme contractors for the first three stations of the Independent Television Authority will be Granada Theatres, which is a chain of cinemas, Broadcast Relay Services (Rediffusion) and Associated Newspapers (publishers of the *Daily Mail*) and Kemsley-Winnick Group. No announcement has been made at the time of going to press as to the location from which the three companies will operate. It is possible that Broadcast Relay Services will operate in London and the Kemsley-Winnick Group from Manchester. Others have made applications, but have not yet been offered contracts. These include the Associated Broadcasting Development Co., of which Mr. Norman Collins (former BBC TV controller) is a director, and the Incorporated Television Programme Co., of which Prince Littler is chairman and Mr. Val Parnell managing director. The I.T.A. has announced that more stations will be available in the second and third years of operation, when new companies will be required. Other companies will probably share the time on the first three stations, which are expected to start working by August next in the London, Birmingham and Manchester areas. The I.T.A. recognises that the operation of one station by one contractor is the ideal to be attained, but that it would be wrong at present with only one station in any particular area for it to be

placed exclusively in the hands of only one operator.

Sir Robert Fraser is director general of the I.T.A. In explaining the appointments he said that it was a marriage of talents to opportunity. He hoped for free trade among the stations and a merry-go-round of exchanges. It will be possible, for example, for Birmingham to take programmes from the London station, and also to transmit programmes direct from London by radio link or cable.

A separate programme company will probably be appointed to present the news to ensure absolute political impartiality. This will mean that the news will be radiated to the network from a London studio. Newspapers who

become programme contractors are not to be allowed to plug their names in the programmes. The company chosen to select the news must not be any particular newspaper.

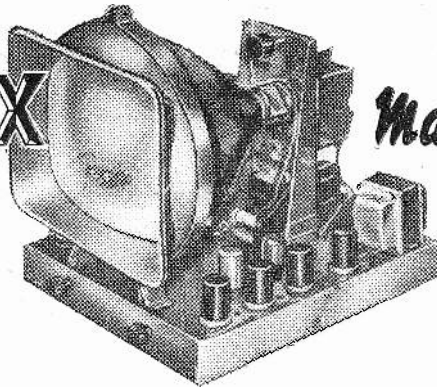
We have previously expressed the view that the very stringent control which is to be exercised over advertisers' announcements will seriously affect demand for programme time. If this proves to be so it may mean either the collapse of commercial TV or a complete revision of existing regulations. Programme time is likely to be expensive and advertisers will naturally wish to get their money back.

Originally there were over 100 applications for contracts, but these have now whittled down to about 25.

In Holland commercial TV is to be introduced and the Broadcasting Associations will be permitted to introduce advertisements on a "moderate" scale, and to broadcast political propaganda. Longer programmes and colour TV are to be introduced.—F.J.C.

The Editor and Staff  
Join in Wishing  
Every Reader a  
Very Happy Xmas

# The SIMPLEX



# Magnetic Model

**T**HE smoothing choke should now be removed and placed under the chassis. If the particular choke you are using is not small enough, then the new smoothing choke and rectifier valve will have to be re-positioned to accommodate it on the top, behind the C.R.T. mounting.

Change the line-hold control over to the position next to the width control.

Change the smoothing condenser C35/36 to the new position indicated on the chassis. The hole left by its removal is to be occupied by the line output valveholder.

The height control should be removed and the hole enlarged to take the frame output valveholder.

### Modifying the Existing Circuit

The existing timebase circuit can now be modified (Fig. 2). Commence by rewiring the shifted line-hold control. (Longer wires will have to be fitted upon its shift to new position.)

Fit a tag strip single point, by the frame oscillator and wire in the 47 K anode resistor used in lieu of the height control.

Modify V13 circuit by fitting RM3 in the anode circuit and strapping the grids, the cathodes, and the anodes, and inserting the 330-ohm resistor in the cathode. The 0.002  $\mu$ F condenser CM17 should be fitted ready for feeding V14.

Replace R28 with RM2 (1 megohm) and connect CM2 across C26. R24 can be used for RM2 as R24 is replaced by a 2-megohm resistor RM1, which can be R32 recovered previously. Add CM1 across C24.

Check the wiring, which should now be in accordance with Fig. 12. Note, however, that the heater of V13 should be disconnected from the common feed with the rest of the timebase valves, as it is to be fed from the new transformer in conjunction with V14 and V15.

Now proceed to Stage IV (M).

### STAGE II (M)

These details and the details in the following section Stage III (M) are for those who are building the new Simplex version directly, and are not modifying the original version.

### DETAILS FOR CONVERTING THE SIMPLEX TO MAGNETIC TUBE

(Continued from page 266, November issue)

Wire in the "live" side of the heater circuits and then fit the 14-way tag strip.

The coaxial cable from the video output stage should now be run and then the whole of the timebase should be wired in accordance with the new wiring starting with V8 circuit and working through to V13, mounting the various components as required.

RM5 is connected between the valveholder and a tag point which is fed from the H.T. line and R22 is fed to the valve, also from this tag strip.

C23 and CM1 should be placed well clear of the chassis.

Mark out and drill the hole ready for V15.

Note that there is available on the market suitable

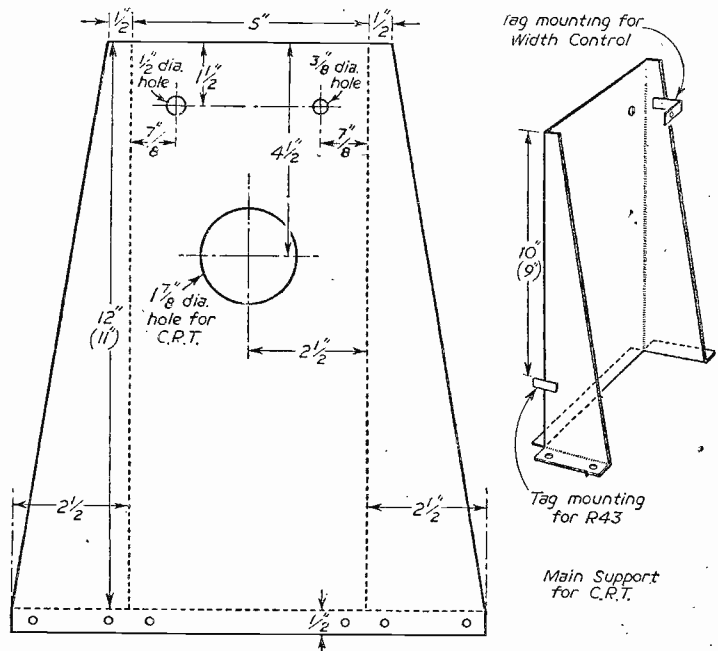


Fig. 4.—Details of the main tube support.

chassis ready drilled for the original version. These are very simply adapted to the new version and will save the constructor a lot of work.

Check all the wiring and proceed to Stage III (M).

**STAGE III (M)**

Like the foregoing stage, this is for constructors who have not built the original model.

Since the production of the original data manufacturers have produced transformers giving the necessary 4-volt tap on the 5-volt winding, and thus have considerably eased construction. The 4-volt winding becomes available for a 4-volt tube if used,

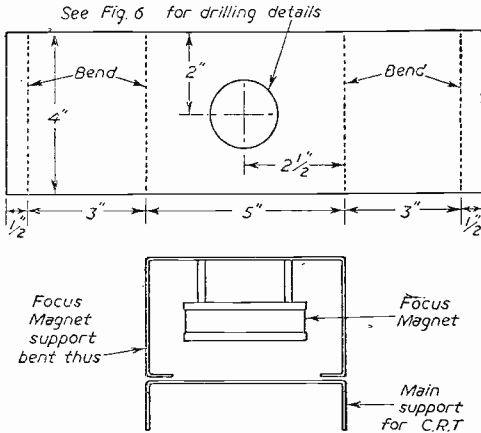


Fig. 5.—Details of the Focus Unit mount.

and will also supply the pentode output valve in the sound circuit.

The mains transformer for the vision and sound supply (T1) should be mounted in the position shown so that it comes right to the edge of the chassis.

The three metal rectifiers can be mounted adjacent to the transformer and can be fitted either horizontally or vertically.

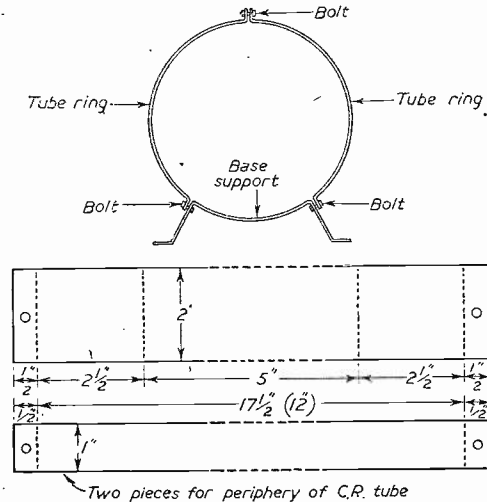


Fig. 7.—Details of the front tube support.

It is possible to obtain some ex-Government rectifiers from time to time and these can be used providing they will cater for 350 volt at 150 mA. Some of these have been used in the prototype.

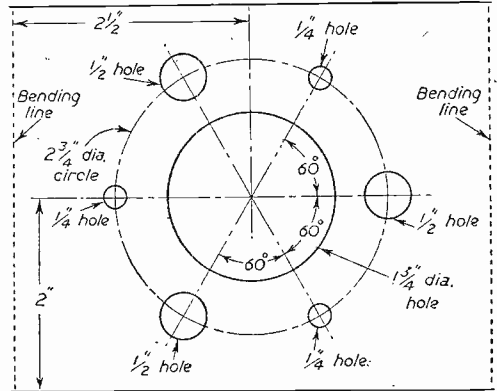


Fig. 6.—Drilling data for the specified focus unit.

R43 is not mounted at this stage as it has to be fitted on the tube holder mounting.

The transformer is connected as in the original Simplex, but the section for E.H.T. is omitted. The spare 350-volt tap is left free.

Note that the position for C35/36 is not as in the original model.

Care must be taken to ensure that the rectifiers are free from earth and are connected correctly.

The E.H.T. rectifiers are not included at this stage as they operate on the line flyback.

The wiring of this power pack should be completed and it can, if desired, be checked for operation.

Now proceed to Stage IV (M).

**STAGE IV (M)**

This is the point where the constructor doing the

**STAGE I**  
This is as given on page 462, Vol. 4, "Practical Television")

**STAGE II (M)**

<p><b>Resistors :</b> All 1/2 w. unless stated otherwise</p> <ul style="list-style-type: none"> <li>3 1M Ω</li> <li>1 6.8 K Ω</li> <li>2 10 K Ω</li> <li>1 100 K Ω</li> <li>4 47 K Ω</li> <li>1 33 K Ω</li> <li>1 680 K Ω</li> <li>1 4.7 K Ω</li> <li>2 2 M Ω</li> <li>1 10 K Ω 1 w.</li> <li>1 100 K Ω 2 w.</li> <li>1 330 ohm 1 w.</li> <li>1 47 K Ω 1 w.</li> </ul> <p><b>Valves :</b> 3 SP61 1 EA50 1 6J5GT 1 6SN7</p>	<p><b>Condensers :</b> All 350 v. wkg. unless stated otherwise</p> <ul style="list-style-type: none"> <li>2 .002 μF</li> <li>1 50 pF</li> <li>3 .01 μF</li> <li>4 .1 μF</li> <li>2 .005 μF</li> <li>3 100 pF</li> </ul> <p><b>Potentiometers (pre-set) :</b> 1 100 K Ω 2 2 M Ω</p> <p><b>Valveholders :</b> 3 Mazda Octal 2 I.O. 1 EA50 3 caps for SP61's</p> <p><b>Sundries :</b> 1 tag board 14-way Wire</p>
--	--

conversion and the constructor building the new version directly come on to common ground. This stage and the two subsequent stages are common to both.

In this stage the frame output amplifier is built. The first step is to fit the V15 holder in its position. It is important that one of the short type of valves is used as a large one will foul the edge of the C.R.T.

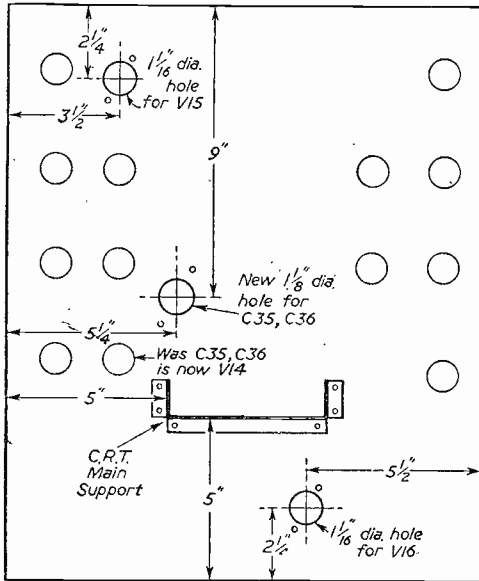


Fig. 9.—Drilling details for the chassis. C35/36, rear support and line-transformer should all be positioned 3in. nearer front of chassis if a 9in. tube is used.

VRM2 and VRM3 are next fitted on to the back of the chassis next to the frame hold control. The frame output transformer is fitted underneath the front end of the chassis in the position shown and VRM4 is fitted as a preset control on the side of the chassis. Two tag points are fitted just above the main 14-way

#### STAGE III (M)

- |                                   |                         |
|-----------------------------------|-------------------------|
| 1 1.5 K 4 w. resistor             | 1 10 henry choke 150 mA |
| 2 K3/40 STC rectifiers            | 1 mains transformer     |
| 3 RM3 rectifiers                  | 350-0-350 v. 150 mA     |
| 1 32+32 $\mu$ F 450 v. condensers | 6.3 v. 4-5 A            |
| 1 16+8 $\mu$ F condenser          | 5 v. 4 v. 3 A           |

tag strip to cater for RM15 and RM16. Both of these resistors dissipate some heat and have been mounted in this position to keep them clear.

RM17 is fitted directly across the terminals of the transformer.

All the wiring is completed in this stage except those from the secondary of the frame output transformer to the scan coils. These will be run in later

#### SHOPPING LIST

List "A" (see text)

- |                       |                     |
|-----------------------|---------------------|
| <b>Resistors :</b>    | <b>Condensers :</b> |
| 1 100 K $\Omega$ 2 w. | 1 .005 $\mu$ F      |
| 1 330 ohms 1 w.       | 1 100 $\mu$ F       |
|                       | 2 .002 $\mu$ F      |

when a tag strip is fitted on the C.R.T. mounting panel.

Now proceed to Stage V (M).

#### STAGE V (M)

This stage includes the line output circuit and the tube supply mountings.

#### STAGE IV (M)

- |  |   |
|--|---|
| <b>Resistors :</b>                             | <b>Condensers :</b>                           |
| All $\frac{1}{2}$ watt unless stated otherwise | All 350 v. wkg. unless stated otherwise       |
| 1 470 K $\Omega$                               | 1 .02 $\mu$ F                                 |
| 1 330 K $\Omega$                               | 1 25 $\mu$ F 50 v.                            |
| 1 100 K $\Omega$                               | 1 4 $\mu$ F                                   |
| 1 5 K $\Omega$ 10 w.                           | 1 32 $\mu$ F tubular                          |
| 1 2.2 K $\Omega$ 2 w.                          |   |
| 1 470 ohms                                     | <b>Sundries :</b>                             |
| <b>Potentiometers (pre-set) :</b>              | 1 6V6 valve                                   |
| 1 1 M $\Omega$                                 | 1 1.0 valveholder                             |
| 1 250 K $\Omega$                               | 1 Frame output transformer as for View-master |
| 1 2 K $\Omega$ ww.                             | 1 2-way tag strip                             |
|  | 2 1-way tag strips                            |
|  | 1 earthing tag                                |

The first step is to drill the hole for the rectifier which is to be mounted behind the C.R.T. rear support. The tube rear support should now be constructed in accordance with the data given in Fig. 4

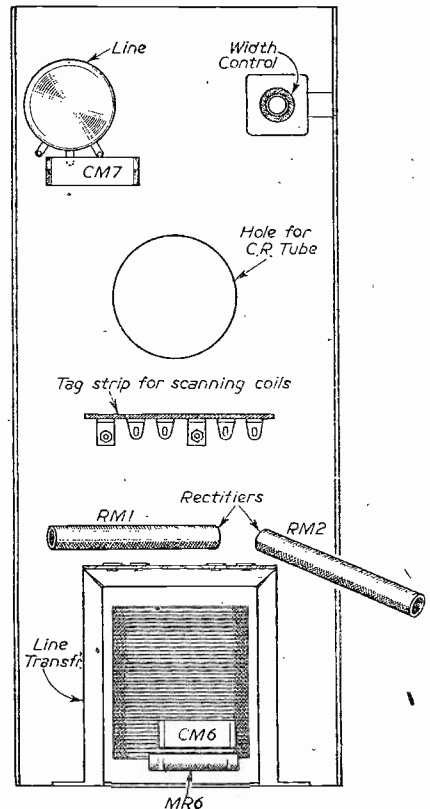


Fig. 8.—Details at rear of tube support.



and at the same time the front supports can be made. Note the difference in measurements for a 9in. tube as compared with a 12in. tube. The 9in. tube is given in brackets.

correct setting of the rear support.

The holes for passing wires through the chassis can be drilled at this stage before the support is mounted in position.

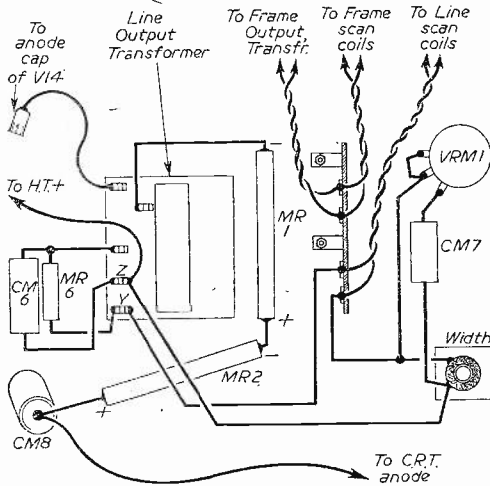


Fig. 10.—Line amplifier wiring-above chassis.

It has been assumed that a normal rubber mask is to be used with the tube but if this is not fitted then the periphery should be bound with rubber strip such as an old cycle inner tube; the dimensions for the strip holding the front of the tube will have to be reduced by about an inch if this is done.

The focusing magnet will have to be mounted in position before the back plate of the rear support is bolted on.

The mounting should be positioned on the chassis so that the extreme front of the tube just overhangs the edge. It is important that the main weight at the front is carried on the chassis.

It is convenient to get the exact position for drilling the holes by trial with the tube in position.

The C.R.T. must be handled with the greatest of care. The weakest part is the neck and under no circumstances must the weight of the tube be taken by holding the neck. Due to the high vacuum, the atmosphere exerts a considerable force on the tube and a violent implosion can take place if the tube is damaged.

For the sake of future safety the television should be fitted into a cabinet and safety glass used for protection of the screen.

Do not fit the tube at this stage, but use it to confirm the

STAGE V (M)	
<b>Resistors :</b>	<b>Sundries :</b>
All $\frac{1}{2}$ watt unless stated otherwise	1 EL38 valve
1 220 ohm	1 rectifier 14D36
1 330 K $\Omega$	1 top cap for EL38
1 4.7 K $\Omega$ 2 w.	1 anode connector for C.R.T.
1 100 ohm 1 w.	1 12 or 9in. C.R.T.
1 47 K $\Omega$ 1 w.	1 sheet aluminium for C.R.T. mounting
1 15 K $\Omega$ 1 w.	1 4 way tag strip
<b>Valveholders :</b>	2 1 way tag strips
1 I.O	1 earthing tag
1 I.O or Mazda according to C.R.T.	1 line output transformer as for Viewmaster
<b>Condensers :</b>	1 set scanning coils as for Viewmaster
2 .1 $\mu$ F 350 v.	1 Elac PM focus magnet to suit tube
1 .25 $\mu$ F 50 v.	1 width control as for Viewmaster
2 .01 $\mu$ F 350 v.	
1 .001 $\mu$ F 6-7 kv.	
<b>Potentiometers (pre-set) :</b>	
1 2 K $\Omega$ w.	
1 25 K $\Omega$	

Having mounted the tube-support, the line output transformer can be bolted in position and CM8 mounted nearby.

(To be concluded.)

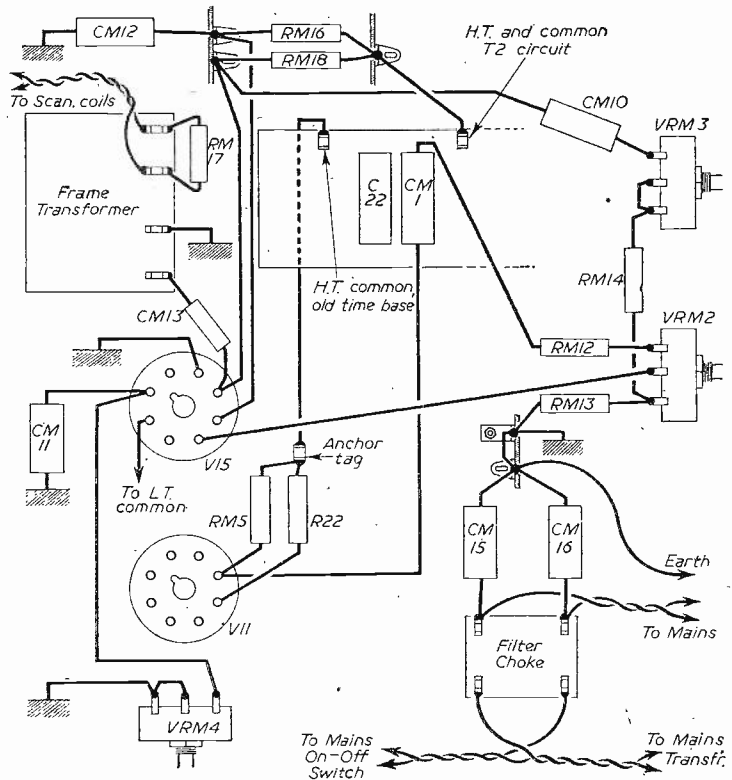


Fig. 11.—Wiring details for the frame timebase.

# E. M. I. Colour TV.

## A DESCRIPTION OF ONE OF THE LATEST DEVELOPMENTS IN THE FIELD OF COLOUR TELEVISION

ONE of the most important, and incidentally controversial, units in a colour television system is the colour camera. A considerable amount of research and development effort has in the past been directed towards producing a compact and yet efficient colour camera. While no generally accepted decision has yet been reached on the most satisfactory type, some comment on the factors involved may at this stage be of interest.

Of all the modern types available today there is little doubt that the field-sequential colour television camera is the simplest. Only a single pick-up tube is required, which may be of the standard type used for monochrome television. Unfortunately, the field-sequential system as a whole is non-compatible, so it is therefore necessary to look into the question of the most practical form of camera which may be used for the generation of simultaneous compatible signals.

One form of simultaneous camera employs three pick-up tubes which are associated with beam-splitting colour filters. This camera has a number of serious disadvantages which make it difficult to handle operationally. For example, it is large, is usually over 300 lb. in weight, and involves a complex optical system which makes turret changes difficult and introduces a considerable loss in light efficiency. Furthermore, it is essential that every camera contains three matched pick-up tubes, which are difficult and

costly to produce. Another objection is that the camera requires separate amplifiers for red, green and blue signals. Each of the amplifiers has three parameters which affect picture quality, namely: gain, picture black-level, and gamma characteristic. In a studio with three cameras, ignoring the question of matching the colour filters and registration, there are altogether 27 possible variables involved in matching the pictures from the three cameras.

It is also the practice when transmitting colour signals by this system to associate a colourplexer with each individual camera channel in order to simplify camera switching. This in itself necessitates a further considerable investment in equipment.

### An Alternative

An alternative approach to the camera problem is to use a simple field-sequential camera and to convert the field-sequential signals into simultaneous signals by storage techniques. There are quite a number of possible arrangements for effecting the conversion.

The method indicated in Fig. 1 uses three cathode ray display tubes and three Emitron pick-up tubes. In the present E.M.I. equipment the field-sequential signals are derived from a camera operating with 405 lines, interlaced 2 : 1, with 150 fields per second and a bandwidth of 9 Mc/s. These signals are then fed into gating circuits arranged so that the red signals are displayed on one cathode ray tube, the

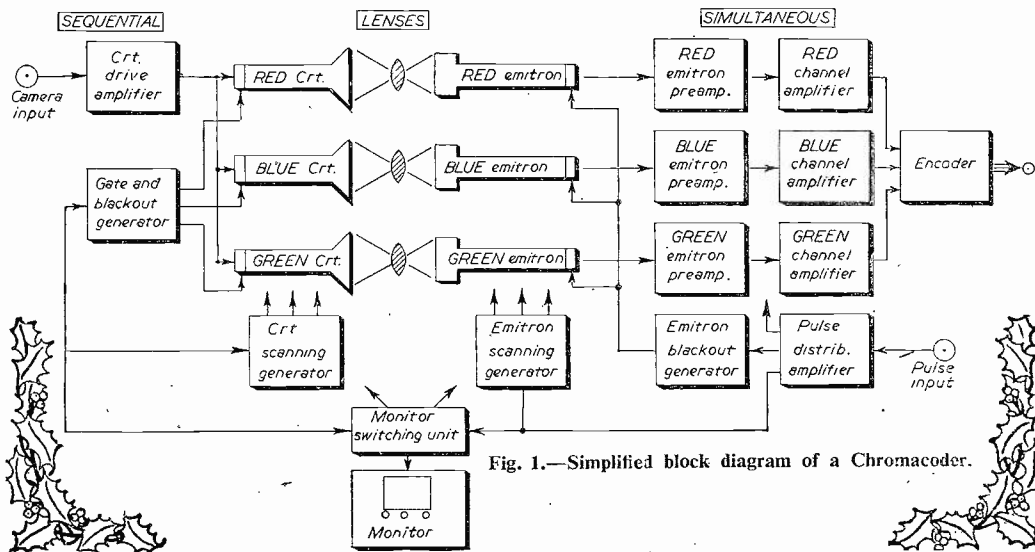
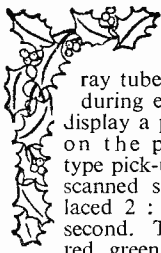


Fig. 1.—Simplified block diagram of a Chromacoder.



green signals on the second cathode ray tube, and the blue signals on the third. In other words, each cathode ray tube is operative for 1/150th of a second during each 1/50th of a second in order to display a particular colour component picture on the photo-sensitive surface of a storage type pick-up tube. All three pick-up tubes are scanned simultaneously with 625 lines, interlaced 2 : 1, and at the rate of 50 fields per second. Their outputs consist of simultaneous red, green and blue colour component signals produced according to the C.C.I.R. scanning standards.

It will be seen that a component field which takes 1/150th of a second to "write on" the display cathode ray tube, is "read off" in 1/50th of a second within its associated pick-up tube. This means that the converter is acting as a frequency divider. Thus, for example, a 9 Mc/s signal in the original field-sequential signal is converted into a 4.6 Mc/s output signal.

**The "Chromacoder"**

The equipment for the conversion of field-sequential signals into simultaneous signals has been developed by E.M.I. Research Laboratories in this country, and by the Columbia Broadcasting System and General Electric Company in the United States, who have called the converter the "Chromacoder." The American companies are at present successfully using Emitron tubes in their colour television broadcasting equipment.

Patent Application No. 25274/52). The arrangement is shown in Fig. 2.

In the type of converter just described, the field-sequential signals are applied by means of gating circuits to three display cathode ray tubes, so that each tube reproduces a particular colour component. Thus one tube displays the red component, the second the green, and the third the blue component. The three storage pick-up tubes associated with the display tubes then produce the simultaneous but separate red, green and blue signals. These signals are passed through matrices in the usual way to form Y, R-Y and B-Y signals. The Y signal, which corresponds to the luminance signal as seen on the monochrome receiver, is formed by adding the red, green and blue signals in suitable proportions, giving  $Y = 0.30 R + 0.59 G + 0.11 B$ .

Since the red, green, and blue signals required to form the luminance signal are derived from these pick-up tubes, it is essential that registration of the three pictures be carried out to a high degree of accuracy if definition is to be comparable with that from a normal monochrome camera. In addition, the definition of the signals from each channel must be equally good, and equivalent to monochrome standards.

In the improved system converter, the field-sequential signals are gated as before and applied to the red and blue component display tubes, but modified signals are fed to the third display tube. The modified signals consist of suitable proportions of all three sequential signals—red, green and blue, and are obtained by passing the sequential signals

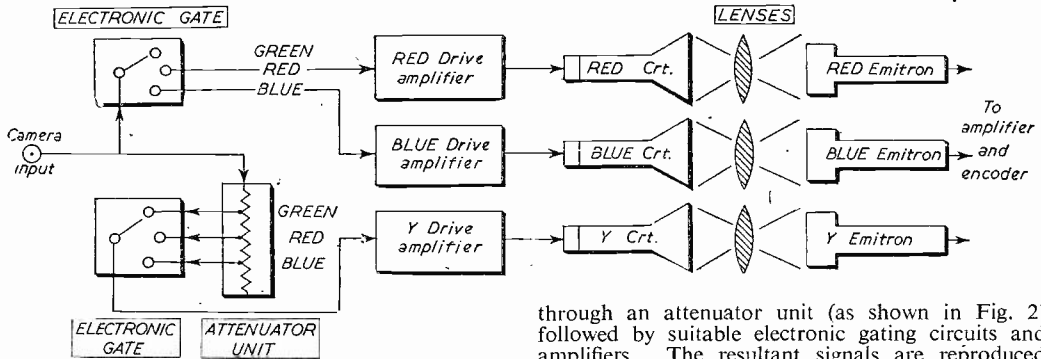
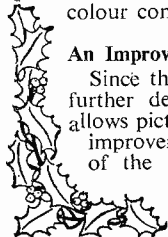


Fig. 2.—The E.M.I. modified R.Y.B. colour system converter.

Research in the E.M.I. laboratories on the Emitron pick-up tube Type 5956 has shown that not only has the tube excellent properties for use in field-sequential colour cameras, but also that its storage characteristics render it entirely suitable for the colour conversion system.



**An Improved Scheme**

Since the preparation of the above notes, a further development has taken place which allows picture definition to be increased. This improvement, which is based on the inability of the human eye to see fine details in colour, represents a practical application of an arrangement described in a pending E.M.I. patent (British

through an attenuator unit (as shown in Fig. 2) followed by suitable electronic gating circuits and amplifiers. The resultant signals are reproduced on the third display tube and represent the luminance signal Y. The pick-up tube associated with the Y display tube integrates the light, giving an output signal of the form  $Y \times 0.30 R + 0.59 G + 0.11 B$ , and this signal is developed simultaneously with the red and blue signals from the other two pick-up tubes.

**Single Tube**

The development of the Y signal has therefore been achieved in a single storage pick-up tube, and the signal can then be transmitted directly as a monochrome signal without subsequent modification. As the three superimposed red, green and blue fields on the Y display tube are perfectly registered because of the inherent registration of the field-sequential system, it is clear that the definition of the luminance channel is greatly improved. Since the red and blue signals from the other pick-up tubes do not con-

tribute to the luminance of the reproduced simultaneous pictures, the necessity for good definition and accurate registration from these two tubes is considerably reduced. This is particularly so when the converter is used with the N.T.S.C. system, as the encoded colour-difference signals B-Y and R-Y have but little effect on the compatible monochrome picture.

It is an established fact that the human eye has much better acuity for luminance differences than colour differences. With the improved version of the system converter, the definition of the luminance signal is substantially increased. It will therefore be apparent that a significant advance in the overall performance of this system of colour television has been achieved.

### The Colour Television Film Scanner

The flying spot technique is here applied to the problem of analysing colour film in terms of three primary colours. The colour film is first of all scanned by a flying spot of light. The spectral characteristic of the spot of light is modified by the transmission at every point on the film. The resultant light is then divided into three colour components by a dichroic mirror assembly. Three photocells collect these light components and convert them to electrical signals, which are then passed on to suitable amplifier chains. In addition to the electronic

with a large aperture used in conjunction with a shifting patch on the face of the scanning tube achieves the same result as previously, but enables a much more efficient optical system to be employed. The film is followed by moving alternate fields to one or other of two patch positions on the scanning tube by means of a specially generated shift waveform applied to the scanning coils.

The method may also be applied to the American standards of 60 television fields and 24 picture frames per second. In this case, alternate film frames are scanned by two television fields and three television fields respectively. Altogether five patch positions on the tube face are required for these particular standards.

## Pye Takes TV to M.E.

TELEVISION is being taken to Baghdad and the Middle East for the first time; all the arrangements for this historic event have now been completed by Pye Limited of Cambridge.

An entirely prefabricated television studio, which has been planned in the light of the most up-to-date experience, was constructed in England before being

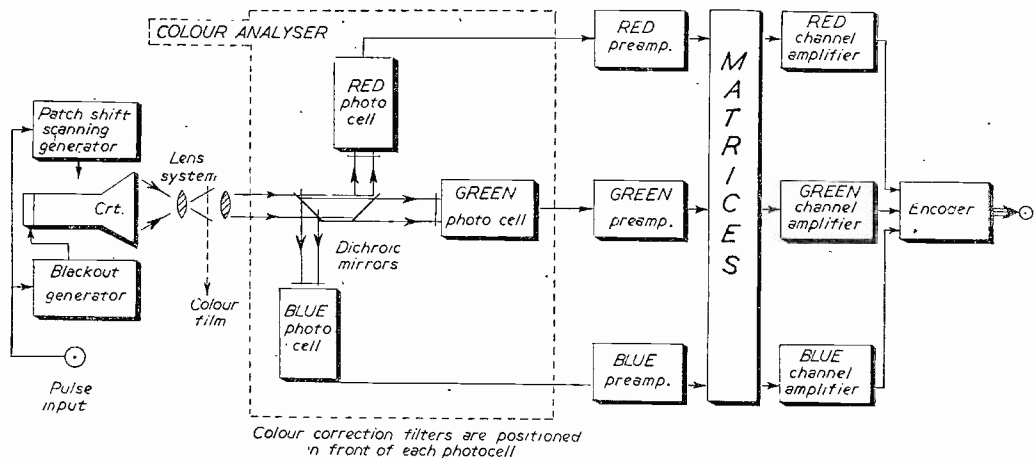


Fig. 3.—Simplified block diagram of a colour film scanner. Colour correction filters are positioned in front of each photocell.

circuits, the amplifier channels include fixed gamma stages and linear matrices for colour-correction and balance. Three video signals—red, green and blue—are available at the output terminals for encoding into a standard colour waveform. A continuous motion projector is used to move the film at 25 frames per second. There are 50 television fields per second, each film frame being scanned twice. The conventional flying spot method of film scanning is to provide an interlaced raster on the scanning tube, two optical paths, and a simple shutter, so that each film frame is scanned in two positions of the film. One important disadvantage of this method is the low efficiency of light collection.

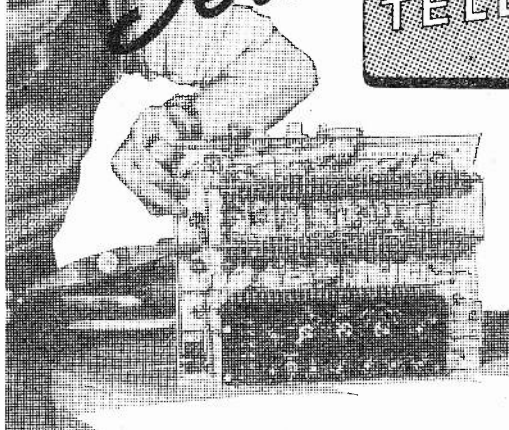
A new method (Fig. 3) is introduced in this film scanner for following the moving film. A single lens

shipped out to Iraq several months ago. The impressive new station, the first of its kind in the world and the first completely portable one ever devised, operates on the European standard of 625 lines. Every conceivable requirement has been thought of and carefully worked out by Pye, who have been granted the exclusive television rights by the Fair's organisers, British Overseas Fairs Limited.

Beneath the towering 60ft. television mast, which will give complete coverage to the whole of Baghdad, there is every facility, from a sound-proof studio and an air-conditioned control room to shower baths, several dressing-rooms and an artists' rest-room.

NEW SERIES

# Servicing TELEVISION RECEIVERS



No. 4.—FERRANTI 136-1145, 138-129,  
1205 AND SERIES

By L. Lawry-Johns

**T**HE Ferranti T.136 and 1145 were earlier models and will be dealt with first. The 136 was a 9in. console and the 1145 was the table version. A power pack which is separate from the main chassis carries the transformers and rectifiers, including E.H.T., and the speaker assembly. The large transformer carries a tag board and the multi-cable connections between the chassis are made to this. All the main smoothing and decoupling condensers are

under the power pack chassis. If sound on vision, and vision on sound, troubles are experienced the cause is nearly always to be found here; the card-board-covered electrolytic condensers seem to dry up before the metal-cased type, and the main chassis should not be touched until the power pack has been thoroughly inspected and all the condensers have been found up to capacity. A very common fault is that the tube is much brighter on one side than the other. This is due to the linearity components dropping in value. If this trouble is experienced the main chassis should be removed to the extent of its cables, and the tube withdrawn after disconnecting the anode cap and the base. Place the tube in a safe position and unscrew the picture centering screw with the milled top (this is on the side of the scan coils case), as the scan coils cannot be removed while this screw is in position.

When the coils have been withdrawn, unwrap the

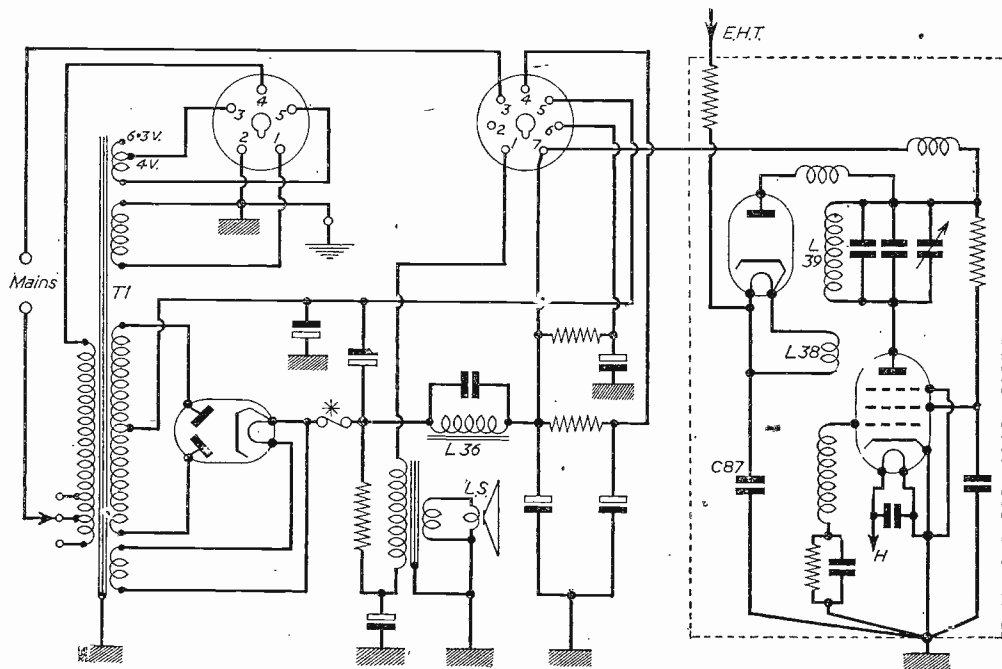
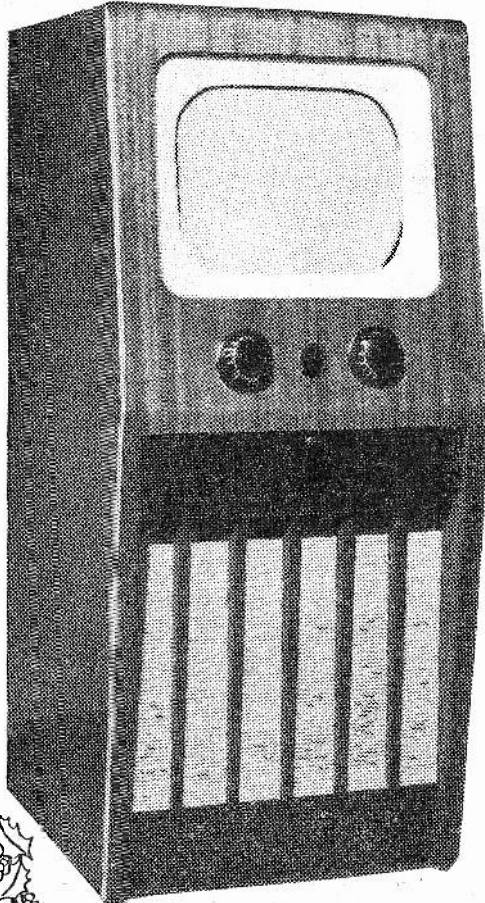


Fig. 1.—The power pack of the T.138 and T.129. The R.F. E.H.T. unit is on the right, and the E.H.T. condenser, .001  $\mu$ F, and heater coil are shown as C87 and L38. The fuse marked with a star is 500 mA and is mounted on the top of the chassis to the right of the GZ32.

covering and the linearity components will be revealed probably embedded in wax. Three resistors ( $\frac{1}{2}$  watt) and a small condenser (50 pF, 2,500 volt working). The defective component will almost certainly be the 150 K $\Omega$  resistor which is across the total winding. The other two are across each half, one being shunted by the condenser. It is recommended that this 150 K $\Omega$   $\frac{1}{2}$  watt resistor be replaced by two 250 K $\Omega$   $\frac{1}{2}$  watt in parallel. This, of course, means that a resistive element of 125 K $\Omega$  1 watt has been fitted. The curvature of the assembly precludes the fitting of a 1 watt resistor. It will be found that the two  $\frac{1}{2}$  watt resistors will fit snugly in position and the coils should then be re-wrapped and replaced so as to allow the adjusting screw to be refitted into the assembly. Considerable care is necessary when replacing the tube and the E.H.T. clip should be replaced when the chassis is out, as it can be awkward to get it to fit when it is back in the cabinet. The tube is a G.E.C. with sunken nipple; the clip with its rubber cover is difficult to fit when it is out of sight behind the vertical chassis.



A model T.129 Ferranti receiver.

T.138-129

Both of these models are consoles and the only main difference is in the cabinet and tube, the 138 being 9in. and the 129 12in., with a very slightly modified focus circuit. The remarks and diagrams refer to both except where stated. The chief trouble which besets these models is without a doubt concerning the line timebase. A self-oscillating EL38 is used and rarely gives trouble. The diagram of the

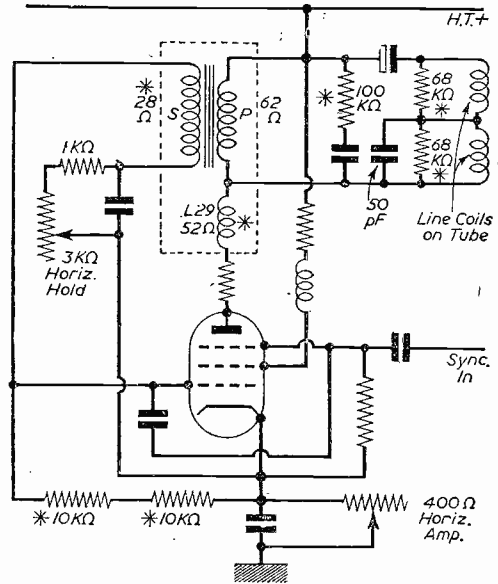


Fig. 2.—The original line timebase of the T.138 and T.129. The components mentioned in the text are marked with an asterisk. The horizontal amp may be found in the H.T. feed to the timebase.

timebase should be studied in conjunction with the following notes.

*Horizontal hold control at the end of its rotation and still not locking or not locking firmly.*

The two 10 K $\Omega$   $\frac{1}{2}$  watt resistors from the grid to cathode of the EL38 have probably changed their value. They are in series, their junction being soldered to an unused pin. Do not use a 20 K $\Omega$  single resistor; two resistors of the original value must be used to return the control to its centre position. To get at these components it is necessary to remove the main chassis. Pull off three control knobs at the front, undo the two wing nuts at the rear and unscrew the two screws which keep the top of the chassis in position. Remove the two multi-plugs from the rear of the chassis and slide out until the E.H.T. lead can be removed from the tube. The chassis may now be completely removed. The EL38 is in the perforated screening can on the right side of the chassis, and the screened lead from the top of this goes into the line output transformer just below. If the replacement of the above resistors does not effect a cure, inspect the 100 K $\Omega$  linearity resistor (1 watt). This will be found in a very obvious position just to the right of the EL38 valve base between a tag strip and the end of large condenser. It may be blackened and it is a good plan to replace this with

two 200 K $\Omega$  1 watt resistors, with their ends twisted together to give the necessary 100 K $\Omega$ . Even if this resistor is not at the moment defective it is worthwhile to do this as it can save almost certain trouble later. Assuming, however, that the trouble has still not been located (unlikely) the EL33 sound output

for it but to order a set of scan coils, as the fault will almost certainly be shorted turns on these components. New scan coils will cost in the region of five guineas and if the line transformer is defective (and this is more likely) it will cost in the region of £2.10.0.

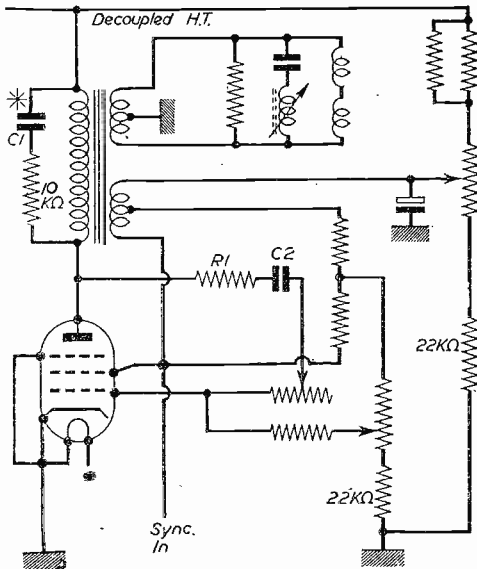


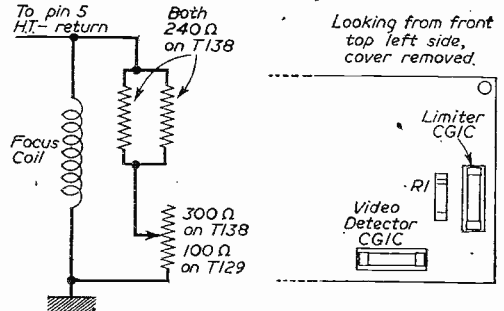
Fig. 3.—Frame timebase of the T.138 and T.129. C1 is the condenser mentioned in the test, its value being .001  $\mu$ F, 2,250 v. working. C2 is .003  $\mu$ F 2,250 v. working, and should be suspected if C1 is proved O.K. R1 is 180 K $\Omega$ .

valve should be removed to provide access to the side of the scan coils (this valve is just above the EL38).

On the right-hand paxolin strip of the coils will be found two 68 K $\Omega$  resistors, one being shunted by a 50 pF 2.5 K volt condenser. These will have to have one end disconnected to measure them, and if they read outside a range of 50-80 K, they should be replaced. By this time the line hold should be back to its proper position, but if not, check the mains voltage selector panel on the power pack and the D.C. voltage on the fuse beside the GZ32 rectifier; this should be approximately 300. A line scan which is just a jumble, ending somewhere near the centre of the tube with a row of vertical lines can prove very expensive unless the following procedure is carried out. Remove the top screening cap of the EL38 can, unsolder the red lead. Withdraw the cap and length of screening lead so that the red lead is left protruding from the top of the transformer can. Undo the four fixing nuts and bolts that secure the can to the chassis and gently pull off. The transformer is held in position in the can by means of pieces of thick felt. The corrector choke L29 is mounted in this can also, and should be measured to prove that it is not shorted. This could be the cause of the fault. However, it is not often that this is the case and the transformer should be carefully examined for blackened turns and measured; the readings should conform with those given in the circuit diagram. If shorted turns are not discovered here, make a quick check-of all the resistors mentioned earlier, and if they prove blameless, there is nothing

**Shorted Transformer**

A high voltage that suddenly appears at the grid and cathode of the EL38 is due to a primary-to-secondary short in this transformer. Turning to the frame timebase, the only "usual" trouble is the condenser marked with a star in the linearity circuit going O.C. This causes a large area of well spaced out lines with a criss-cross pattern covering the top half or more of the raster. The normal raster being completely lost. The frame output valve (self-oscillating) is the EL42 which is the lower of the three valves on the left side of the chassis. The other two being the EF42 line and frame sync-separators. If the raster closes to a narrow band which occasionally jumps to a full scan and down again the trouble is almost certainly the tag panel carrying the linearity components. However, these components should be tested before the purchase of a new transformer is considered as this again is an expensive item. A faint picture can usually be traced to a defective crystal diode video detector which may be swapped for the interference limiter to prove the point.



Figs. 4 and 5.—The focus circuit of the T.138. The 129 is modified both in circuit and values. On the right is the video detector, vision limiter and R1. The video anode load resistor is 6.8 K $\Omega$

Both are B.T.H. C.G.I.C's and are readily obtained from the columns of PRACTICAL TELEVISION advertisers. Access is obtained by removing the screening plate from over the right-hand side of the vision and sound strip. When this plate is off the video anode load resistor should be measured as this often drops in value giving a weak picture and unsteady sync—refer to Fig. 5 to check all these points.

If it is necessary to remove the tube for servicing the three screws which compress a rubber band on the neck of the tube must be loosened before the tube is removed.

E.H.T. is supplied from an R.F. unit on the power pack chassis, and lack of E.H.T. can be due to the following points. Leaky .001  $\mu$ F E.H.T. smoothing condenser, defective EY51, low emission EL33 oscillator and an

unusual yet common fault on these sets is an O.C. heater winding on the R.F. transformer. This winding is at the base of the coil unit and, of course, supplies the heater of the EY51. If it is unduly of a greenish colour, its continuity should be tested and if defective, the winding removed, measured and replaced with a wire of the same gauge and insulation. The length is about 36in. I said unusual, yet common, and by this I mean that this fault is not normally found in the general run of sets, but is common on this model. I have heard that this fault doesn't happen but in my experience on the 138 and 129, it certainly does. An out of focus picture with a narrow band of focus which moves up and down the screen as the control is rotated indicates that one section of the GZ32 rectifier is defective, probably the heater is O.C., that is, half-waving.

#### Focus

Focus that is only just achieved at the end of the rotation of the control is due to one of the focus resistors going O.C. (see diagram). If these are O.K. the fault may be due to an incorrect voltage tapping on the selector panel or a low H.T. line; test GZ32.

#### Ferranti 1205 and Series

Several versions were made in table and console types, with or without radio, and for different channels. They may be identified by the up-ended vision and sound strip at the rear (EF80s). These are

very reliable sets but have a "usual" fault which almost invariably happens.

It shows itself by a "No picture, no E.H.T., no line timebase." It is due to the screen dropping resistor of the EL38 line output valve going O.C. It may go "high" first, resulting in a width which varies constantly. The resistor is a 5.6 K $\Omega$  8 watt type, and when the chassis is up-ended it cannot be missed by virtue of its size, "shedded white" appearance, and position (very accessible). It should be replaced by a 5.6 K $\Omega$  10 watt resistor, or a number of 3 watt resistors bunched together to give the right value and adequate wattage. For example, four 3 watt 22 K $\Omega$  with their ends twisted, will give permanent service, and there is room for them in this position. A raster which does not reach the edges of the mask is due to a failing H.T. metal rectifier, and a replacement assembly should be obtained from any Ferranti dealer and involves fitting a bracket on the metal strip which carries the mains plug, and extending the leads from the original position. The voltage selector plug should be checked to ensure that it is on the correct tapping.

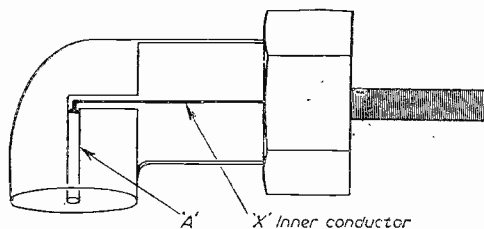
#### Fading

A fading picture and/or sound is usually due to the EF80's on the rear strip becoming loose in their sockets, and the pins should be slightly widened (carefully, so as not to crack the glass base) and refitted. This condition is more common on this model due to these valves being mounted on their sides.

## An Improved Pye Connector

NO doubt many experimenters have found when using Pye connectors with coaxial cable that there is a tendency for the inner conductor to break off after a period of use, especially if the lead has to be frequently transferred from one socket to another.

The trouble is due to the inner lead, shown X in the diagram, which is usually very short, snapping off



The arrangement for wiring a Pye connector.

due to the slight up and down movement of A when the plug is inserted and withdrawn from the socket.

The author has found that by stripping off the metal braiding and insulating material from the large nut to the grub screw leaving only the bare inner conductor wire (see X in diagram) there is more freedom of movement for that wire and, therefore, much less likelihood of the lead snapping off inside the plug. The bare inner conductor wire can be covered with a small piece of pliable sleeving, if desired, but providing there is no surplus wire there should not be any danger of the wire shorting to the inside of the metal plug, as there is ample

clearance, and the up and down movement is only slight.

It is also a good plan to bind some insulating tape around the nut and cable or, better still, use one of the special clips which can be obtained for this purpose—P. DODSON.

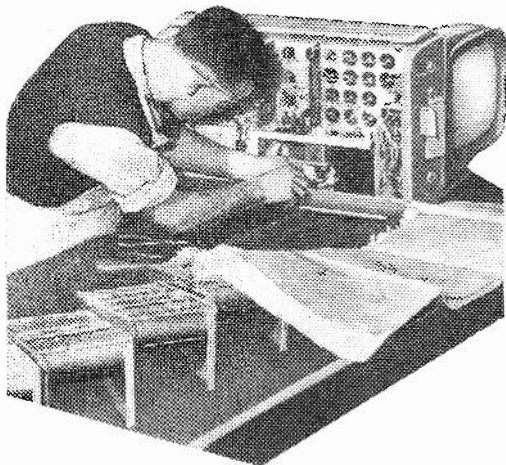
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# PAGES FROM A TELEVISION ENGINEER'S NOTEBOOK



## 23.—OSCILLOSCOPES

the possession of which would, in many cases, cut time and trouble for them in the repair and adjustment of television receivers or, for that matter, ordinary broadcast receivers and amplifiers.

The following notes deal with the general design details of a small, compact oscilloscope which will adequately cover the requirements of TV servicing and which can be constructed for a matter of some ten pounds or so, using new parts throughout. The general scheme will be covered, leaving the actual form of layout to the builder.

### General Design

The complete instrument can be conveniently divided into three main units, as can most oscilloscope designs: the tube network and power supply system, the vertical amplifier and the timebase.

The tube suggested for use is the 2½in. DG7-5 Mullard, although the ECR30 may be substituted without a lot of modification, the latter being obtainable in ex-Government gear. The E.H.T. requirements of either tube are small and readily obtained without special transformers; the overall tube lengths are less than 8in. and the problems of screening

**T**HE oscilloscope is an indispensable piece of gear for the television experimenter and serviceman, but many of the published designs are so complicated with gadgets and specialised circuitry that the task of building such an instrument is little short of the work involved on a complete televisor. For this reason many amateur constructors and part-time servicemen carry on without the aid of an instrument,

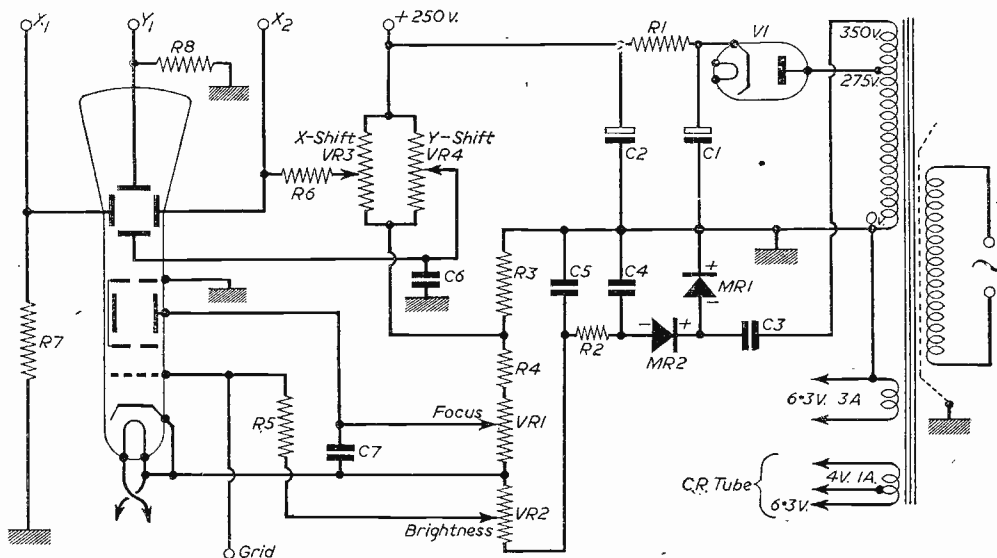
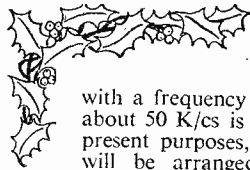


Fig. 1.—The power unit and tube supplies. All resistors are ½ watt unless marked otherwise. MR1 and MR2 are rated about 400 v. 1 mA.

### LIST OF PARTS FOR FIG. 1

- |                       |                        |                        |                    |
|-----------------------|------------------------|------------------------|--------------------|
| C1—32 $\mu$ F 350 v.  | C6—.05 $\mu$ F 350 v.  | R4—470 K $\Omega$ 1 w. | VR1—1 M $\Omega$   |
| C2—32 $\mu$ F 350 v.  | C7—.05 $\mu$ F 350 v.  | R5—100 K $\Omega$      | VR2—100 K $\Omega$ |
| C3—0.5 $\mu$ F 500 v. | R1—2.2 K $\Omega$ 6 w. | R6—2.2 M $\Omega$      | VR3—2 M $\Omega$   |
| C4—0.5 $\mu$ F 1 Kv.  | R2—100 K $\Omega$      | R7—2.2 M $\Omega$      | VR4—2 M $\Omega$   |
| C5—0.5 $\mu$ F 1 Kv.  | R3—330 K $\Omega$ 1 w. | R8—2.2 M $\Omega$      |                    |

All resistors are ½ w. unless marked otherwise. MR1 MR2.—Metal rectifiers rated about 400 v. 1 mA.



associated with larger oscilloscope tubes do not, with care, exist.

A simple timebase with a frequency range of some 5 cycles to about 50 K/c/s is normally adequate for the present purposes, and in these design notes will be arranged to provide a push-pull deflection to the X-plates, thus avoiding defocusing at the extremities of the trace.

For vertical deflections, a Y-amplifier is used having adjustable gain over two bandwidth ranges. First, a

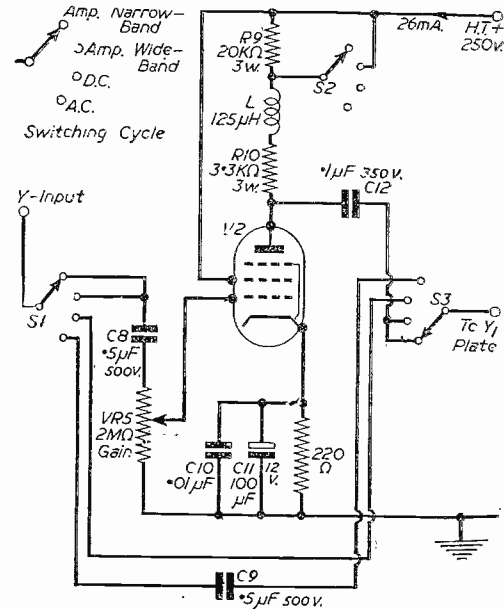


Fig. 2.—The amplifier and input switching circuit.

gain of about 80 times for a bandwidth (to 6 db points) of 20 c.p.s. to 200 Kc/s, and second, a gain of 18 times for a bandwidth of 20 cps to 2.5 Mc/s.

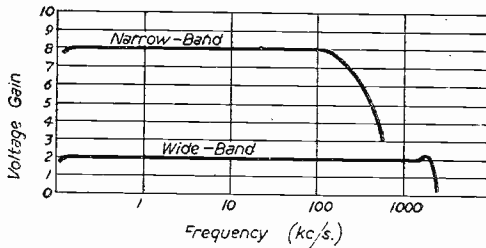


Fig. 3.—Graph showing the frequency response curves.

An E.H.T. supply of 800 volts for either tube final anode and a 250-volt supply for the time-base and amplifier H.T. rail is obtained from a single mains transformer overwound to provide the E.H.T. input to a voltage-doubler rectifier circuit.

These sections will now be discussed in turn.

**Power Supplies**

The circuit for this is shown in Fig. 1. The

mains transformer has a 275-volt point which is rectified by V<sub>1</sub> (6X5) and smoothed by R<sub>1</sub> and C<sub>1</sub>.

C<sub>2</sub> to provide about 250 volts at 40 mA for the timebase and amplifier supplies. An overwind of 350 volts is rectified and doubled by metal rectifiers MR<sub>1</sub> and MR<sub>2</sub> to provide about 800 volts tube supply. This is smoothed in the usual way and fed across a bleeder and divider network of R<sub>2</sub>, R<sub>3</sub>, VR<sub>1</sub> and VR<sub>2</sub>. The focus and brightness controls operate in the usual way and shift controls for both X- and Y-deflections are wired across points positive and negative with respect to chassis.

The focusing anode requirements of the ECR30 are different from those of the DG7-5, the former being about 150 volts for focus, while the latter is about 250 volts. The range of the focus control in the suggested circuit will cover both tubes, but if the proper focus point should occur at an extreme of the slider, a change in resistor values on either side will correct.

The outlet points marked X<sub>1</sub>, X<sub>2</sub>, Y<sub>1</sub> and G will, of course, connect up with similar points on the other

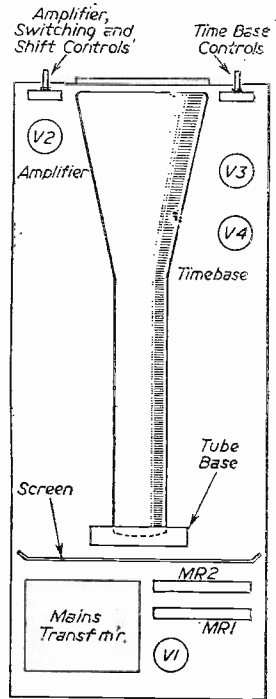
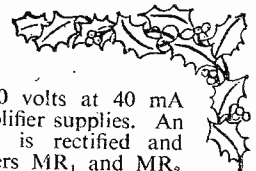


Fig. 4.—A suggested layout for the oscilloscope. This is not to scale.

units as they are described.

**Vertical Amplifier**

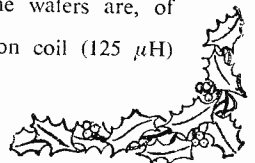
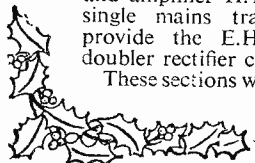
The circuit for this is shown in Fig. 2, where a single video-type pentode is used in an anode-compensated stage. The valve V<sub>2</sub> is a Brimar 6CH6, and the load is switched together with the input to provide the two alternate gain-bandwidth conditions.

The input switch S<sub>1</sub> selects Y-inputs, either direct in D.C. or A.C. coupling, the amplifier then being by-passed or amplified, narrow or wide band. The anode switch and output switch, S<sub>2</sub> and S<sub>3</sub> respectively, select the load and actual plate connections to the tube. The wafers are, of course, ganged.

Details of the correction coil (125 µH) will be given later.

The response curves of this amplifier are given in Fig. 3.

(To be continued)



# Surplus Time-base Valves

DETAILS OF EX-GOVERNMENT THYRATRONS, ETC.

By E. G. Bulley

VALVES suitable for use in timebases are available at very reasonable cost. They are, in fact, grid controlled gas filled triodes, the gas being in most cases mercury vapour although types other than surplus contain gases such as Xenon, etc. The principal application of such valves is the control of circuits by the variation of the grid potential of the valve. However, it is as well to mention that once the discharge has commenced inside the valve, it cannot be cut off except by the reduction of the applied anode voltage. There again the discharge will not cease unless the anode voltage is reduced below the ionisation value of the gas filling.

As in the case of gas filled rectifiers, it is necessary

condenser C1 via a resistance R. In other words, a condenser is allowed to charge from a fairly high voltage source through a resistance. The gas discharge valve is connected across the condenser, the valve having a small negative bias voltage applied to it. Now, as and when the anode voltage reaches a determined value, the valve will conduct.

The conducting voltage is usually small compared with the supply voltage. This ensures that any departure from linearity is likewise small. The bias voltage on the valve actually determines the voltage at which the discharge valve will strike, or to clarify it still further, the voltage at which the gas will ionise and the valve conduct.

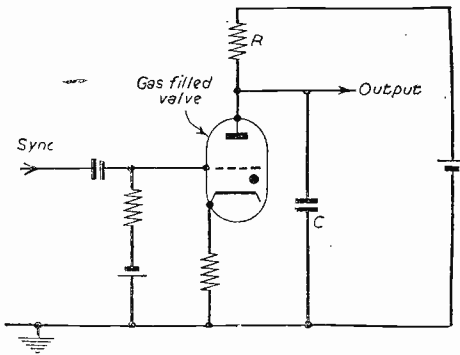


Fig. 1.—Basic circuit for a gas-filled valve.

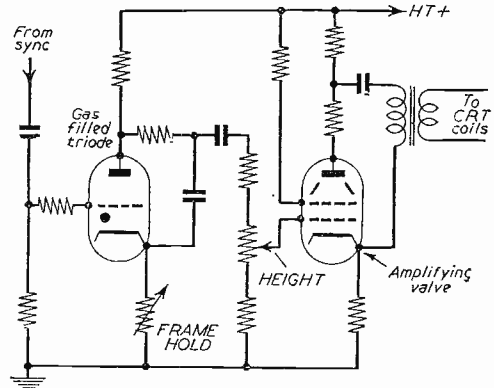


Fig. 2.—Basic frame timebase as used in TV receivers.

to mount the valves in well ventilated positions, thus preventing unwanted temperature rise during operation, which in turn would affect the operating characteristics of the valve. Fig. 1 shows a basic circuit in which a gas filled triode is used. This is the most common method of producing a saw-tooth waveform.

### How they Work

To appreciate this more fully, the reader will, by referring to the diagram, understand the following explanation. A positive potential is applied to the

Referring again to Fig. 1, the reader will appreciate that when the voltage is applied to the anode, the voltage across the condenser C1 rises, and thereby absorbs its charge through the resistance R until the breakdown occurs within the valve. That is to say the gas in the valve ionises. When this occurs, however, the internal resistance of the valve falls, and in so doing the condenser discharges.

As the voltage across the valve falls, the valve ceases to function, in other words it is "cut off" and thereby offers once again a high resistance, and the

Type	V.F.	I.F.	Max Va	Max Pk Ia	Control Ratio	Voltage Drop	Base	Pins									
								1	2	3	4	5	6	7	8	TC	
NGT2	4	1.4	500	1.0 amp.	28	16	B5	A	G	H	H	C	—	—	—	—	—
VGT128	4	1.4	500	1.0 amp.	28	16	B5	A	G	H	H	C	—	—	—	—	—
VT189	4	1.4	500	1.0 amp.	28	16	B5	A	G	H	H	C	—	—	—	—	—
VGT121	4	1.5	400	500 mA	20	70	M.O	A	C	A	H	H	—	—	—	—	—
VGT121A	4	1.5	400	500 mA	20	70	M.O	A	C	A	H	H	M	—	—	H	C
*884(CV647)	6.3	0.6	300	300 mA	—	16	IO	A	M	H	A	A	—	—	—	—	—
*VT222	6.3	0.6	300	300 mA	—	16	IO	A	M	H	A	A	—	—	—	—	—
*885(CV648)	2.5	1.4	300	300 mA	—	16	UX5	M	H	A	A	C	—	—	—	—	—
CV3723	4	1.5	400	500 mA	20	16	M.O	A	C	A	G	C	H	—	—	M	—
NGT1	4	1.75	350	1.0 amp.	40	—	B5	—	G	A	H	—	H	—	—	—	A

\*American Types.

condenser once more charges up through the resistor and the cycle then repeats itself.

As a point of interest, the relationship between

### TV Uses

These gas filled valves are useful in frame and line timebases of television receivers as well as "sweep" generators in oscilloscopes. In the former case, such valves are used in conjunction with an amplifying valve, to ensure a complete sweep or full deflection of the cathode ray tube screen. A typical frame timebase is shown in Fig. 2 in which the amplifying valve is also shown, this being a beam tetrode.

Fig. 3 is a typical timebase as used in oscilloscope practice, this too has an amplifying valve, although in some cases, this may not be necessary.

Many oscilloscopes adopt a method whereby a condenser is charged through a pentode, the latter acting as a constant current device, and periodically discharged by the gas filled valve. In this case, however, the frequency of the charge is controlled by the impedance of the pentode.

Valves suitable for such timebases are shown in Table I.

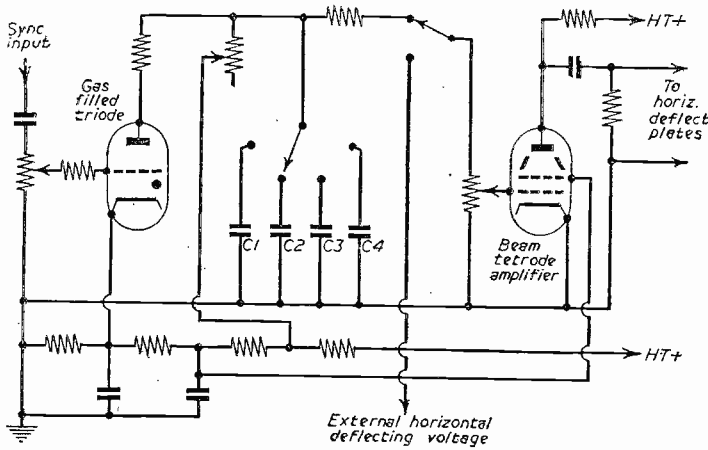


Fig. 3.—Basic circuit for a linear timebase for an oscilloscope.

the grid voltage and the anode voltage is known as the control ratio and is an important characteristic.

## 50th Anniversary of the Valve

SIR AMBROSE FLEMING, whose birthday anniversary was on November 28th, reporting on his experiments in a personal letter to Marconi, remarked in conclusion, "I have not mentioned this to anyone yet as it may become very useful."

Recalling the results of experiments which he had made some years before when associated with the original Edison Electric Light Co., of London, Fleming saw that in them lay a possible solution of his problem. These investigations had concerned the passage of electric currents through rarefied gases. It had been noted that if two electrodes were separated in a partial vacuum and one of them, such as a carbon filament, was made hot, current would flow across the space between them provided that the potential of the cold electrode was made positive in relation to that of the hot one. If the polarities of the electrodes were reversed no ordinary voltage would cause any current to flow at all.

Nothing was known of electrons in those days, and it had been assumed that the current was conveyed by particles of negatively charged carbon thrown off from the incandescent filament. In 1899, however, Sir J. J. Thomson had proved that it was, in fact, particles of "disembodied electricity."

Fleming connected up one of his old experimental bulbs, with its hot and cold electrodes, in a receiver circuit using a mirror galvanometer as an indicator. At the other side of the room he pressed the key of his little spark transmitter and the spot of light reflected from the mirror of his galvanometer leapt across the scale to proclaim the immediate success of the first wireless valve. That was in November, 1904.

Sir Ambrose Fleming, F.R.S., was born near Lancaster on November 29th, 1849. He was brought

to London at the age of five years. At 14 he went to University College School, which was then conducted in a wing of the College in Gower Street. Decided on engineering as a career, at age of 17, and worked for B.Sc. degree in the University of London by private evening study while helping to maintain himself by taking a post as clerk on the Stock Exchange. He was one of the only two in the First Class in the degree list of 1870, when not quite 21 years old. Took post of Science Master at Rossall College, and, after 18 months, entered the Science Schools just established in South Kensington, studying for three years under Dr. Frankland. Helped in formation of the Physical Society to which he read its first paper. After a short period as Science Master at Cheltenham College he won a scholarship to St. John's College, Cambridge, in 1877, and studied there under Clerk Maxwell. In 1881 he was appointed Professor of Physics and Mathematics at University College, Nottingham, soon, however taking a post as scientific adviser to the Edison Electric Light Company. In this capacity he conducted the investigations to which he reverted when seeking a detector of H.F. currents some 12 years later in the service of Marconi's Wireless Telegraph Company, Ltd., to which he was appointed scientific adviser in 1899.

In his position at University College he trained many hundreds of engineers, who later made their names in the radio industry and his many public lectures on scientific subjects held the interest of thousands. He continued to lecture until nearly 90 years of age, when he still displayed the wonderful energy and enthusiasm which had held his audiences spellbound throughout his career.

He died aged 96 on April 18th, 1945, at Sidmouth.



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6A3B	7/6	6V6G	7/6
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6BB6	8/-	6X5GT	7/6
6C4	8/-	7B7	8/6
6C5GT	7/6	7C5	8/6
6C6	6/6	7C6	8/6
6C9	8/-	7H7	8/6
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384	8/6	956	3/6
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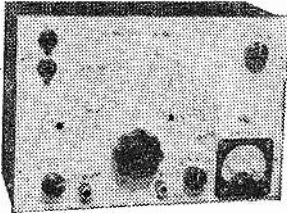
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crackle finished case and white panel. £4.19.6, or 34/- deposit and 3 monthly payments 25/- P. & P. 4/- extra.

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# THE 5CP1 C.R.T.

SOME DETAILS ON THE USE OF THIS TUBE FOR TV

**T**HERE has recently been a fresh release of the Loran Indicator Unit APN4 which contains, besides a veritable host of useful components and nearly 30 valves, a very useful C.R.T., the 5CP1. The tube is of short persistence and will provide a brilliant picture.

The tube has a screen diameter of slightly over 5 inches and has the following characteristics:

- Heater volts 6.3.
- Heater current 0.6A.
- V<sub>A1</sub> 575 v.
- V<sub>A2</sub> 2,000 max.
- V<sub>A3</sub> 4,000 max.
- Volts grid 60 v. negative cut-off voltage.
- The deflection sensitivities are as follows:
- X plates 0.28 mm/v., Y plates 0.32 mm/v.

It is not necessary to apply the full final anode voltage and it will be found that the tube will give a sufficiently brilliant picture when used with a standard type of E.H.T. transformer giving 2.5 kV output such as is available at the present time.

A suitable circuit for the E.H.T. network is given in Fig. 1. All the resistances are of 1 watt rating and should be mounted in stagger formation on a paxolin panel-well insulated from the chassis.

Four shift controls are provided which give a very good control over the raster and assist to stabilise the picture.

Focusing is obtained by the potentiometer VR5 and it will be found that a very fine degree of focus can be obtained, the lines standing out very clearly.

Brilliance is controlled in the usual manner by varying the cathode potential. It is intended that the tube be used with the standard form of timebase employing ex-Gov. tubes; most of these circuits are given a phase splitting stage where the picture signal is taken from the cathode of the phase splitter valve. By this means the grid is almost at earth potential and very high voltages on the cathode are thereby avoided.

It is recommended that the heater be strapped to the cathode so as to reduce the effects of hum. If trouble with hum is experienced then try strapping the cathode to the other side of the heater.

The base of the 14 pin type and the holder is available with the unit. The intensifier anode is brought out to a side terminal on the tube and connection is made from this point to the highest point of potential in the E.H.T. chain.

Note that the shift controls are

at quite a high potential and they should therefore be mounted on a paxolin panel well insulated from the chassis; this will avoid the possibility of breakdown due to leakage through the slider to the spindle.

Insulated knobs should be employed with all the controls.

The X plates are brought out to pins 7 and 8 and the Y plates to pins 10 and 11. Should the picture be found reversed from left to right then all that is necessary is to reverse the leads on pins 7 and 8 connecting the deflector plates to the timebase; similarly, if the picture should appear upside down then simply reverse pins 10 and 11.

E.H.T. is shown with the negative earthed and the coupling condensers to the timebase will therefore have to be of the high-voltage type. Note that where metal-cased coupling condensers are used, the can must be fully insulated from the chassis. It is better, in these cases, to take the can to the timebase and to connect the highly insulated terminal to the C.R.T. network side. When this is done the insulation of the can will have to withstand only the timebase voltage.

### Power Supply

A suitable circuit for the power supply is given in Fig. 2. It is a standard circuit using half-wave rectification and a resistor in the smoothing circuit.

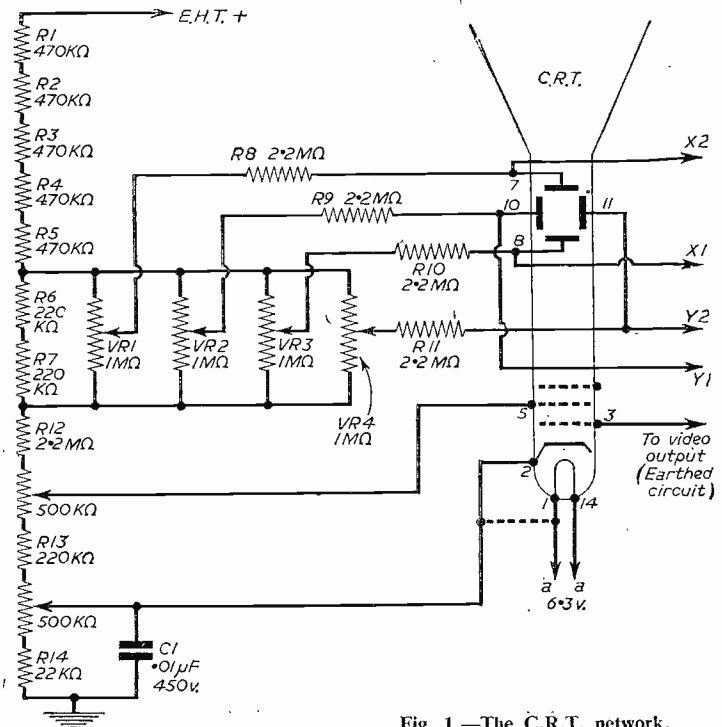


Fig. 1.—The C.R.T. network.

The smoothing and reservoir condensers can be of the metal-cased type and in this case the outer can can be connected to the chassis.

There is some shortage of high-voltage condensers of this type and it is possible to obtain an E.H.T. voltage which is quite satisfactory by employing two 0.03  $\mu$ F 2.5 kV in parallel with each other.

The rectifier valve can be an ex-Gov. type of 4 v. or 2 v. rating, but it is important that the heater be connected to the heater winding which is fully insulated for the 2.5 kV. Most of the transformers of this grade have been designed for the VCR97,

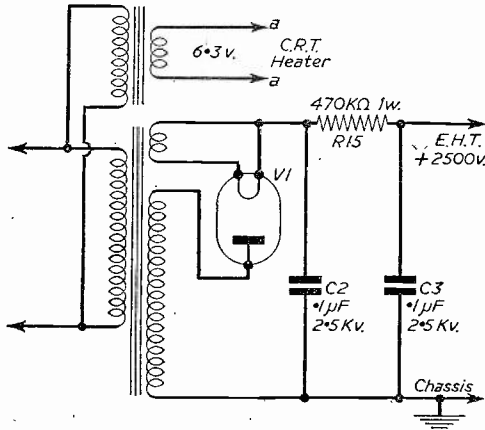


Fig. 2.—The power supply.

which is a 4 v. valve; they have, therefore, two heater windings, and it is the highly insulated winding which should be used for the rectifier.

If it is not possible to use a separate heater transformer for the tube, then the strap between cathode and heater must be omitted as one side of the normal heater chain in the timebase is earthed.

The E.H.T. transformer does not provide a 6.3 v. winding for the 5CP1.

#### Setting Up

The complete C.R.T. network and power supply can be wired up and tested independently from the timebase. When this is done the grid (pin 3) should be connected to chassis via a resistance of about 3.3 k half-watt rating. Do not under any circumstances apply the power without the grid being so earthed.

After allowing time for warming up, the brilliance should be adjusted until a spot appears on the screen. Do not allow the spot to be too brilliant or the screen will be burned.

Adjustment of the focus control should allow the spot to be brought from a blurred position through to a fine spot and then to a blurred spot again. Normally the focus is set for the finest spot possible, but during the preliminary tests it is as well to allow it to be blurred so as to reduce the possibility of burning the screen.

Operation of the brilliance should enable the spot to be completely faded out.

The final operation is to set the four shift controls so that the spot is central on the screen.

#### Layout

The layout of the components is not particular,

provided due attention is paid to insulation of the various high potential points as mentioned previously. The positioning of the mains transformer is rather important as it can affect the scan. The best position is behind the tube.

If it is found that a spot cannot be made to appear round, but has a "tail" like a comet, then it is probable that hum is affecting the spot directly from the transformer and the remedy is simply to fit the transformer in another position.

## Semi-conductor Research

ALTHOUGH only recently opened, the new G.E.C. semi-conductor laboratories are already achieving their object of extending the company's first-class facilities for concentrated research into all aspects of semi-conductors.

It is not easy to find a really satisfactory definition of these materials; they have been variously described as "conducting electricity much less well than metals, but far better than insulators," "having electrical conductivity that increases with temperature" and "conducting electricity by reason of the impurities they contain." None of these definitions is by any means perfect but together they give some idea of the interesting properties that characterise semi-conductors.

The practical uses of these materials in the radio frequency ranges date back to the crystal detector which was extensively used in the earliest days of radio but almost forgotten after the rapid development of the thermionic valve. The rebirth of semi-conductor devices came in 1940 when the silicon crystal diode was used as a mixer or frequency changer in almost all ultra-high-frequency radar equipment. The G.E.C. was an active participant in this field and, some time later, in the development of the germanium point contact diode which is now used in communications and other equipment.

Tremendous impetus was given to the study of semi-conductors by the discovery of the transistor in 1948. Bardeen and Brattain, of the Bell Telephone Laboratories, found that a triode amplifier could be made by arranging two point contacts close together on a small slab of germanium. While the full implications of this discovery have yet to be realised, its great importance was immediately apparent. About two years later, another milestone was reached with the discovery of the p-n junction rectifier. Essentially, this consists of a block of germanium, one part of which has an excess of p-type impurities (atoms that will accept electrons) and the other an excess of n-type impurities (atoms that will donate electrons). The potential barrier set up at the junction allows current to flow more easily in one direction than the other, giving a rectifying effect. Yet another device, the junction triode, was developed shortly afterwards. This can take many forms, but is basically a sandwich in which a thin n-type layer separates two p-type regions, or vice-versa. Such p-n-p or n-p-n triodes are capable of very efficient amplification.

The G.E.C. was quick to appreciate the manifold possibilities of all these devices and their refinements. It was clear that they would have a profound effect on many of the Company's widespread activities. The advantages of the new devices have been enumerated many times: long life, ruggedness, small size, low power consumption, etc.

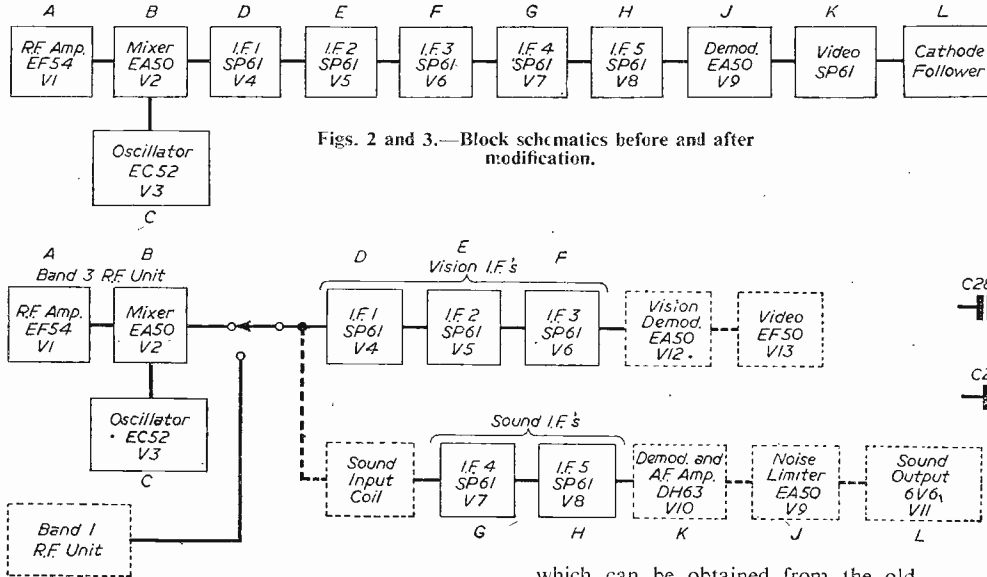


R.F. unit to the other. Heater supplies are permanently connected to both R.F. units.

**Modifications**

After removing the chassis from its case, the next step is to remove all unwanted items. The front panel should be removed complete with

removed. The front panel should be replaced by an aluminium one long enough to include the new R.F. unit fitted on the side of the chassis. The panel should be wide enough to accommodate the main controls (Contrast, Brilliance, Volume and Waveband) above the existing tuning controls. The three tuning dials are easily fitted to the new panel. Each dial needs a round hole and a slot, the dimensions of



the test panel and jacks, and all wiring associated with the items on the panel should also be completely

**RESISTOR VALUES**

1—100 k	31—27 ohms
2—22 k	32—100 ohms
3—470 ohms	33—1 k
4—6.8 k	34—10 k
5—100 ohms	35—10 k
6—22 k	36—27 ohms
7—22 k	37—100 ohms
8—1 k	38—4.7 k
9—68 k	39—220 ohms
10—4.7 k	40—220 k
11—470 ohms	41—100 k
12—220 ohms	42—1 k
13—5.6 k	43—10 k
14—2.2 M	44—27 ohms
15—100 k	45—100 ohms
16—470 ohms	46—1 k
17—5.6 k	47—10 k
18—22 k	48—27 ohms
19—1 k	49—100 ohms
20—22 k	50—33 k
21—2.2 k	51—150 k
22—1 k	52—1 Meg.
23—10 k	53—33 k
24—10 k	54—330 k
25—27 ohms	55—330 ohms
26—100 ohms	56—3.3 Meg
27—10 k	57—10 k
28—1 k	58—10 k
29—10 k	59—6.8 k
30—10 k	

NOTE—The values may differ slightly in different units.

which can be obtained from the old panel. It will be found in practice that the slots can be quite roughly cut without impairing the operation of the dials. The dimensions of the new panel are 13 in. by 6 in.

In one corner of the chassis is a 16+16  $\mu$ F capacitor which should be removed with its associated wiring. This provides space for fitting the video valve. When all the surplus wiring has been removed, the underside of the chassis will begin to look much clearer. A few "loose ends" of wiring will be lying about, mainly H.T. inputs to the I.F. cans. In the I.F. stages all the essential components such as decoupling resistors and capacitors, load resistors and coupling capacitors are inside the cans, and the only wire leading into each can which should be lying disconnected is the H.T. input, and should be connected to the appropriate H.T. point. Fig. 4 shows the wiring of the components in the cans, and it will be seen that in each can is an unnecessary capacitor C. This should be removed in each case. It serves no useful purpose, as its associated decoupling resistor has already been removed. In any case it only provides an additional fault liability.

**Sound and Vision**

It is now necessary to separate the sound and vision sections. The first four I.F. cans become the vision I.F. channel, and the two cans along the back of the

chassis become sound I.F.s. The wire from the top of the fourth can to the top cap of V7 should be removed and replaced by a wire through the bottom of the can to the vision demodulator (V12) which is fitted beneath the chassis.

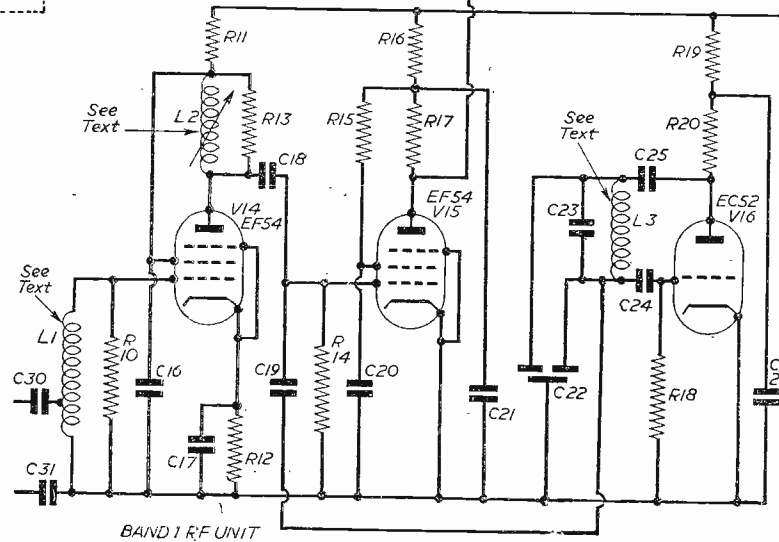
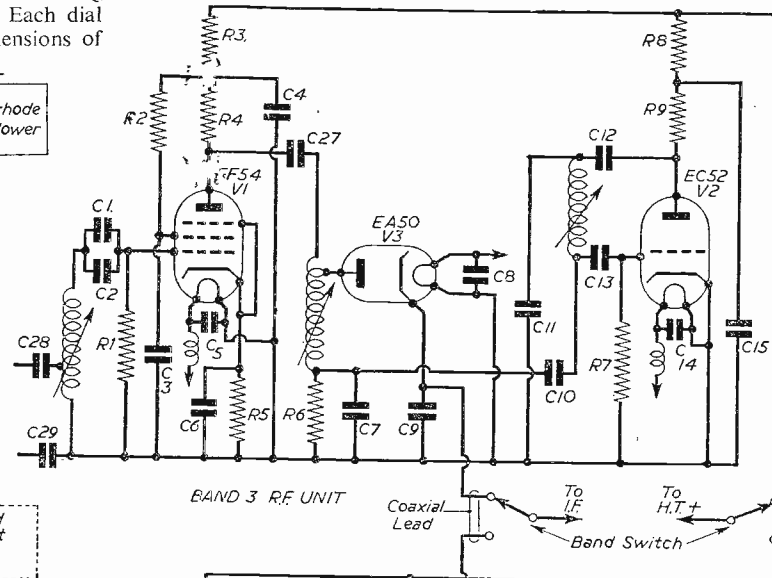


Fig. 5.—The Band I and Band III units.

**The Vision Demodulator (EA50)**

A small bracket should be made to carry the EA50 valveholder to the inside of the chassis. A position will be found on the side of the chassis which will keep the wire from the last vision I.F. can quite short. The demodulator filter (L4 and C42) and load resistor (R38) are mounted close to the EA50.

**The Video Stage (V13, EF50)**

The hole left in the chassis by the removal of the

**CAPACITOR VALUES**

1—3 pF	34—.001 $\mu$ F
2—3 pF	35—200 pF
3—47 pF	36—200 pF
4—47 pF	37—.001 $\mu$ F
5—100 pF	38—200 pF
6—47 pF	39—200 pF
7—15 pF	40—.001 $\mu$ F
8—100 pF	41—200 pF
9—4 pF	42—10 pF
10—3 pF	43—.1 $\mu$ F
11—3 pF	44—25 $\mu$ F
12—47 pF	45—.1 $\mu$ F
13—10 pF	46—.1 $\mu$ F
14—100 pF	47—.1 $\mu$ F
15—47 pF	48—100 pF
16—.1 $\mu$ F	49—200 pF
17—.1 $\mu$ F	50—.1 $\mu$ F
18—200 pF	51—200 pF
19—3 pF	52—.001 $\mu$ F
20—.1 $\mu$ F	53—.1 $\mu$ F
21—.1 $\mu$ F	54—See text.
22—25+25 split stator	55—200 pF
23—15 pF	56—200 pF
24—50 pF	57—.001 $\mu$ F
25—500 pF	58—See text.
26—.1 $\mu$ F	59—100 pF
27—4 pF	60—.03 $\mu$ F
28—100 pF	61—.001 $\mu$ F
29—100 pF	62—.03 $\mu$ F
30—100 pF	63—200 pF
31—100 pF	VR1—1,000 ohms
32—3 pF	VR2—1 Meg.
33—200 pF	

NOTE.—The values may differ slightly in different units.

16+16  $\mu$ F capacitor should be filled in with a small aluminium plate. In this plate should be cut a hole

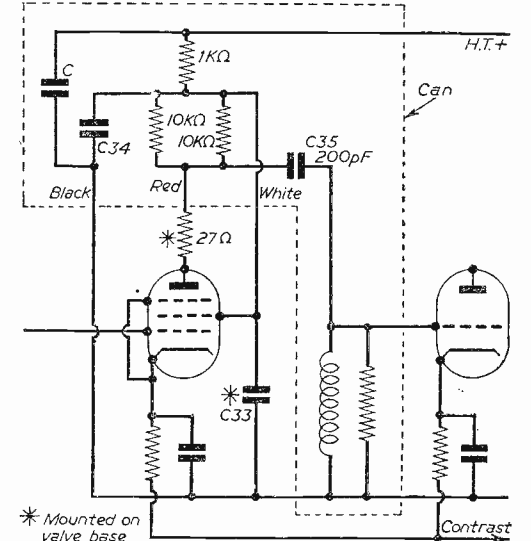


Fig. 4.—Details of the wiring in the cans.

to accommodate the nine-pin valve base. There is space underneath the chassis to fit the video stage components (L5, R59). If the timebase chassis is alongside the main chassis, these two components can be fitted on to the timebase chassis in close proximity to V13.

(To be continued)

# BBC v. I.T.A.

A SUMMARY OF THE EFFECTS OF INTRODUCING A RIVAL TV SERVICE

By "Q"

THERE is a sense of surprise that what has so long been promised is here at last. The Television Bill has become an Act, the members of the controlling body appointed, and by the time these words are published we shall know who the programme contractors are to be. It is not expected that commercial television will make its bow before September, 1955, and it needs every minute of the intervening time to prepare.

The future invites speculation. How will the BBC prepare to repel the onslaught of the newcomers attempting to establish themselves upon its hitherto inviolate preserves?

What can the I.T.A. give that the BBC cannot offer? Will the viewers benefit from the coming struggle and, if so, how?

Commercial television starts with two advantages. It knows what the BBC can do, and, presumably, will have bigger financial resources—otherwise it had better not start at all. The crude fact is that a programme costing twice as much as another will not necessarily be twice as good, but will usually be better to some degree. The programme contractors of the I.T.A. will obviously exert themselves from the start to provide greater attractions than the BBC can offer, such as flying Hollywood stars here, with all the accompanying ballyhoo inseparable from such occasions.

## The Money Question

The breaking of the BBC monopoly will have a profound effect in many quarters. An example which comes to mind is the Derby. At present the authorities there consider the terms offered by the BBC to be inadequate and therefore refuse them. As a consequence this great event is not televised. A safe prophecy is that in future it will be seen, because commercial television will be ready and anxious to pay an adequate sum for the rights, even though in this case it may have to share its transmission with the BBC. The power of the long purse will be felt in many directions, particularly in the early months, in order to make BBC viewers feel a sense of loss that they, too, are not able to participate in the feast.

The BBC will not be able to stand still against this formidable opposition. In its turn it will be forced to fight to keep its customers. It will become increasingly conscious that a single dull item in an evening may cause a viewer to "see what's happening on the other programme," and once there he will probably stay.

Although on the whole the coming competition will make for better programmes, it is far from being an unmixed blessing. There have been several programmes by the monopolistic BBC which at first were not too promising, but which, lacking an alternative, viewers watched and learned to enjoy. "Animal, Vegetable or Mineral?" was one such programme which at first had only a limited appeal

and was slated by some critics, who, incidentally, subsequently conveniently forgot their comments. Under the competitive system it is to be expected that programmes such as this will be nursed to popularity? Will advertisers be prepared to spend money on subjects of limited appeal? Time will show.

The prevailing high standard of BBC plays will call for especial efforts if I.T.A. is to go one better. It is probable that they will seldom exceed an hour in length, which, after all, is not such a bad thing. They will also make a feature of starring actors who are world famous. This, in turn, does not mean that the acting will necessarily be any better than the existing high standard, but, the star system being what it is, a television play with Sir Laurence Olivier in the leading rôle will make many viewers watch him in preference to nearly anything the BBC can put up in opposition. It will mean that programmes such as these will usually be recorded on film so as to secure the services of the best actors who, because of their talents, are kept constantly employed in the theatre.

## Light Entertainment

It is in the realms of light entertainment that the greatest changes will be seen. At the present moment we are surfeited on the radio with many programmes dependent upon verbal flippancies and imbecilities in which the comedians act as human gramophones by reading, in their own styles, words which cleverer people than themselves have written for them. These same comedians achieve wide and easy renown on the radio and when on the strength of this spurious fame they appear on television, they often have little natural comedy of their own to offer. What went down so well before the non-paying invited audience in the radio programme will "die the death" in television unless supported by suitable funny situations. Some television comedians appear not to have the ability or the energy even to memorise their lines.

If the I.T.A. really means to do better than the BBC, then light entertainment is its great opportunity. Several things are needed. First, outstanding script-writers; this means money. Next, a comedian prepared to rehearse for several days with the seriousness of a straight actor; again this means money to secure and maintain his exclusive services. The ability of the producer and the technical staff must be high and this too will cost money. Yes, light entertainment is going to be a costly business, but no prophecy could be more certain of fulfilment than that this is the way the I.T.A. will attempt to coax viewers from the BBC.

A handsome reward awaits writers who can write superlatively well for television, particularly if they have the sense not to attempt to write too much. A weekly series is beyond the capacity of any man whose work must be original and fresh.

# Using the Responder Unit

HINTS ON ADAPTING A POPULAR EX-GOVERNMENT UNIT FOR

BAND I AND BAND III RECEPTION

By R. E. Jones

THE unit to be described appears to have more than one title, but it can be recognised by the three small tuning dials on the left of the front panel, the test panel on the right, and four jacks underneath (labelled R.F. input, output, power input and gain control).

The unit was obtained for 30s., but prices and stocks may vary in different parts of the country. As it stands it consists of a Band III R.F. unit as a small sub-chassis on the main chassis. The circuit line-up is as follows:—R.F. amplifier (EF54), oscillator (EC52), diode mixer (EA50), 5 I.F. amplifiers (SP61s), demodulator (EA50), video (SP61) and cathode follower (P61). The intermediate frequency is 13 Mc/s.

The physical layout of the chassis lends itself very well to modification into two separate I.F. channels, one for sound and one for vision. The first three I.F. stages (V4, V5, V6) are neatly and effectively screened, and form a good basis for the vision channel. The last two I.F. stages (V7 and V8) are not quite so well screened, but make a good sound channel. There is room on the unit for the extra components required for the conversion, with the possible exception of the sound output transformer. This component can be fitted to the outside of the chassis, but in the author's case it was fitted on to the adjacent timebase chassis in a position alongside the sound output valve. It could, of course, be fitted on the loudspeaker. Fig. 1 gives an idea of the layout after the main modifications have been carried out.

The block schematic diagrams (Figs. 2 and 3) represent the unit before and after conversion. It will be seen that items A to F are not affected by the modifications, G and H are modified for sound channel working, and J, K and L are completely rewired to form the audio stages. New components which have to be fitted include the vision demodulator (an EA50) and its associated components, the video valve and its associated components, and the sound input coil.

The R.F. unit, which covers Band III, is a sub-unit on the main chassis, and the question rose as to whether to modify it for Band I or to leave it *in situ* and fit an additional R.F. unit for Band I. Examination

of the existing R.F. unit indicated that the wiring was so neat and compact that modification to Band I would be a tricky and possibly untidy job. The valves used, however, would seem to be more suitable for Band I than Band III, particularly in view of the recent appearance of special valves for the higher frequencies. In the absence of any concrete data on the performance of this unit on Band III, it was finally decided to give it a trial if and when Band III transmissions take place. The issue was finally settled by the fact that the R.F. unit can be taken out completely and could, if necessary, be replaced by a completely new unit using more modern valves. The existing valves could then be used as spares for the Band I R.F. unit built alongside the existing chassis. This was eventually done, and switching of the two R.F. outputs was finally decided on. A suitable switch was found amongst surplus equipment. It consists of a Yaxley-type ganged to a toggle type. The Yaxley switch is used to switch the I.F. inputs to the appropriate mixer output, while the toggle switch diverts the H.T. from one

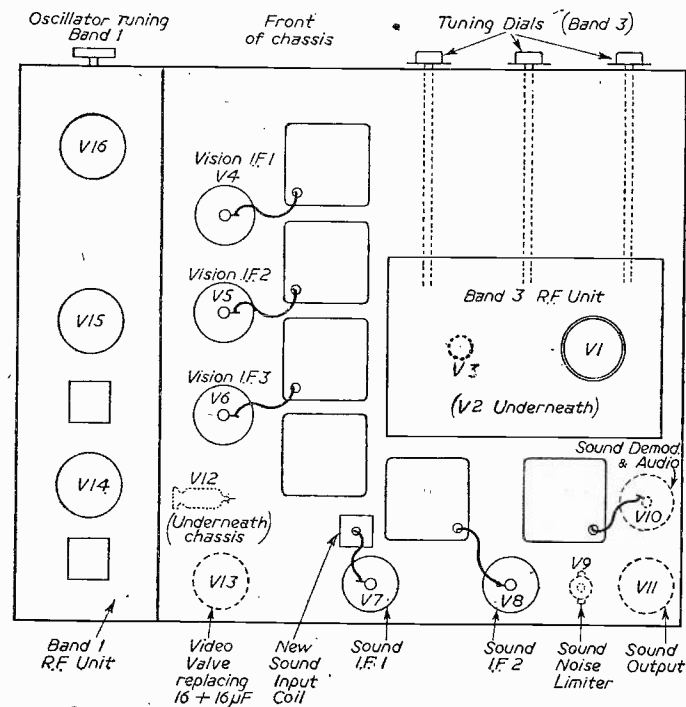
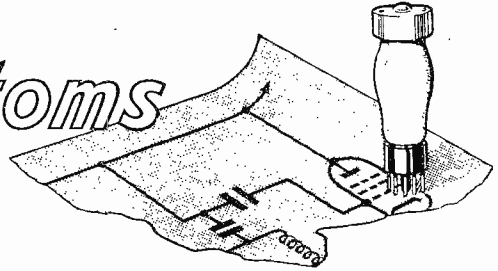


Fig. 1.—Layout after modification.

# Fault Symptoms



THE CAUSES OF COMMON FAULTS, AND METHODS OF CORRECTION

By Gordon J. King, A.M.I.P.R.E.

(Continued from page 272, November issue.)

AN appreciable reduction of valve reactance change with grid-bias voltage can also be achieved by introducing a degree of negative feed-back to the controlled stages. This scheme is adopted by the G.E.C. in their BT2147 series receivers, the relevant circuit details of which are shown in Fig. 73. As will be observed the N.F.B. is produced by the unbypassed 74 ohm resistors R1 and R2 in the cathode circuit.

Although the feed-back gives rise to a certain amount of gain degeneration, this is far outweighed by the advantage of a constant input reactance.

The control depicted is mainly from the sensitivity aspect, for in the G.E.C. series mentioned a separate contrast control varies the video drive between the vision detector and the video amplifier—very much like a conventional volume control.

The wiring arrangement of this system is illustrated by Fig. 74; V1 is the vision detector valve—sometimes a crystal diode is used—and R1 constitutes the detector load resistor. This being variable (a potentiometer) allows any desired amplitude of the rectified video signal to be tapped off and applied to the control-grid of the video amplifier valve.

As we have already seen (see "The Vision Detector," PRACTICAL TELEVISION, February, 1952) it is essential that the very-high-frequency components of the vision signal are not unduly attenuated in this section. This means, then, that the overall stray capacitance value must be kept as low as possible and precautions taken to ensure that additional shunt capacitance is not inadvertently introduced, for even a small value of wiring capacitance, for instance, will tend to attenuate the higher video frequencies with a consequent loss of picture definition. To assist in maintaining a good high-frequency response peaking inductors are generally included in the detector circuit.

It should be mentioned here that bias for the contrast control is not always provided by the cathode current of the associated valve; for example, in the Philips 385U series receivers a source of negative potential (relative to chassis) is produced across a resistor potential-divider network in the negative H.T. circuit. From this source a suitable negative potential is applied across a variable potentiometer, constituting the contrast control, and conveyed to the control grid of the sound and vision R.F. amplifier, and the first vision I.F. amplifier valves.

## Automatic Control of Contrast

Many current model receivers, particularly those incorporating facilities for two band operation, embody an automatic means of contrast control. In fringe areas such a feature can be of great advantage for, apart from minimising the number of disturbing trips from the comfortable arm-chair to the receiver contrast control and back again, it does tend to smooth out—in certain cases—the disconcerting flutter resulting from aircraft operating in the near vicinity.

Furthermore, Automatic Contrast Control, Automatic Gain Control (A.G.C.), or "Automatic Picture Control" (Pye, Ltd.), as the feature is some-

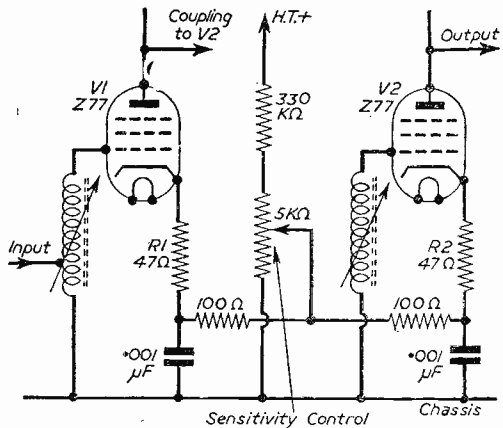


Fig. 73.—A two-stage gain control system used in G.E.C. BT2147 series receivers.

times known, will yield a certain assistance to viewers when more than one programme is available. For it is the aim of the designer of multi-band receivers to create a circuit that by the flick of a switch will change from one programme (station) to another—in the same or in a different band—without the necessity of making further circuit adjustments. A.G.C. will most certainly be a large contributory factor in this respect, for it is extremely unlikely that the local signal strength will be the same for all stations.

## The Pye System

Fig. 75 shows the A.G.C. circuit arrangement used in Pye V4 series receivers. It is in itself a most ingenious piece of circuitry which creates a suitable gain or contrast control bias for direct application to the vision

I.F. amplifier valve, and of a magnitude corresponding to the rectified amplitude of the vision signal. Its application thus tends to increase the gain of the I.F. amplifier stage should the vision signal fade, and reduce the stage gain as the signal strength rises.

On the face of it, one may be inclined to suppose that the action of the circuit is similar to a conventional "automatic volume control" system associated with broadcast receivers. The way in which the applied potential takes control of the stage

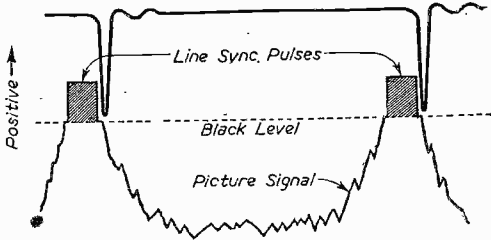


Fig. 76.—How the five microsecond black-level intervals of the picture signal are sampled to produce a positive waveform held to the signal black level.

gain is similar, but, as we shall see later, the method of deriving the controlling potential is entirely different.

In sound receivers it is quite in order to rectify the carrier signal and employ the potential so derived as a control bias. This method is not as efficient so far as the vision signal is concerned, however, for the fluctuating mean D.C. value of the carrier would tend to stabilise the overall white level of the picture.

To avoid this possible white level clamping, the Pye circuit makes use of the five microsecond black-level intervals which follow the line sync pulses. These being, of course, a portion of the received vision signal that provide a true indication of actual signal strength, as opposed to the composite signal strength and modulation level.

To understand how the black-level intervals are made to correspond to a control potential a close study of Fig. 76

is essential. V3 is simply a cathode follower energised by the video amplifier. The negative-going video output from the cathode of this valve is taken to the picture-tube cathode in the usual way, and the signal is also conveyed to the anode of diode V1(b).

This diode can be considered essentially as an electronic switch arranged to switch-on or conduct only during the black-level intervals following the line sync pulses; during the remainder of the vision signal the diode is held at cut-off to completely isolate the A.G.C. section from the video cathode follower.

The switching action of the diode is provoked by a large negative-going pulse derived from the line fly-back, and taken to the diode cathode through T1, R1, R2, and C1—let us call this pulse the "diode actuating pulse."

Since the line fly-back is initiated by the leading edge of a line sync pulse, the diode actuating pulse is bound to occur just a little after the commencement of the sync pulse. But since it is necessary for the diode switch to close during the five microsecond black-level interval, the diode actuating pulse is delayed to correspond precisely with the interval by reason of the network R1, C2.

Therefore, during the interval period the instantaneous black-level magnitude of the vision signal is sampled, and a composite signal, including the diode actuating pulses, is fed to the cathode of V2.

Now, due to the conduction of diode V1(b) the negative-going diode actuating pulses tend to be restored to the D.C. value of the black-level intervals in the video make-up. This means, then, that the tips of the once negative diode actuating pulses are held at a potential corresponding to the black signal level. The composite waveform is thus inverted, and its absolute positive value follows any variation in black signal level. This effect is illustrated by the waveform at Fig. 76.

Clearly, then, should the black level of the signal

(Continued on page 319)

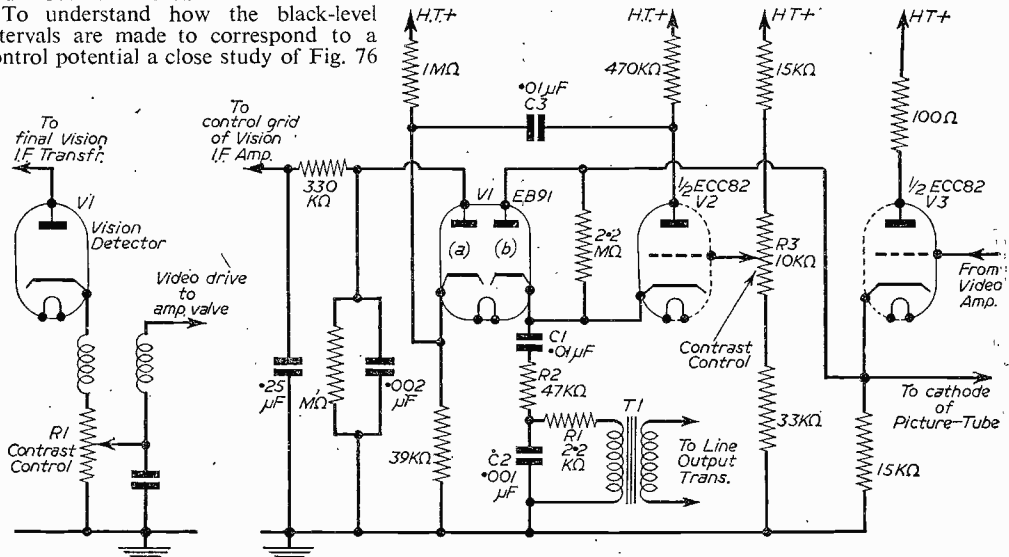
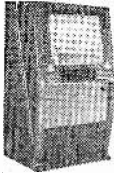


Fig. 74. (left).—The detector-load contrast control used in G.E.C. BT2147 series receivers. Fig. 75. right).—The "automatic picture control" circuit of the Pye V4 series receivers.

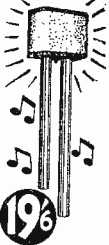
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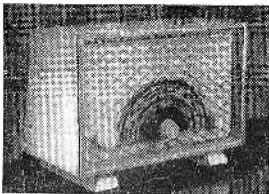
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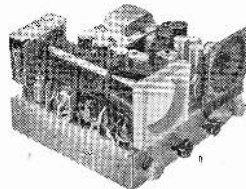
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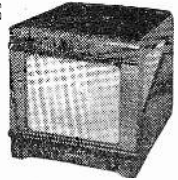
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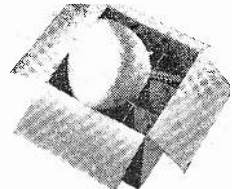


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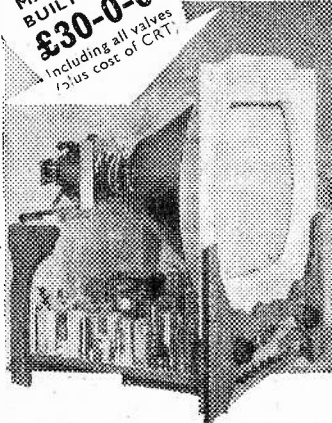
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fluctuate by reason of varying signal strength, the positive value of the waveform will fluctuate in sympathy.

Since the cathodes of V1(b) and V2 are strapped the valves follow a similar pattern of conduction so that appearing across the anode load resistor of V2 is an amplified replica of the waveform at the cathode.

The A.G.C. signal is taken from the anode of V2, through C3, to the cathode of V1(a). This diode simply rectifies the A.G.C. signal and puts it into negative form suitable for controlling the gain of the vision I.F. amplifier valve.

The manual contrast control—R3 in the grid circuit of V2—allows adjustment of the signal applied to V1(a) and hence the magnitude of negative control bias developed at the anode of this valve, and subsequently the gain of the vision I.F. channel. A similar action is, of course, brought about when the video signal strength varies.

**The Ferguson System**

The Ferguson method of A.G.C. makes use of the actual sync pulses for deriving a control bias. It is well known, of course, that a negative-going picture signal applied to the control-grid of the sync separator runs the valve into anode current cut-off during the picture portion of the signal, and into grid-current during the period of the sync pulses.

Fig. 77 illustrates the Ferguson A.G.C. circuit. Here V3 is the sync separator valve coupled to the video amplifier through R1 and C1.

During the period of grid-current C1 charges—so that its grid side goes negative—to a value dependent on the amplitude of the received sync pulses. The grid circuit of V3 is completed through R2, R3, R4 and R5. And it is the negative potential existing at the junction of R3 C2 which, being directly dependent on signal strength, is used as an A.G.C. bias.

It will be seen that diode (a) V2 is also in receipt of the control bias. Furthermore, since the diode anode is in connection with the H.T. positive line, through R4 and R5, the diode tends to conduct and produce a delay potential. The A.G.C. comes into operation, then, only when the control potential outweighs the delay potential.

The delay potential can be adjusted by the variable potentiometer R5, which, as will now be realised, constitutes the manual contrast control.

The control potential is conveyed to the grid of V1—the first vision I.F. amplifier—through R6 and L1, whilst a constant input impedance is maintained to this stage in virtue of the unbypassed cathode resistor R7.

**The Murphy System**

The relevant circuit details of the Murphy arrangement of A.G.C. are shown in Fig. 78. The system is

somewhat similar to that used by Pye, but instead of the five microsecond black-level intervals being sampled, the 10 blank lines that follow the frame pulses are sampled and used as an A.G.C. reference level.

In this system, of course, the actuating pulse is derived from the frame flyback, and, as a result of the double differentiating chain—C1, R1, and C2, R2—the pulse arrives at the grid of V2 in the form of a distorted sine-wave.

Since V2 is arranged to have a relatively short grid-base, the valve runs into grid-current on the positive peaks and into anode current cut-off on the negative peaks of the applied waveform. This mode of working gives rise to a waveform in the anode circuit that is heavily suppressed in a negative

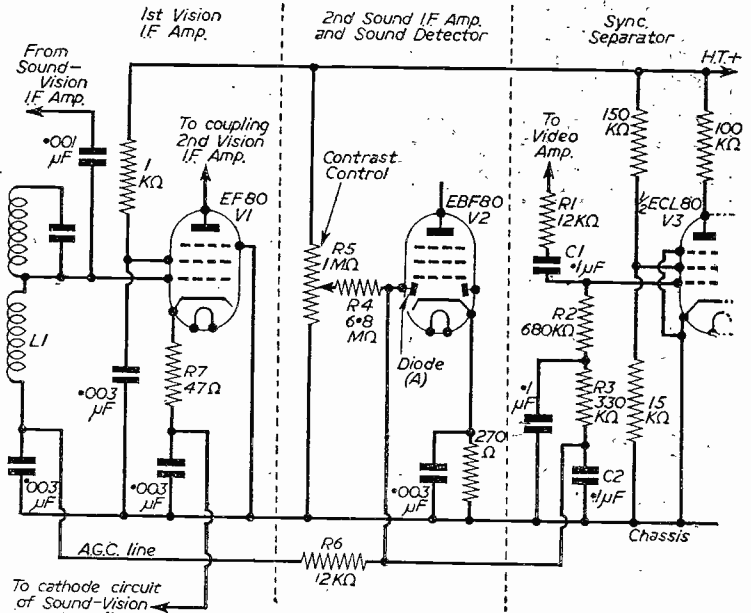


Fig. 77.—Circuit details of the A.G.C. system used in the Ferguson series 991T receivers.

direction (due to the grid current), but which rises considerably to form a square-wave in a positive direction. This square-wave is conveyed through C3 and developed across R3.

At this point it should be carefully noted that the frame flyback initiates the positive half of the waveform at V2 grid, which means, of course, that the negative half-cycle, provoking the positive square waveform across R3, occurs sometime after the frame flyback.

This assists in delaying the pulse across R3 so that it occurs during the 10 blank lines that follow the framing signal.

So far, then, the circuit has produced a pulse across R3 that corresponds precisely with the black-level blank lines. The aim is now to connect the video signal to the A.G.C. line via an electronic switch that can be made to close during the pulse period, and open during the period of picture signal.

The triode-pentode valve V1—connected as a double-triode—performs this function. Section (a)

of this valve is connected as an unbiased cathode-follower which allows the negative-going picture signal to swing the grid as far negative as required. The picture signal thus appearing across R4 is reflected into the grid circuit of V1(b).

It will be noticed that the inclusion of R5 will always provide a minimum bias potential to V1(b) even if V1(a) ceases to pass current, whilst the maximum positive signal potential across

across R6 negatively, to give rise to a fluctuating control potential across R7 and R8.

The variable potentiometer R3 determines the signal level at which V1(b) commences to conduct to provide an A.G.C. action, and this function can, of course, be employed to provide a manual form of contrast control.

Now that a firm understanding of the various types of contrast control systems is achieved, the constructor and experimenter will undoubtedly find that fault tracing—particularly in the automatic circuits—is considerably eased.

### Contrast Control

Apart from the automatic arrangements, there is very little that can initiate trouble in the actual control circuit anyway. As we increase the contrast setting we simply increase the gain of the vision channel, and if this operation happens to provoke the sudden occurrence of a brightly illuminated screen—synonymous to our opening symptom—we can be almost certain that the vision channel goes into oscillation when its gain exceeds a certain level.

This, of course, is no indication that the contrast control circuit is at fault—this must be doing its job properly otherwise it would not raise the stage gain to provoke instability or oscillation. Generally speaking, the symptom is nearly always caused by deterioration in one or more of the associated decoupling capacitors—employed in the anode screen and cathode circuits. Dry joints, poor connections between a soldering tag and chassis (particularly where the tag is secured to the chassis by means of a rivet or nut and bolt), disturbed or inefficient R.F. and/or I.F. screening are other factors that should be investigated when the symptom of instability is evidenced.

Sometimes a mismatch between the aerial feeder and the receiver input circuit provokes instability at certain contrast control positions.

An open-circuited control will be immediately apparent, while an open circuit in the resistor between the cathode and the H.T. line will affect the control of contrast, as it will not be possible to reduce it to a minimum setting; the control will, therefore, lose its linear effect and will become very sharp in operation.

A set exhibiting the symptoms of instability, means that for some reason or other the R.F. and/or I.F. stages have turned into oscillators working at a frequency mainly governed by the resonant elements of the network, instead of performing their correct function of faithfully amplifying the minute signals applied to the receiver aerial terminals.

In certain cases of instability the energy of the oscillations is extremely great and appears to the vision and/or sound detector as an A.C. waveform. Under these conditions, therefore, the detector operates very much like a H.T. half-wave rectifier in a power-pack, and a large magnitude D.C. potential is developed across the detector load resistor.

It is as well to bear in mind at this stage that where a crystal diode is used for detection, the oscillation amplitude is often sufficient to damage the crystal, or impair its efficiency by a marked degree. This possible fault should be suspected if, after clearing instability from a receiver, the picture appears "watery" and thin, or lacking in contrast.

(To be continued.)

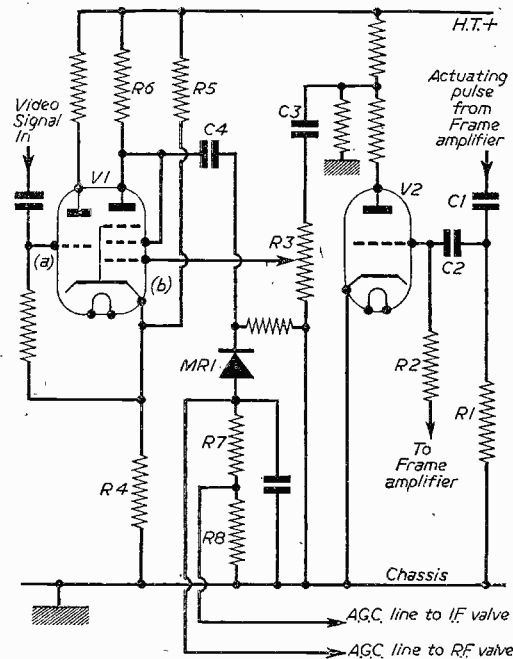


Fig. 78.—Circuit details of the Murphy A.G.C. system.

R4 is governed by reason of its value; in this way a judiciously arranged and limited potential swing—in sympathy with the picture signal—occurs between the cathode and grid of V1(b).

The positive-going picture signal does not permit this valve to conduct since it is subjected to the minimum bias potential created in the cathode circuit. It thus remains in a state of quiescence during the whole of the picture signal.

During the period of the 10 blank lines following the framing signal, however, the positive-going activating pulse across R3 is fed to V1(b) grid and overcomes the cut-off bias to allow the valve to conduct.

This gives rise to a negative pulse across R6, which is conveyed through C4, and rectified by MR1. The resulting D.C. component of the black signal level is thus developed across R7 and R8, and tapped off at two different levels for direct application to the R.F. amplifier and the vision I.F. amplifier valves.

Any fluctuation of the black signal level—due to fading and, etc.—therefore, be reflected across R4 positively, and



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1R5	7/6	6U5G	7/6	75	8/6	U19	10/-	VP43	6/6
1S4	7/6	6N7GT	7/6	83	8/6	Y63	8/6	U22	8/6
1S5	7/6	6Q7GT	8/6	866A	15/-	MU11	8/6	ATP4	4/-
184	7/6	6S7GT	8/6	T240	37/6	PL31	11/-	TP22	8/6
1C5	7/6	6S7GT	8/6	93A	50/-	PT32	10/-	TH23	10/-
3A4	9/-	6SA7GT	8/6	EA50	2/-	PX25	12/6	4IMP	7/6
3V4	7/6	6SQ7GT	8/6	ECH35	12/-	PY81	10/-	42SP7	6/-
351	7/6	6SG7	7/6	EF54	6/-	PY82	8/6	2159G	4/-
5Z3G	8/6	6SK7GT	7/6	EB34	3/6	PCC84	12/6	HL2	3/6
5U4G	8/6	6SL7GT	9/-	EBC33	8/6	PCF82	12/6	LP2	4/-
5Z4G	8/6	6SN7GT	8/6	EP36	6/6	KT39C	10/-	MS/PEN	7/6
6A7G	8/6	6SCT	10/-	EF39	6/6	GU50	12/6	MS/PEN	7/6
6A7G	6/6	6V6GT	7/6	EY51	12/-	GU50	12/6		7/6
6A7G	12/6	6AG7	12/6	EK32	6/6	XP2V	4/-	VT501	7/6
6A8G	8/6	12A6	7/6	EF91	9/-	XH (1.5)	4/-	AC/PEN(7)	10/-
6AM6	9/-	12K7GT	8/6	EL33	10/-	VU111	4/-		10/-
6B9	7/6	12S3GT	8/6	EL32	7/6	VU133	4/-	PENDD4020	12/6
6C5GT	5/-	12Q7GT	8/6	EP50	7/6	VU20A	4/-		12/6
6C8	6/6	12SA7GT	8/6	Red Syl.	10/-	QP230	8/-	FC13C	10/-
6D6	6/6	12SQ7GT	8/6	EF50	5/-	VR10530	8/6	VP47	8/6
6F6G	8/6	12SJ7	8/6	SP2	8/6	VR15030	8/6	ID5	8/6
8G6G	6/6	12SK7	8/6	VP2	8/6	CK510AX	5/-	EF39	10/3
6H6GT	5/-	12SR7	7/6	TDD2A	8/6	DI	2/-	EC83	10/6

## INDICATOR UNIT TYPE 182A

This unit contains VCR517 Cathode Ray 6in. tube, complete with Mu-metal screen, 3 EF50, 4 SP61 and 1 504G valves, W/W volume controls, resistors and condensers. Suitable either for basis of TV or Oscilloscope. Radio Constructor "Scope" constructional circuit included. 67/6 (plus 7/6 carr.).

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VCR97 (slight cut-off) 15/-  
 VCR97, guaranteed full TV Picture ... 40/-  
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Finest Audio available. Complete list of parts, including drilled chassis, 5 valves, types 6AM6, 12A6R, EB91 and 2 6AD6. Also complete circuit and wiring diagram. 66/7/6. Or assembled and aligned, 68/10/-. Alignment only, 7/6.

## TRI196 RECEIVER

Receiver 27/3. This is a six-valve superhet receiver with 465 kc/s I.F.'s. — 2 EF39, 1 EK32, 2 EF36, 1 EBC33. In brand new condition with full conversion data. SPECIAL OFFER 27/3 plus 2/6 carriage.

## RECORDING TAPE (G.E.C.).

600 feet reels, 10/-, 1,200 feet reels, 17/6.

## STROBE UNITS.—Brand new

in sealed cartons, these contain 6 EF50's, 5 EA50's, 1 SP61, a host of condensers, resistors, transformers, chokes, relays, switches, 7 pots and 5 smoothing condensers. Size 18in. x 8in. x 7in. Only 59/6, carriage free.

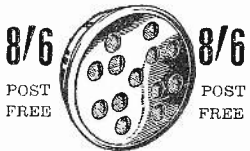
## RCA 931A PHOTO-ELECTRIC CELL AND MULTIPLIER.

For facsimile transmission, flying spot telecine transmission and research involving low light-levels. 2-stage multiplier. Brand new and guaranteed, only 22.10/-. Special 11-pin base 2/-, Data sheets supplied. Replacements for Mazda 27M1 and 27M2.

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Ten EF50 (Ex-Brand New Units), 5/- each ... 45/- Set  
 GK8G, 6K7G, 6Q7G, 5Z4G, 6V6G ... 37/6 ..  
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 6K8G, 6K7G, 6Q7G, 25A6G, 25Z5, or 25Z6G ... 37/6 ..  
 12K8GT, 12K7GT, 12Q7GT, 35Z4GT, 35L6GT or 30L9GT 37/6 ..  
 12A7GT, 12SK7GT, 12SQ7GT, 35Z4GT, 35L6GT or 30L9GT 37/6 ..

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Manufactured by Parmeko and Sound Sales for Admiralty 4 valves, PX25, MS PEN, AC/HL, MU14, Output Matching 3 Ω and 15 Ω, 100/250 v. A.C. Pick-up and Microphone Inputs Complete in steel grey case 49.10.0.

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Size 15in. x 8in. x 2in. Complete with 45 Mc/s Pye Strip, 12 valves, 10 EF50, EB34 and EA50, volume controls and hosts of resistors and condensers. Sound and vision can be incorporated on this chassis with minimum space. New condition. Modification data supplied. Price 45/- Carriage paid.

## No. 38 "WALKIE-TALKIE" TRANS-RECEIVER.

complete with throat mike, phones, function box and aerial rods in canvas bag. Freq. range 7.4 to 9 Mc/s. Range approx. 5 miles. All units are as new and tested before despatch, 44.10.0.

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150 V	M.C. 2 1/2" Flush ...	10/-
300 V (50c)	A.C. Projection 5" Dial ...	50/-

## AMP-METERS

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6 A	T/C 2 1/2" Flush ...	7/6
15 A (50 c/s)	M.I. 2 1/2" Projection ...	21/-
20 A (50 c/s)	M.I. 2 1/2" Flush Mtg. ...	10/-
30 A	M.C. 2" Square ...	7/6
20 A	M.C. 2" Round ...	7/6

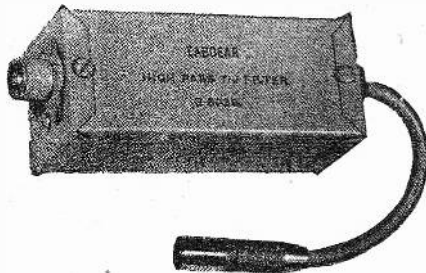
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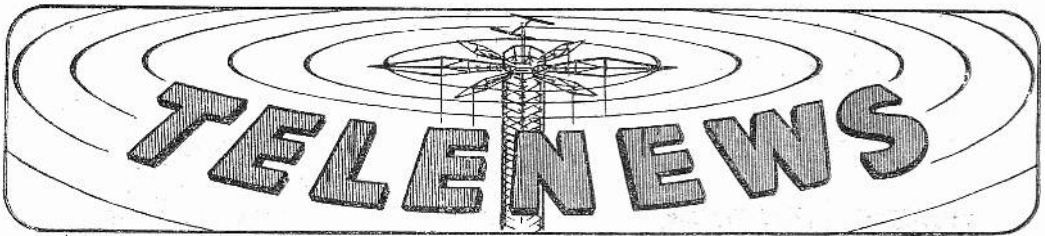
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**Television Licences**

THE following statement shows the approximate number of television licences issued during the year ended September, 1954. The grand total of sound and television licences was 13,527,864.

Region	Number
London Postal ... ..	997,172
Home Counties ... ..	391,533
Midland ... ..	705,086
North Eastern ... ..	512,739
North Western ... ..	525,580
South Western ... ..	167,022
Wales and Border Counties	188,586
<b>Total England &amp; Wales</b>	<b>3,487,718</b>
Scotland ... ..	175,028
Northern Ireland ... ..	15,050
<b>Grand Total ...</b>	<b>3,677,796</b>

**More and More Viewers**

RECENT figures issued by the BBC Audience Research Department indicate that nearly one-half of the nine million people receiving BBC programmes are tuned in to television.

The percentage of viewers in the entire "TV public" has risen from 38 a year ago to 46 at the present time. This substantial increase is understandable when it is considered that about a million TV sets have been bought in the past year.

**First Commercial Station**

THE first commercial television mast, 200ft. high, is to be situated at Beaulieu Heights, South Norwood, London, but will only be a temporary transmitter until the I.T.A. is able to share the Crystal Palace mast with the BBC after 1956.

The station's range will be about 35 miles.

**Finding the Top Programmes**

WHEN commercial TV starts in this country, advertisers will be able to keep a check on the programmes most viewed by the average family. A machine in the form of a meter has been invented

which, when plugged into a receiver, records the length of time the set is switched on and at what hour of the day.

**Riverside Studios**

THE BBC has completed its purchase of the leasehold interest in Riverside Studios, Hammersmith, W.6. The negotiations leading to the purchase were carried out by Messrs. Knight, Frank and Rutley, acting on behalf of the BBC, and Messrs. Goddard and Smith, acting on behalf of the vendors, Alliance Film Studios.

**Radio Industry's Guest**

SIR ANTHONY EDEN, M.P., the Foreign Secretary, is to be the guest of honour at the annual dinner of the Radio Industry Council, at the Dorchester Hotel, London, on Wednesday, December 1st.

Lord Burghley, president of the R.I.C., will preside.

**Overseas Station**

IN October, the first overseas TV station of the U.S. Military Transport Service went into operation at Lajes Field, in the Azores.

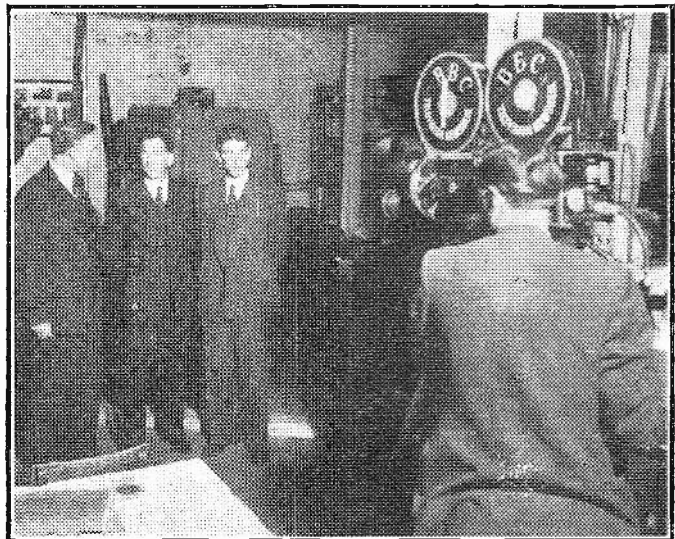
Local programmes and telefilms of shows will be transmitted to the troops and their families.

**No Live Transmissions from N.E.**

DUE to lack of equipment, there will be no more "live" TV broadcasts from the North-East of England for at least a year. Mr. Bryan Cave-Browne-Cave, head of BBC Northern programmes, has stated: "There just is not enough equipment to make more programmes from Tyneside possible. There are also Government restrictions on the amount we can spend on additional television equipment."

**New Askey Series**

THE next Arthur Askey series on television will commence on February 8th.



BBC News and Newsreel recently featured the Mullard 15-million volt linear accelerator, which was installed in St. Bartholomew's Hospital, London. Officials of the hospital are filmed discussing the machine with Mr. P. E. Trier of Mullard Limited.

### Council's Suppressor Rule

CAR owners in the Yiewsley and West Drayton district in Middlesex, who keep their cars in council garages are being told by the council that they must fit TV suppressors to their cars.

### Indian TV Service

DR. B. V. KESKAR, Minister for Information and Broadcasting in India, has recently forecast that a television service may begin in India in 1956 or 1957, under the second five-year plan.

### Not At Any Price

WE learn from America that film star Greta Garbo was offered 25,000 dollars to appear for no more than a few minutes on a television programme.

The offer was not accepted.

### Work for 800

THE largest factory on the Eastwood Industrial Estate at Southend will be the new plant of Messrs. V. T. Bond and Sons, Ltd., which will be completed in a few months. It is hoped that the building will be ready for use early in the new year for the manufacture



David Nixon, whose illness caused him to miss some sessions of "What's My Line?" recently.

of wooden radio and television cabinets.

Four hundred people will be employed at first, but this figure may be doubled within three years.

### By 1964

IT is learned that the BBC plans to bring television reception within the reach of 97 per cent. of the population and to operate two alternative services.

### Commercial Transmitters Less Powerful

SPEAKING at Birmingham recently, Mr. R. A. Bevan, chairman of the TV, Film and Radio Sub-committee of the Institute of Practitioners of Advertising, said that the first three commercial TV stations would be less powerful than BBC transmitters, but 2,400,000 sets would be able to receive programmes from them.

### Aberdeen Station

AT the time of going to press, the probable date for the opening of the television transmitter at Aberdeen is December 13th.

### Dutch Commercial Service

WE learn that commercial TV is to be introduced in Holland. Broadcasting associations will be permitted to include advertisements on a small scale and to broadcast political propaganda.

As from next March, the number of viewing hours a week will be increased from three to 12.

### TV. and Navigation

THE Duke of Edinburgh watched demonstrations of television and its aids to navigation when he visited the Radio Research Institute of the Department of Scientific and Industrial Research in October. Some of the developments demonstrated were on the top secret list.

### Rowridge Reception

RECEPTION from the new R. Rowridge station on the Isle of Wight was reported by Sussex dealers as being "very poor" on the first day of operation.

### Religious Broadcasting Assistant

THE Rev. John Elphinstone-Fyfe has been appointed Religious Broadcasting Assistant, Television. His duties will include the investigation of possible programmes, some production work and assisting the producers of other broadcasts.



Benny Hill, one of TV's most popular comedians, who begins his own series in the new year.

### Colour Sets Ignored

IT is reported that colour television will not enter the American home before 1956. Attempts earlier this year by the Radio Corporation of America and the Columbia Broadcasting System to sell 15in. colour tubes on a large scale did not meet with great success.

The sets themselves cost nearly a thousand dollars.

### Receivers in Russia

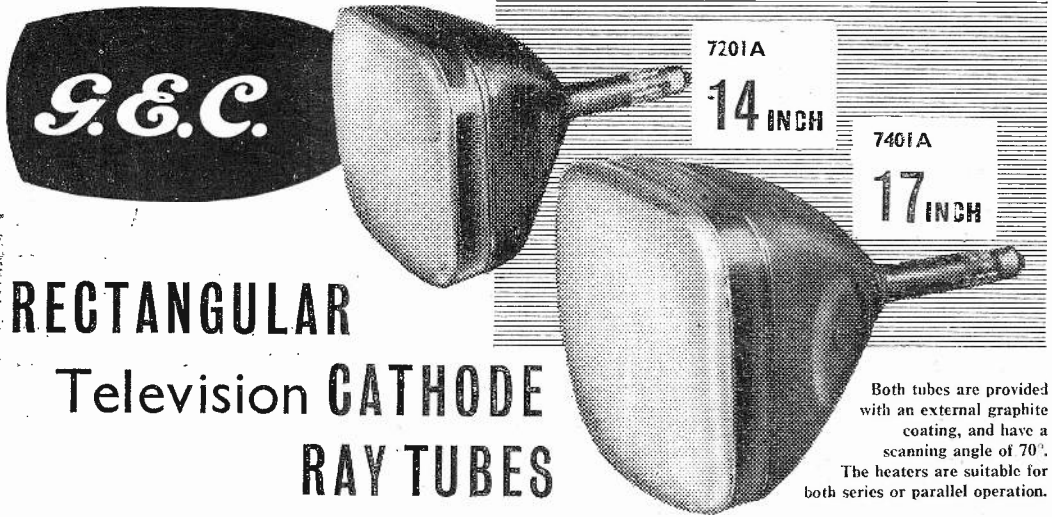
OFFICIAL figures from Russia show that 70,000 TV sets are in use in Moscow where the total population is eight million.

When buying a set, the customer has a choice of two models, both made by the same manufacturer. The smaller receiver has a screen size of six by five inches and the larger a seven by five inches picture.

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.

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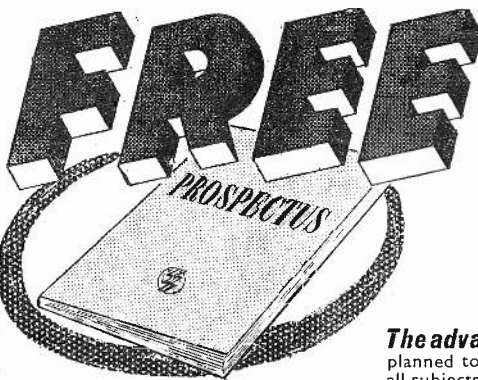
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Vh	6.3V	Vh	6.3V
Ih	0.3A	Ih	0.3A
Va (min)	10.8kV	Va (min)	11kV
Va (max)	14.0kV	Va (max)	16kV

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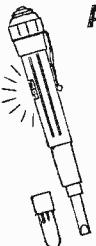
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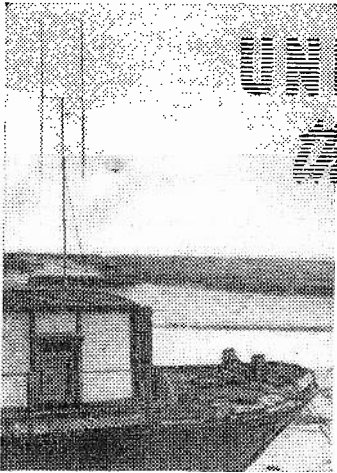
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# UNDERNEATH *the* DIPOLE

TELEVISION PICK-UPS AND  
REFLECTIONS

By *Iconos*

## I.T.A. AND FILMS

WILL "live" TV transmissions continue to hold the field at the BBC? Up to now, apart from the newsreels, a few cinema films, mostly of ancient vintage, and film interpolations in TV plays and commentaries, direct transmission from the studios has been the rule. There are many technicians in the BBC and elsewhere who believe that this state of affairs will not continue. There is no doubt that I.T.A. programmes will contain a very large proportion of specially filmed features which are preferred by sponsors.

## KINESCOPE RECORDING

DURING the last few months there has been a tremendous improvement in the technique of scanning films for TV transmission, both here and in the U.S.A., and keeping pace with this progress has been the development of new techniques for recording pictures, sometimes known as KineScope recording. The latest examples of films made at the Highbury Studios on the high definition system of closed-circuit KineScope recording were recently shown to the British Kinematograph Society and demonstrated that the quality very nearly equalled that of direct motion picture photography, even when viewed on a large screen. Viewed on a small TV screen, the difference in quality was negligible. As a matter of fact, the H.D.F. films, recorded with a high lighting key and contrast especially suitable for TV reproduction, seemed to give a more pleasing result than the rather dark normal cinema films. The main criticisms I heard

of the complete film shown to the B.K.S. concerned the casting and the cutting from camera to camera, which does indicate that the technical values were entirely acceptable. Highbury Studio is now turning out two or three complete half-hour TV plays or features each week for American television networks and is being watched by potential sponsors on the I.T.A. transmissions here. Considering that the studio space at Highbury comprises one stage, 116 ft. by 60ft., and most of these subjects have several sets, this result is most creditable.

## LIVE TRANSMISSION

THE "live" transmission of TV plays is an expensive business. The play is performed and transmitted and that is the end of it, unless it is recorded on film for re-transmission. KineScope recording carried out by the BBC on its normal 405 lines, interlaced, is good but not good enough for export purposes and certainly not to be compared with filmed television features, whether photographed directly with motion picture cameras or by the H.D.F. electronic system. The BBC could recover a considerable amount of the production costs of their best plays by making available to commonwealth and foreign TV stations first-class film records. These will be made either by direct filming in the first place or by the incorporation of a special closed-circuit with sequential scanning and "hotted up" circuitry for a TV film recording camera.

## GOOD TV PLAYERS

SOME of the best of the BBC's TV plays recently have been notable for the smallness of their casts. "Never Get Out" was sustained by two characters portrayed by Hilary Liddell and Jack Rodney. The playing was better than the play which concerned a

girl who returned to her home, now an abandoned village in the centre of a practice bombing range, where she hoped to bring an end to her life. Jack Rodney gave a fine performance as the eccentric young tramp who finds himself in the same deserted village. "Out Of Bounds" had a few more characters, but the story was carried by two principal ones, brilliantly played by Diana Churchill and Anne Crawford. The setting of the piece was in the Ladies' Committee Room of a golf club and the fun was fast and furious, thanks largely to the quarrels of the two good-looking golfing ladies over a gentleman friend who turned out to be a mild little ass, amusingly played by George Benson. The pace of direction was good and the length—half an hour—was, to my taste, just right. Very few TV plays carry sufficient weight to play the 90 minutes so often allocated. Yet, there is no denying that long plays are very popular with the TV public, especially, for some reason or another, costume plays. W. P. Lipscombe's "Ninety Sail" played the full ninety minutes in its narrative of the lively adventures of Charles II and Samuel Pepys, played respectively by Reginald Tate and Mervyn Johns. Here was a comedy set in history, written by a playwright who usually specialises in serious historical plays. With plenty of incident and lively characterisation, the balance was not upset by the hackneyed mistake of attaching major importance to the rôle of Nell Gwyn.

## NORTH COUNTRY PLAYS

JOHN Greenwood's play "The Cure For Love" pleased both eye and ear, which proves once more that Lancashire or Yorkshire backgrounds are suitable mountings for the special kind of wit and wisdom inherent in this particular type of comedy. Wilfred Pickles proved his versatility by playing the principal part in a down-to-earth manner which made every point out of each humorous situation, though lacking some of the intangible charm which characterised the memorable film performance of the same part by Robert Donat. Set anywhere else, other than Lancashire, Yorkshire or the Hebrides, it would fail to convince. "Hobson's Choice," "Hindle Wakes," "Love On The Dole" and "When We Are Married" always seem fresh and interesting to me, providing the dialect is not laid on too thickly.

# 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).

## HIRE PURCHASE DISADVANTAGE

**SIR**,—I read that L. Lightfoot (Kew) suggests that hire purchase will put the young man of the future off constructing his own "Simplex." I am one of these young men of the future and this will not put me off constructing my own. If a young man has the interest in this vast and ever-growing subject, surely a small thing like this will not discourage him. He must realise that it is not just a matter of anyone buying a kit and putting it together. Technical and practical knowledge is needed to appreciate the intricate details of modern designs. I am only a beginner and have much to learn, but just because I can buy a set for £1, I will not be put off constructing my own, and I have years of study before I shall reach that standard.—F. GRIGGS (Ceylon).

## TELEVISION AT THE SHOW

**SIR**,—In your article, "Television at the Show," in the October issue, you state that there are no front controls on the 12in. Vidor table model, CN4216. Being the owner of one of these models, I wish to point out an error. These models are fitted with front controls which are beneath a hinged panel at the base of the screen. These controls are, reading from left to right: "contrast," "horizontal hold," "on/off brightness," "volume," "vertical hold" and "picture height."—G. HITCHINGS (Abertillery).

## A SATISFIED READER

**SIR**,—I am in receipt of your very helpful letter of advice and you will no doubt realise how much you have "solved my problems," and you can rest assured that I will tell my friends to buy your publication in the hope that you may be "so helpful" to them, and also all the new TV owners who would like to know how to use the horizontal and vertical linearity, amplitude and picture-centring and rotation controls, which as you know full well are *not given* as instructions in the booklet supplied by manufacturers.—J. HILL (Oldham).

## NEW MAGNETIC RECEIVER

**SIR**,—In reply to many queries concerning this article, I should like to point out that four errors occurred in the original article, viz.: (1) Tags 2 and 3 of the line transformer were transposed in the circuit diagram, i.e., EL38 anode should go to centre tap, as is normal. (2) Cathode of V6a should be connected to cathode of V6b, slider of R45 and thence to chassis. (3) The value of R29 was omitted and this should be 47 k. (4) Delete one of the double entries against R23 in the components list.—J. COOK (Ashford).

## A SIMPLE WOBULATOR

**SIR**,—Congratulations to Mr. S. C. Murison on his article "A Simple Wobulator" in the May and June issues of PRACTICAL TELEVISION. In making this instrument, which has proved of tremendous value in servicing receivers, I found his method of dealing with the constructional details both original and comprehensive.

The simplicity of design and general efficiency of the instrument will, I have no doubt, make it

popular with all radio engineers and enthusiasts.—P. K. WILLIAMS (Sunbury-on-Thames).

## TUBE AS 'SCOPE

**SIR**,—Many explanations of the working of television receivers deal with the waveform to be expected as many parts of the set, but not all of us have oscilloscopes. Surely it is not beyond the ingenuity of some of the experts to design a way of using the actual tube of the set as a test scope, perhaps even having makeshift timebases where it is to be used for timebase testing. For tuning, in conjunction with a wobulator, could not the line base be arranged to go slow in some way and the instrument used in a more or less orthodox manner?—H. ROBSON (Hartlepoons).

*[Whilst it would not be too difficult to carry out the idea suggested on a receiver employing an electrostatic tube, it would not appear to be possible in the case of an electromagnetic tube. Still, some readers may have tried out something on the lines mentioned, and if so, we should be glad to know of the results.—Ed.]*

## SHARING ONE RECEIVER

**SIR**,—I shall soon have a TV problem which none of your experts can solve. It is this. During the years after the war when my family had no television, my children would often disagree as to which radio programme we should listen to: Arguments became so frequent that I set to and constructed another wireless receiver and installed it in the kitchen so that not only could my wife hear the radio during the day, but any of my children not liking the programme I tuned in to in the evening could use the new set in the kitchen. The set, by the way, cost me £4 to build.

Since the introduction of TV into my home, however, the wireless has taken a back seat and we are all content to view the BBC programmes together. There is no alternative wavelength to argue over.

Now, I understand, my worries are to return some time next year when a commercial service is to be introduced. The same old argument is bound to crop up—which programme shall we have on? This time there will be no solution.—P. ROSS (Nottingham).

## PROJECTION RECEIVERS

**SIR**,—Having saved for a long time to buy my first television set, I have been looking through many catalogues to try and find the set most suited to me.

A friend showed me his projection model and I was certainly impressed. The focus generally was superior to that of a direct-viewing receiver and the flat screen gave me more of the illusion of being in a cinema. The actual screen size was larger too, of course. Another model that I saw at my dealer's shop was the direct-viewing type and to my astonishment I found that its advantages were those not possessed by projection models, but nor were its disadvantages. Straight lines on projection screens tend to curve on "tube screens" giving the wrong effect, and although the focus was not so good on the "tube screen" its picture sparkled more and was much brighter than a projected picture.

I have finally decided on the projection type but was not aware before of the marked differences between the types.—H. BALL (Weybridge).





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*Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 335 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.*

#### AERIAL MATCHING

I have been re-reading all the articles I can find on TV aerials, and it seems to me the most trouble is in matching the dipole with co-axial lead and lead with aerial coil.

Is there any method in which to check the matching?

Is it possible (or practical) to measure, with a microammeter, the strength of signal in various aerials?

Would a germanium diode and tuned circuit give a microamp reading? I am thinking it is necessary to use a detector or rectifier.

What type of diode would be best—high, medium or low impedance type (GEX34, 35, or 55/1)?

If I am on the wrong track I shall be pleased for your advice on the lines to follow and your comments on the queries.—H. W. Boswell (Grimsby).

Matching of the aerial is not quite as critical as you suggest. The amount of mismatch tolerable depends upon the S.W.R. ratio, and this can be as high as 2:1 without causing any noticeable effect. The S.W.R. ratio can be measured as the ratio of one impedance to the other; from this it follows that the centre impedance of the dipole can fall to 40 ohms using an 80 ohm cable.

If the coil constructional details are followed faithfully together with the type of valve and input circuit components, no troubles with incorrect matching at the receiver end should be experienced.

To obtain the utmost from the aerial follow the constructional instructions for aerial and receiver and then add an 0.25 wavelength section of coax in parallel with the receiver end; cut in, at a time from this section short-circuiting the ends and note the effect on the picture. It is possible by this method to tune out a measure of mismatch.

To judge the degree of aerial efficiency an 0.2 mA meter can be connected in series with the diode detector load resistor for use as a signal strength meter.

#### H.M.V. 1808—SOUND ON VISION

I am the owner of an H.M.V. 1808, and found the

article on this set in "Servicing Television Receivers" extremely informative and interesting.

The fault on my set—sound on vision—was not dealt with in the article, and I am wondering whether a new B36 would be the solution.

So far I have tried interchanging the Z77s and attempting to re-align the tuned circuits, both without success.

Incidentally, what procedure would you recommend a beginner to adopt on realigning this type of set, bearing in mind that he usually has not access to a signal generator?

At present I am using an indoor aerial and have noted that the setting of the volume control has no effect on the sound on vision trouble.—J. Esmonds (S.W.2).

"Sound interference on vision" on your receiver is almost certainly the result of misalignment. Unfortunately, there is no simple method by which your set can be accurately realigned without instruments. The hit-and-miss method which you have adopted cannot be recommended, for it is bound to provoke poor picture quality coupled with sound and/or vision breakthrough.

We would mention, however, that if the aerial is picking up too much signal it may be tending to overload the first stages of your set to set up what is known as "cross modulation." You can prove this possibility by applying the aerial signal through the attenuator provided.

#### SOBELL T121 AND LYNX

I have a Sobell model T121 which has been in constant use since Wenvoe started. You are no doubt aware that this model has very little gain, due to insufficient stages in the vision strip. I modified the timebase some nine months ago to give a better interlace, and I now propose building a separate vision strip, as per your "Lynx" television. As cash is of paramount importance I plan to use EF80 valves, which I have, instead of the valves specified, and to incorporate a five-channel tuner advertised by several firms in "Practical Television," which I think is almost identical to the first two stages of the "Lynx," and would save a great deal of work, plus "factory produced" efficiency where it is most needed. I intend incorporating the sound trap coil No. 16 and feed off this into existing sound section or possibly an amplifier which I have, with some form of detection circuit.

Would you please advise me if this proposed strip has any snags which I might have overlooked and if the EF80s will be O.K.? The H.T. rail on the Sobell is 200 volts but can be increased to 220 if required, but I think that slight changing of the resistor values would overcome this if necessary—correct me if I am wrong, please.—C. G. Harman (Glamorgan).

On the face of it, your proposed arrangement would appear to be quite satisfactory. We cannot, of course, guarantee results since we have no practical experience of using the Lynx vision strip in the Sobell receiver. Using EF80 valves in place of the EF91 series may tend to modify the tuning characteristics of the strip generally, but you should have little difficulty in re-balancing by means of the tuning cores and/or the value of the shunt capacitances. It may also be found necessary to alter the value of the cathode resistors slightly, though experimentation will be demanded to determine this. The H.T. line voltage in your Sobell is quite suitable for the valves you intend to employ.

**SIMPLEX—RASTER TOO BRIGHT**

Please can I have some advice about my Simplex? My main trouble at the moment is inability to blank out the screen. With brilliance control at minimum I still have a "too-bright" raster. I have tried another potentiometer of, I think, about .25 meg., but with same result. Could you indicate likely cause or give me some lines of investigation? The same fault persists with vision disconnected and only E.H.T. and time-bases working. All potentiometers, except brilliance, fulfil their proper functions, though the raster is not perfect. However, I feel that if I could blank out the screen, perhaps other faults will fall into place. Regarding sound and vision, sound is present with some instability, but I have not achieved a picture though I am confident the vision signal is reaching the C.R.T. I wonder if the following would have any adverse effect on the coils? I had great difficulty winding them with formers fixed on chassis, so I removed them from chassis and held windings in place with a turn of "Sellotape." I wound all coils in like manner. Hoping you can assist and many thanks.—J. Gray (Glasgow, E.I.).

Where difficulty is experienced in blanking out the screen R14 should be checked with its connection to the grid of the C.R.T. Check also C17 for leakage. If these points are in order then try reducing R38 to 1 megohm.

You should search for the vision signal by the listening method as indicated in the data. It will be found that the cores of the coils must be unscrewed one or two turns from the peak sound position in order to get the vision.

**VIEW MASTER—E.H.T. REGULATION**

I completed my 12in. Viewmaster during the latter part of 1952.

Until October, 1953, the picture was very good, although I have quite a lot of ignition interference on sound.

The main point in asking for your help is that during October, 1953, I had a new tube fitted, which, being better than the previous one, was a Mazda aluminised, and since then the picture appears too bright and somewhat diffused.

The more light, such as sky or light dresses, etc., the more off-focus it seems to be. The whites are not clear cut and spread into the blacks.

On turning down the brilliance control I lose the detail, being too dark.

I have looked up questions from readers of the "Practical Television" over the past two years but cannot find anything quite like this.

I had the set aligned when first made up and as I have no signal generator I have tried adjusting coils according to the book.—W. Bailey (Hull).

The diffused effect on your picture is due to the regulation of the E.H.T. and this is usually more serious with a triode tube. It may be that your tube is taking an excessive current, or that the regulation is itself poor, due to MR3 being faulty. It is also possible that the H.T. voltage is too low, necessitating too high a tube current and if this is so, then the E.H.T. boost circuit should be adopted.

**EKCO TCS102—FAULTY TUBE**

Please could you tell me what component is faulty on my Ekco TV. No. TCS102, which gives the following symptoms:

The picture repeatedly becomes very hazy or misty, either as a whole, or in wide bands across the screen, and then jumps back to a clear picture again; the sound is not affected.—V. S. Snell (Edmonton).

This symptom is becoming progressively more common and is caused by an intermittent short between the heater and the cathode elements in the picture-tube. Since the tube heater in your set is energised by reason of a separate winding on the mains transformer, the tube short permits ready passage of the higher frequency content of the picture signal to chassis through the self capacitance of the mains transformer, and consequently provokes serious deterioration in picture quality. A further lease of tube life can nearly always be achieved by employing one of the special low-capacitance transformers for lighting the tube heater, and cutting off and insulating the existing heater feed. When this method is adopted it is advisable to connect an 0.1  $\mu$ F capacitor between the heater and cathode on the tube base. This will eliminate intermittent variations in picture quality that would otherwise occur owing to the intermittent nature of the tube defect.

**LINE TIMEBASE FAULT**

I have recently purchased a Model VT2 Pye Table Model TV and I have a broad, black line appearing most of the time down the left-hand side of the screen and then a small strip of picture, but this remaining piece belongs to the other side.

The voltage tappings are correct and the picture does not reach the edge of the screen by approximately 1in. width only, and the "horizontal holds" must both be in on the shut position to achieve this result. If you try to widen the picture it just breaks up, but the raster will fill the screen.—C. D. Stocks (Southampton).

The effect you describe is indicative of a fault either in the line timebase or in the H.T. circuit. A single valve line timebase circuit is used in your set, the valve being a PL81, positioned in the near left-hand corner of the chassis when viewing from the rear of the cabinet. In the first place you should have this valve checked for emission, and replace it if necessary.

Should this check all right, however, have the PY82 H.T. rectifier valve checked, for this sometimes loses emission to upset the operation of the line timebase and reduce the horizontal scan amplitude.

**LINE FREQUENCY DRIFT**

I have an Ekco 9in. screen televisor, model TS46.

When first switching on the set the picture is excellent. As the set warms up, however, the picture develops into a multiple or "wicker-work" pattern accompanied by loud timebase whistle.

Even with the line hold control hard over in the anti-clockwise position the picture seldom corrects itself. My aerial is such that there is ample signal strength and the "brilliance" and "contrast" controls are nowhere near maximum.—Dennis H. Moody (Hull).

The effect you describe is almost certainly caused by a drift in the frequency of the line timebase. The T41 frame oscillator valve is usually responsible for this, and you should endeavour to establish this possibility, preferably by substituting with a valve known to be well up to standard. In your set the valve concerned is positioned in the near right-hand corner of the chassis when viewing from the rear of the cabinet.

**WINWOOD FOR VALUE.**—3-wave Coilpacks, L, M, and S, 24/6; V/master Coils, any area, 17/6 set; 6AM6 and 6AL5 Valves, 6/-; 1so/trans., 2v, 4v, or 6v, 25% boost, 6/6; Fil/trans., 200-240v, 6.3v at 1.5a, 5/6; W.W. Cntrls, 5K and 25K, 3-watt, 3/6; V/master Pre-sets, 2/9 each. Dubilier, Bmf-500v, 2/3; 8 x 8-500v, 3/6; 16 x 16-500v, 4/6; Cored Solder, 8oz. reel, 4/6; Elliptical Spkrs., 7in. x 4in., closed field, 17/9; SP41 and SP61 Valves, 24/- dozen. WINWOOD, 12, Carnarvon Rd., Leyton, E.10. (Mail only.)

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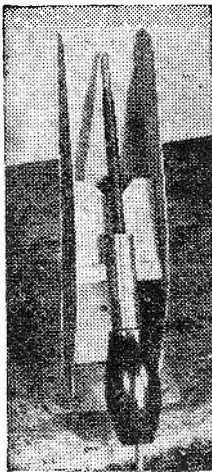
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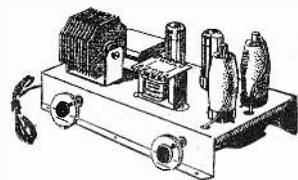
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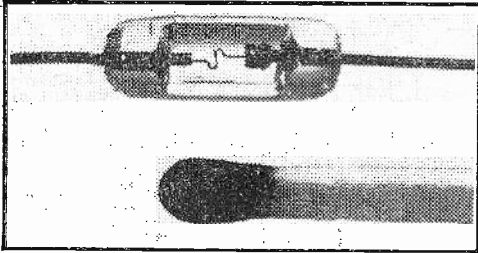
# News from the Trade

## MULLARD ALL-GLASS FUSION-SEALED GERMANIUM DIODES

THE main causes of failure of germanium point-contact diodes fall into two groups: first, contamination of the germanium by traces of foreign substances, such as water. Second, minute movements of the contact point.

The envelope of a germanium diode must, therefore, perform the twin functions of protecting the contact area from chemical contamination and physical movement. It must obviously be composed of a material which is strong and rigid and chemically inert. The use of accessory sealing materials such as solder and fixing cement is deprecated, since they may themselves be a source of chemical contamination.

Glass is an obvious choice of envelope material, and is in fact widely used. The possibility of employing true glass-to-metal fusion seals for the leads has not in the past been greatly exploited, however, because of the danger of altering the



Close-up view of a Mullard fusion-sealed germanium diode, compared with an ordinary match head.

characteristics of the germanium by raising it to a high temperature during the sealing process. Mullard have developed a special fusion-sealing technique suitable for germanium diodes, and the first fusion-sealed diodes of a new range have been in use for some time. These are the OA70 television diode and the OA73 low forward resistance high frequency diode for communications and industrial use.—Mullard, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

## NOISEMASTER KIT

MESSRS. WATTS RADIO have produced a neat kit of parts for use in View-Master receivers for the improvement of noise suppression on the sound section. The kit consists of six condensers and four resistors, each separately packed in envelopes clearly printed with the value and circuit reference number. In addition, a small envelope containing wire and sleeving, nuts and bolts and soldering tags is provided, together with a B7G valveholder and a quantity of soldering wire. A two-page book of instructions gives adequate diagram and instructional matter to enable the modification to be carried out with the minimum of difficulty, and the necessary valve, an EB91 is also included in the kit. At 26s. this will be found a very useful addition to those who

are so situated that they experience difficulty in obtaining good interference-free sound on the View-Master.—Watts Radio, 8, Apple Market, Kingston-on-Thames, Surrey.

## NEW 17in. CONSOLE TELEVISION RECEIVER

TO meet the demand for a successor to Ekcovision Model TC178, E. K. Cole, Ltd., of Ekco Works, Southend-on-Sea, have introduced a new de-luxe, 13-channel console receiver incorporating a 17in. rectangular aluminised tetrode tube, with ion trap for extra long life. This receiver—Ekcovision Model TC248—is housed in a high-grade walnut veneered cabinet which has full-length, spring-locking doors.

For operation on 200-250 volts A.C. or D.C. mains, Model TC248 possesses many outstanding features. It incorporates high-efficiency Turret Tuning, which provides switch selection of alternative programmes; flywheel synchronisation, for better fringe area reception; automatic picture and sound control, for minimising "aircraft flutter" and simplifying receiver operation; Ekco "Spot-Wobble," for comfortable close or distant viewing; and automatic sound and vision interference limiting, with three-stage pre-set adjustment of vision limiter.

Model TC248, which is mounted on concealed castors to facilitate easy movement, measures 34½ in. high by 22in. wide by 24½ in. deep (overall). List Price is £78 5s. 8d., plus Purchase Tax, £26 14s. 4d.—E. K. Cole, Ltd., Southend-on-Sea.

## 20th CENTURY ELECTRONICS

NINE months after opening their new factory at New Addington, 20th Century Electronics announce the opening of an extension doubling the size of the original building. The complete building now occupies one-third of an acre and a further three-quarters of an acre awaits the future development which seems bound to come if the present rate of progress is maintained.

Both factory and research laboratories of the cathode ray tube section, formerly at Dunbar Street, S.E.27, were moved completely en bloc during the course of a single week-end starting at Friday, October 1st, at 4 p.m. As many personnel as possible worked through Saturday and Sunday, in continuous relays, packing, moving and installing, so that by 9 a.m. Monday, 4th, operations commenced smoothly in the new domicile.

A further factory extension is already envisaged for the manufacture of new types of cathode ray tubes, some of which are capable of reproducing four different pictures simultaneously.

Visitors to the new premises will be welcomed. Enquiries should now be addressed to 20th Century Electronics, Ltd., King Henry's Drive, New Addington, Surrey. Telephone: Springpark 1026.

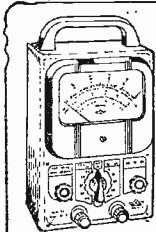
## QUERIES COUPON

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PRACTICAL TELEVISION, Dec., 1954.

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**SPECIAL OFFERS.**—6ft. Flexible Steel Pocket Tapes, 1/6. 6in. Engineers Steel Rules, 9d. 1/2 in., 1/6 ; 2ft. folding, 2/6. Ex-Army Jack Knives, 2/6. Pocket Spirit Levels, 3in., 1/6. Tailor's Trimming Shears, 8in., 3/11.



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