INTERESTING & UNUSUAL FAULTS

Practical Television

1/3

AND TELEVISION TIMES

APRIL.1958

EDITOR: F.J.CAMM

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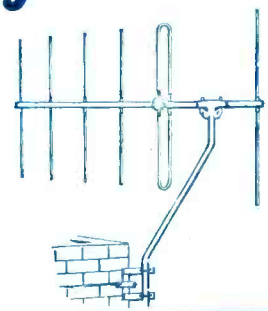
Build your own Aerials...



AT HOME

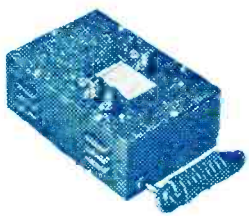
AERIAL FITTINGS FOR BAND III, BAND I & RADIO F/M. Useful formulæ and hints for constructing your own aerial quickly and cheaply. Catalogue illustrating our increased range of Diecast Alloy Fittings, including Band III to Band I Mast Couplers, Reflector and Director Rod Holders, Insulators (both "Inline"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

Fringevision Ltd.

MARLBOROUGH, WILTS. *Phone : 657/8*

COMMERCIAL TV

DON'T GIVE UP BEFORE YOU HAVE TRIED OUR BAND III PRE-AMP



Separate coaxial inputs for Band I and III Aerial Downleads. No changing of Aerial leads. No Diplexor required. Attractive black crackle finished case fitted with non-scratch rubber feet. Easily installed—just plug in mains and aerial leads.

A sensitive unit complete with built-in power supply specially designed for use in ultra-fringe areas. High signal to noise ratio. Will produce excellent results in localities where the signal is normally unusable.
Dimensions 6in. x 4in. x 2½in. Will fit inside most receiver cabinets. 200-50 v. A.C.

PRICE £6.6.8. C.W.O. OR C.O.D.
(Fly Lead **3/6** extra.)

"AIRVISION"

(Electronic Equipment Manufacturers)
14 Boulton Road, SOUTHSEA

TELEVISION TUBES

WE OFFER
MULLARD — COSSOR — EMITRON
Etc., From Stock

12" TUBES £5 10.
14" TUBES £6 10.
17" TUBES £7 10.

Please add 12/6 Carriage and Insurance.
All Tubes Guaranteed for 6 months.

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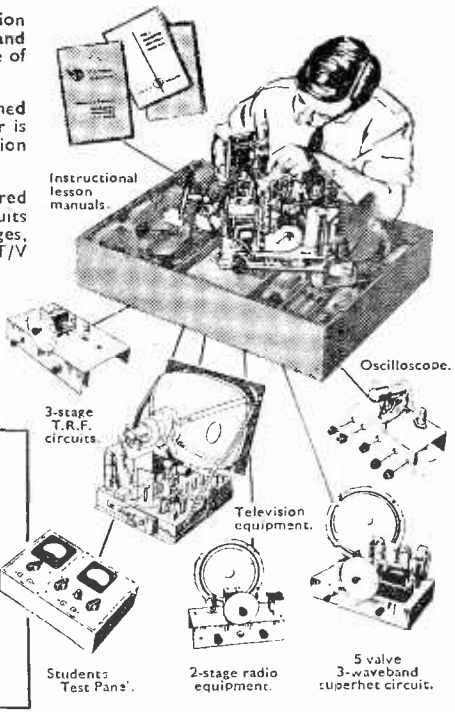

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BLOCK CAPS PLEASE

APR./58

1C107

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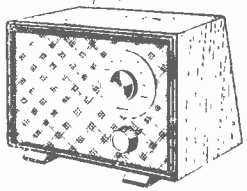
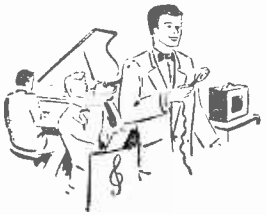
OUR 19/6 COLUMN



THE SKYSEARCHER

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

ALL-MAINS AMPLIFIER



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

Don't Be Caught Like This

CAR STARTER CHARGER KIT

All parts to build 6- and 12-volt charger which can be connected to a "flat" battery and will enable the car to be started instantly. Kit comprising the following.

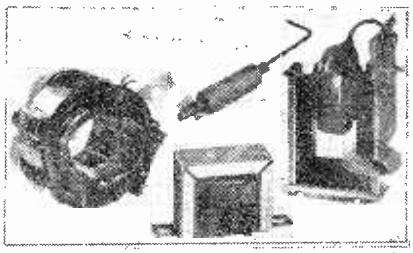
Mains Transformer	22 6
5-amp. Rectifier...	17 6
Regulator Stud Switch ...	3 6
Resistance Wire	2 -
Resistance Former	2 6
Mains on/off Switch	2 6
0-5 amp. Moving Coil Meter ...	12 6
Constructional Data	1 6

or if bought all together price is **62 6**, plus 2 6 post and packing.

EX-GOVERNMENT VALVES

Many types in stock. Here are some of the more popular ones :

TT4	7 6	6J5	5 -	7Y4	8 6	DL74	9 6
1LD5	3 6	6J7	6 -	25Z4	9 6	EF80	8 6
2X2	4 6	6K6	7 -	25Z6	10 6	EL50	10 6
3A4	7 -	6K7	7 6	25Y5	10 -	H63	6 6
5Z4	9 6	6K8	9 6	42	8 -	HL4C	6 6
5U4	8 -	6L6	9 -	43	10 -	HL13	9 6
6AC7	6 6	8N7	7 6	75	12 6	HL1320	9 6
6AL5	6 6	6SA7	7 -	77	8 6	KT61	9 6
6B8	4 -	8 -	78	8 6	KT72	9 6
6C4	6 0	6Q7	9 6	81	8 6	KTW61	4 6
6C6	6 6	6SJ7	8 6	954	3 6	KTW73	9 6
6D3	6 6	6SK7	6 -	1625	10 6	KT741	9 6
6F6	7 6	6SL7	3 -	DDT4	8 6	U12	8 6
6F8	9 8	6V6	9 6	DDT13	-	U71	9 6
6G6G	4 6	7A7	9 6		8 6	U71	9 6
6H6	2 6	7V7	9 6	DH73	9 6		



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

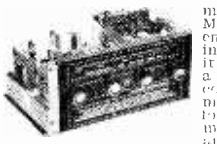
19 RANGE TESTMETER

With Free Gift

Can be yours for only 10 - deposit and 19 payments of 10 - weekly. Like all AVO meters it is a very fine instrument : it has a sensitivity of 10,000 ohms per volt and 19 most useful ranges as follows :— D.C. volts 0-1,000 (seven ranges), A.C. volts 0-1,000 (five ranges), D.C. current 0-1 amp. (5 ranges), resistance 0-2 megs. (2 ranges) complete with test leads). Immediate delivery. **Cash price £9 10 0 non-callers please add 3 6 post & ins.**

FREE GIFT. All purchasers of the above item this month will receive the M.M. Range Extender which adds : capacity 0.1 m.f. in two ranges—inductance 0-100 henrys and decible —20 to +36.

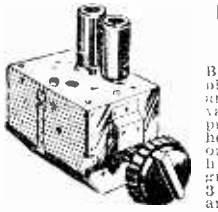
A.M./F.M. CHASSIS



made by the famous McCarthy Radio. This employs a printed circuit in the F.M. Tuner section, it uses 8 valves and has a very attractive three colour dial, size approximately 12 x 5¼in., covers four wavebands : 1000-2000 m., 200-550 m., 15-50 m., and 88-100 Mc/s. This is a precision made chassis with four controls, tuner, volume, wavechanger and tone. Fully guar. Price **£22 10 -**. Post and insurance 5 -.

NOW 2 MODELS

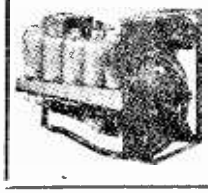
Turret Tuner



Brand new stock, not surplus, with coils for Band I and III complete with valves. Model 1 I.F. output 33-38 Mc/s, series heaters. Model 2 I.F. output 16-19 Mc/s, Parallel heaters. With circuit diagram. **79 6**. With knobs 3 6 extra, post and insurance 2 6.

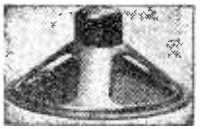
THIS MONTH'S SNIP

Complete Walkie-Talkie for £1



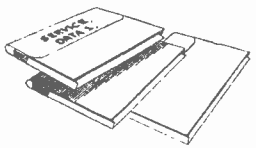
Walkie-Talkie No. 58 Radio Transmitter has a range of approx. 5 miles. Just right for search parties, fire brigades, etc. Operates on dry batteries. Complete with five valves and in metal case. Size approx. 9 x 6" x 3½". Unused but not tested or guaranteed **£1** only, plus 2 6 post and insurance.

SPEAKER BARGAIN



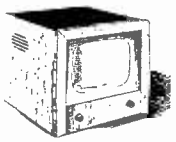
12in. Hi-fidelity loudspeaker. High flux. Permanent magnet type with standard 3 ohm speech coil. Will handle up to 12 watts. Brand new by famous maker. Price **32/6** plus 3 6 post and insurance.

T.V. SERVICE SHEETS



100 sheets covering the most popular post-war Televisors by leading makers—Cossor, Ekco, Ferguson, Pye, etc. etc. Give circuit diagram, component valves, I.F. frequencies, etc., **£1** post free.

14" T.V. CABINET

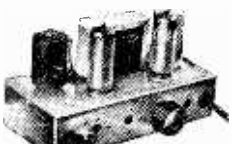


14 T.V. cabinet of the latest styling made for one of our most famous firms—beautifully veneered and polished—limited quantity—**19 6** each. Carriage and packing 3 6 extra.

—SEND NO MONEY—

—just a large stamped addressed envelope and we will send you details of how you can build a 14in. or 17in. televisor in one evening without technical knowledge. If you decide not to build our televisor we request you to return the data or remit **3 6. Note :** Second hand parts or units are not used in our televisors or sold by us.

The "ESTRONIC" Band III Converter



To-day's best value in Band III converters suitable for your T.V. or money refunded. Complete ready to operate **49 6** non-mains, or **79 6** mains, post and insurance 3 6.

—Stop Press Items—

R. & C. SUBSTITUTION BOX As described in last month's issue—author describes this as second most used instrument on his bench. Kit of components with full instructions, **£2 10 -**, plus 2 6 post and ins. **Simple Tone** electronic organ described in Feb. issue. Kit of components as specified complete with valves but not chassis or case, **£4 10 -**, plus 3 6 post and ins.

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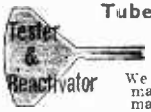
Tube Tester and Re-Activator



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

Transistor Timer

All the parts for making transistorised Enlarging or Process Timer with constructional details. £2 10 -. plus 2'6 post and pkg.

Beginner's Superhet

All the components including metal chassis, valves, metal rectifier, coils, tuning condenser, etc., etc. required to build the "Beginner's Superhet" as described in the January issue, are available as a parcel. Price £3, plus 3 - post and ins.

Condenser Tester and Re-Activator

This unit tests condensers under correct working conditions at proper voltages, it can also be used for "reforming" electrolytics. All basic parts and full instructions, 50 -, plus 2 6 post and ins.

Band III Converter

Suitable Wales, London, Midlands, North, Scotland, etc. All the parts including 2 EF90 valves, coils, fine tuner, contrast control, condensers, and resistors. (Metal case available as an extra.) Price only 19/6, plus 2 6 post and insurance. Data free with parts or available separately 1/6.

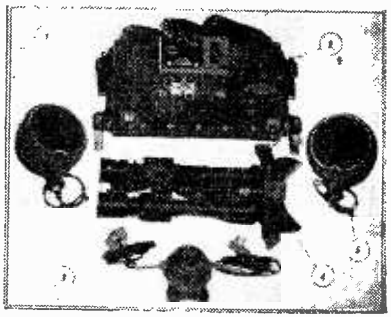
Making a Solder Gun

A 7-second solder gun of the type costing £3-£4 was described in Prac. Mech. Only two essential parts are required—(a) transformer and (b) push switch. These we can supply at 13 6, plus 2/- post. The rest of the parts you will have in your own "junk" box. Copy of the article concerned given free with the kit.

A.C./D.C. Multimeter Kit

15 Basic Ranges

Measures A.C. D.C. volts, D.C. current and ohms. All the essential parts including metal case, 2in. moving coil meter, selected resistors, wire for shunts, range selector, switches, calibrated scale and full instructions, price 19 6 plus 2/6 post and in urance.



TABBY EQUIPMENT COMPLETE

Complete equipment for seeing in the dark, as fitted to Army vehicles for night driving, etc. Complete working equipment comprises: 2 Infra Red Radiators, adjustable binoculars, power pack for 6 or 12 volts, control units and inter-connection cables. Original cost probably around £100. Unused and in perfect order—**£10**, plus 10 - carriage and insurance. Mains power pack, £4 extra.

PUBLICATIONS FOR CONSTRUCTORS

Title	Short Description	Price of data
Car Starter Charger	A 6-12 volt 5 amp battery with overcharge position.	1 6
Chimelite ...	Door chimes and hall light combined.	2'-
I.T.A. Converter	A two valve unit suitable for converting any type of television.	1 6
Crispian	Four valve all dry battery portable.	1 6
Economy Amplifier	Cheapest possible 3 valve mains amplifier.	1 6
Skysearcher ...	Cheapest possible 2 3 valve mains receiver for medium wave.	1 6
Economy Three...	Three valve battery version of the Skysearcher.	1/6
F.M. Tuner ...	Good unit quality tuner based on the original Radio Constructor circuit.	1 6
Mini Radio ...	Four valve mains T.R.F. medium and long wave.	1/6
A.C. D.C. Multimeter	15 range test meter for A.C. and D.C. volts, ohms and milliamps.	1 6
Simplex	The simple transistor receiver for headphones.	9d.
Transistor Timer	For photographic and process timing.	£d.
Easy to Build T.V.	A modern set suitable for wide angle 14" or 17" tubes which can be assembled in an evening (only 24 solder joints to make).	3/6
Condenser Tester	Tester for all types of condensers, can also be used for reforming electrolytics.	£d.
C.R.T. Tester ...	A device for testing and re-activating television picture tubes.	9d.
Beginner's Superhet	A 4 valve mains operated receiver, simple to make and align.	9d.
Two Way Switch	Describes how to control a light from two points.	£d.
Moisture Operated Switch	Describes a switch which is operated by moisture.	9d.
Electric Blanket	Describes how to make a foolproof, waterproof electric blanket.	9d.
Anti-burst ...	Describes how pipes in lofts can be prevented from freezing.	9d.
Thermal Delay Switch	Gives circuits of process timer, sequence switch, overload relay, smoke control, etc.	9d.
Solder Gun ...	Shows how to make a 7 second solder gun.	9d.

Special Offer: All the above booklets and pamphlets, 12 6 or any ten at half price.

Hi-Fi SNIP Infinite Wall Baffle

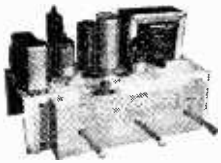
Nicely veneered and polished. Corner fitting tattaches to picture rail). Takes up no floor space. Gives really fantastic result with only low-priced 8" speaker. Fitting for tweeter. Only 45 - each, carriage and insurance 3 6.

Yours for 10/- Down and 17 weekly payments of 10/- or cash price

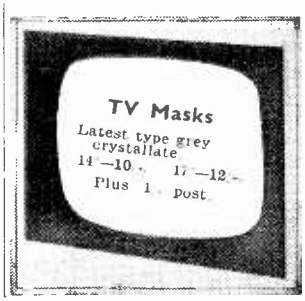
£8.10.0

The latest most up-to-date Record Player made by the famous B.S.R. company. Using Hi-Fi Crystal Pick Up and fitted with every modern device. Definitely a record changer which will give years of trouble-free music. Not surplus but the current model. Price £8/10/- or 10/- deposit and 17 weekly payments of 10 -, carriage and insurance 2 -.

Guitar Amplifier operates directly from A.C. mains—high-fidelity.



3-valve 4/5 watt with frequency response better than 40-15,000 c.p.s. Control panel size 8in. x 2½in. comes fixed to chassis but is intended for independent mounting. Separate bass and treble controls giving fullest variation of cut and lift. Separate switch, absolutely no mains hum. Remarkable value at £4 19 6 plus 3 6 post and ins.



ELECTRONIC PRECISION EQUIPMENT, LTD.

For prompt attention post orders should be sent to our Eastbourne address marked Dept. 5.

42-46, Windmill Hill, Ruislip, Middx.
Phone: RUISLIP 5780
Half day, Wednesday.

66, Grove Rd., Eastbourne, Sussex.
Half day, Saturday.

29, Stroud Green Rd., Finsbury Park, N.4.
PHONE: ARCHway 1049
Half day, Thursday

266, London Road, Croydon.
Phone: CRO 6558
Half day, Wed.

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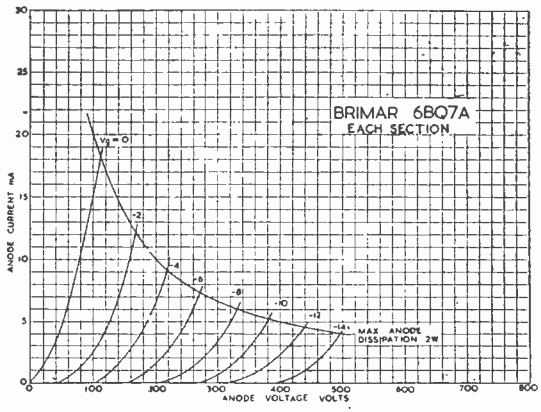
BRIMAR 6BQ7A

The Brimar 6BQ7A is a double triode consisting of two independent high slope sections with similar characteristics. The valve is particularly useful as a cascode R.F. amplifier for television receivers and also as a combined oscillator and mixer for frequency modulation receivers. It can, of course, be used wherever high slope triodes are required, and features low interaction between the sections as an internal screen is provided which is brought out to a separate base pin.



TYPICAL CHARACTERISTICS

Heater voltage	6.3 volts
Heater current	0.4 amp
Anode voltage	150 volts
Cathode bias resistor	220 ohms
Anode current	9 mA
Mutual conductance	6.4 mA/V
Amplification factor	39
Anode resistance	6,100 ohms
Grid cut-off voltage (I_a—10μA)	—10 volts approx.

Write to the Publicity Department for a data sheet.

Standard Telephones and Cables Limited **FOOTSCRAY SIDCUP KENT** **Footscray 3333**

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 1/9 extra under £2, 2/9 under £5. Open to callers 9 a.m. to 5.30 p.m. Sats. until 1 p.m. S.A.E. with enquiries, please. Full list 6d.; Trade list 5d.

R.S.C. TRANSFORMERS

Fully Guaranteed
Interleaved and Impregnated.
Primaries 200-230-250 v. 50 c/s screened

TOP SHROUDED DROP THROUGH

260-0-260 v 70 ma, 6.3 v 2 a, 5 v 2 a ... 16/9
350-0-350 v 80 ma, 6.3 v 2 a, 5 v 2 a ... 18/9
250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a ... 23/9
350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a ... 23/9
350-0-350 v 150 ma, 6.3 v 4 a, 5 v 3 a ... 29/9

FULLY SHROUDED UPRIGHT

250-0-250 v 60 ma, 6.3 v 2 a, 5 v 2 a Midget type 21-3-3in. 17/9
250-0-250 v 100 ma, 6.3 v 4 a, 5 v 3 a ... 26/9
250-0-250 v 100 ma, 6.3 v 6 a, 5 v 3 a for R1355 Conversion 31/-
300-0-300 v 100 ma, 6.3 v 4 a, 5 v 3 a ... 23/9
350-0-350 v 100 ma, 6.3 v 4 a, 5 v 3 a ... 23/9
350-0-350 v 150 ma, 6.3 v 4 a, 0-4-5 v 3 a... 33/9
425-0-425 v 200 ma, 6.3 v 4 a, C.T. 6.3 v 4 a, C.T. 5 v 3 a 49/9

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, 8/11; 6.3 v 6 a, 17/9.

CHARGER TRANSFORMERS

200-250 v 6-9-15 v 1½ a, 11/9; 0-9-15 v 3 a, 16/9; 0-9-15 v 5 a, 19/9; 0-9-15 v 6 a, 22/9.

OUTPUT TRANSFORMERS

Standard Pentode 5,000 to 3 ohms ... 4/9
Small Pentode 5,000 to 3 ohms ... 3/9

SMOOTHING CHOKES

250 ma 5 h 50 ohms 11/9
100 ma 10 h 250 ohms 8/9
80 ma 10 h 350 ohms 5/6
60 ma 10 h 400 ohms 4/11

SELENIUM METAL RECTIFIERS

B.E.C. 300 v 250 ma, 12/9; 120 v 40 ma, 3/9
6/12 v 1 a F.W., 4/11; 240 v 50 ma, 4/11; 6/12 v 2 a F.W., 8/9; 6/12 v 4 a, 14/9; 250 v 80 ma, 7/9; 6/12 v 6 a F.W., 19/9; 6/12 v 10 a, 25/9; 6/12 v 15 a, 35/9; 24 v 2 a, 14/9.

CO-AXIAL CABLE 4in.
75 ohms 14/36 ... ... 8d. yd.
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5Y3G	7/9	6SN7GT	8/9	EF80	8/9
6J5G	4/9	6L6G	11/9	EF36	4/9
6K8G	9/9	807	7/9	EL32	3/9
6S7JGT	6/9	12A6	7/9	EL84	10/6
EF39	5/9	15D2	4/9	EL91	5/9
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Practical Television

& TELEVISION TIMES

Editor : F. J. CAMM

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CONTENTS :

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TELEVIEWS

THOSE SURGICAL PROGRAMMES

WITH all the wealth of subject matter available to those responsible for selecting our TV programmes, it is surprising that the BBC should have to visit the operating table for material. The programmes showing how various operations are carried out are, in our view, in very bad taste. They are unwanted and may indeed have the effect of scaring off those who should undergo operations. Not so long ago, there was a programme demonstrating painless childbirth, and before that a series of programmes showing how a woman could reduce excessive avoirdupois by dieting. Naturally, this raised a storm amongst the doctors and surgeons, and it has yet to be demonstrated that the public want them. There may be a few with hypochondriac tendencies who enjoy the glint of the surgeon's knife but it can be of no possible real interest to the public at large to witness, say, an operation on the heart.

TV—THE TIME-WASTER!

ACCORDING to the President of the Westinghouse Broadcasting Company, who recently addressed a conference the average American spent five hours, seven minutes, every day of the week throughout the year with his TV set—in other words a total of 35 hours, 49 minutes per week. The object of the conference was to draw attention to the point of view that the average American pays more attention to TV than to his work. The average American is paid for a 40-hour week, which said the President is reduced by more than 4 hours by coffee breaks and other interruptions. The comment, however, proves nothing.

TV AND MOTOR OFFENCES

DURHAM has installed TV apparatus so that the officers on point duty can observe whether traffic is obeying the traffic lights and recently a motorist was fined and summoned on the evidence of the TV camera. It might be thought by some that it would be almost impossible for a policeman watching a black and white screen to distinguish between red, green and amber, and such evidence, like that of the electronic timing devices for timing motorists exceeding the speed limit, is in our view not irrefragable. It is open to serious doubt.

However, the police are tending more and more to make use of modern scientific developments; photographs, tape recordings, and finger prints now frequently figure in court evidence. As far as the television camera is concerned, its angle can make a great difference to what appears on the screen.

Scientific developments, however, should not be warped to make it impossible for an accused person to bring rebutting evidence, and we must be careful not to place too much power in the hands of the police.—F. J. C.

Our next issue, dated May, will be published on April 22nd

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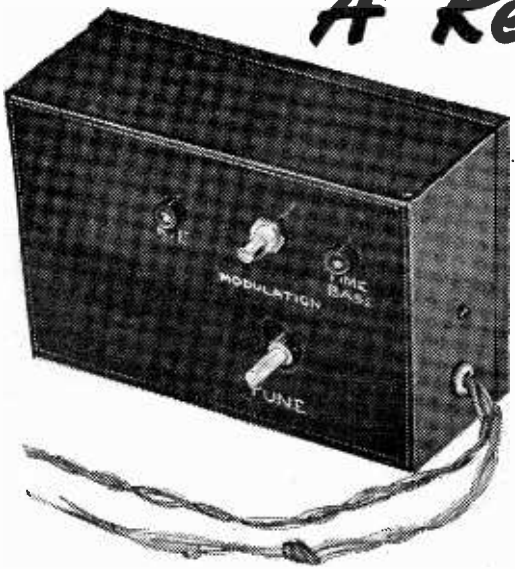
A Response Curve Generator

ANOTHER INVALUABLE TEST SET FOR THE SERVICEMAN OR EXPERIMENTER

By D. Bowman



MOST experimenters in television are concerned with picture definition, and it can be a tedious business seeking it without suitable equipment. Here is described a cheap and efficient apparatus which, with the aid of an oscilloscope, will enable the constructor to be sure of one factor at least—the important one of "response curve"—in his circuit adjustments.

The aim of the designed circuit is to produce an oscillator which can be varied in its frequency so as to sweep through the nominal intermediate frequency of the I.F. amplifier. In order to show the response curve of the receiver on the face of the tube of an oscilloscope, the output of the oscillator is connected to the input of the amplifier, and the voltage developed at the detector is fed to the Y plates of the oscilloscope tube—amplified as necessary. If the timebase generator is set to a low speed—say, 10 sweeps per second—and the oscillator is swept through the I.F. at the same speed, the response curve of the amplifier appears on the end of the C.R.T. A moment's consideration will show the reason for this. Away from resonance the amplifier is off tune and only a small voltage is developed at the detector. As the generated frequency approaches the tuning point of the amplifier the detector voltage will increase, and since the spot will have moved (towards the centre of the trace, normally) it will be deflected vertically. At the point of resonance—if a single tuned circut is taken as the simplest example—maximum voltage is developed at the detector, and the spot on the tube face suffers maximum deflection. As the generated oscillations increase in frequency, off-tune conditions are again met and the deflection of the spot decreases. Fig. 1 shows a typical trace curve for a single circuit.

Conditions of Design

Certain conditions have to be met in the design of such a "wobbulator." First, there must be automatic means of sweeping the oscillator frequency though the nominal I.F. of the amplifier. Second, this process must repeat at a high enough rate to show an apparently continuous trace on the C.R.T. The third condition is that this must not be done at too high a rate, otherwise the tuned circuits, if highly selective, cannot respond in time and a distorted trace results. Five to 10 traces a second is good enough, and with large-band-width amplifiers 50 per second will do, though it is really too high a rate of sweep. In the fourth place, the oscillator must swing completely through the I.F., and where considerable band-widths are involved this is a limiting feature of design.

The timebase generator of the oscilloscope will produce a linear sawtooth voltage, and if this can be caused to produce a considerable linear variation of oscillator frequency, the problem is solved.

The writer tried several methods of varying the oscillator frequency before settling on the present circuit. The normal method, using a "reactance valve" proved to have two faults at the usual television I.F.—it was impossible to get a large enough sweep without generating at a low frequency and multiplying up, and also the variation of frequency was not linear with a linear sawtooth voltage. The use of a Miller valve across the oscillator tuned circuit gave a better sweep, but the frequency change was not linear. In both cases four or five valves would have been needed to give reasonable results, because of the correction involved. The mechanical method is attractive—using a motor-driven variable condenser to tune the oscillator—but it is a little unreliable, and does not lend itself well to low speeds of "wobbulation." It is, moreover, not elegant.

The Circuit

The circuit eventually adopted is shown in Fig. 2.

V1 and V2 together comprise a multivibrator of low output. It does not give a rectangular wave-form because of this, and because of the fact that it is "locked" to a tuned circuit consisting essentially of L2 and C2 in series. It thus resembles closely a Franklin oscillator. (C1 is merely a H.T. blocking condenser.)

The timebase voltage, at about 20-30 volts, is fed to the suppressor grid of V1. The action can be visualised as follows: the actual analysis is complex.

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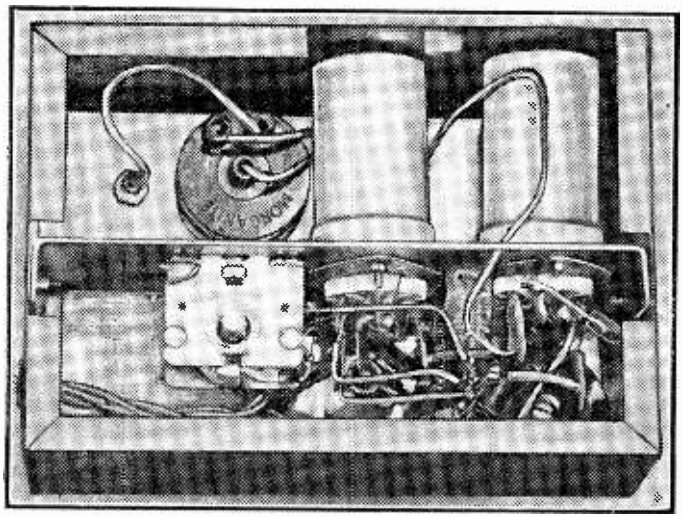
Consider the suppressor of V1 very negative; then all the valve current is diverted to the screen and L1 (which is coupled closely to L2), is virtually open-circuited and has no action on the tuned circuit L2C2 apart from its capacitance. Thus the oscillatory frequency of L2C2 is almost unaffected by L1. Now if the suppressor becomes positive the cathode current goes nearly all to the anode and thus flows through L1. This is now an active part of the tuned circuit because of its mutual inductance with L2; the frequency of oscillation therefore changes. Since the degree of effective coupling between L1 and L2 varies with the suppressor grid voltage, the time-base voltage on the suppressor varies the frequency of oscillation.



A view of the interior of the generator.

Construction

The construction is simple enough and calls for no special precautions other than those usually adopted when circuits have to cope with frequencies of 10-50 Mc/s. The components shown should, of course, be of good quality and low loss. All condensers below 500 pF. in value should be of mica or ceramic manufacture. With the coils L1 and L2, as now described, the fundamental frequency of oscillation is about 8 Mc/s. but can be varied to about 14 Mc/s. Up to the fifth harmonic can be used effectively, and thus the following ranges are covered:

8-14 Mc/s 32-56 Mc/s
16-28 Mc/s 40-90 Mc/s
24-42 Mc/s

If the higher harmonics are not prominent enough, the anode resistor of V1 can be increased to, say, 100 ohms.

L1 and L2 both consist of 14 turns of 24 s.w.g. enamelled copper wire, close-wound on a 0.4in. Aladdin former with an iron dust core. L2 is wound on top of L1, with an insulating layer of Sellotape between. The cathode end of L2 should be directly next to the anode end of L1.

Adjustment

Adjustment is simple. First, a meter is inserted in the cathode lead of V1 (i.e., in series with the 5K resistor) and the standing bias on the suppressor is varied until the valve current is minimum. This is not a critical adjustment, and if preferred this control can be dispensed with, using a 2.2K resistor instead of the 5K in the cathode lead; in this case the suppressor grid lead is returned direct to earth.

Next, setting the variable condenser C2 at about half its travel, adjust the core of L1-L2 until the frequency generated is about 9 Mc/s, the sweep control R5 being set to zero. The wobbulator is now ready to use.

The only connection not shown in Fig. 2 is that between the amplifier detector and the oscilloscope. For this, a 10K resistor should be attached to a flex lead; the other end of the resistor is connected to the diode anode or the volume control slider, and the free end of the flex connected to the Y-amplifier input of the oscilloscope. The 10K resistor will avoid instability due to the connection, and if

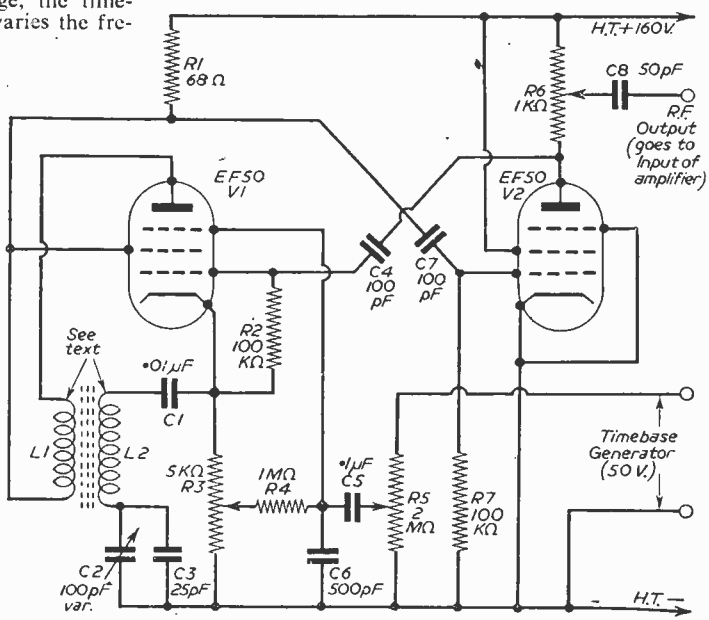


Fig. 2.—Theoretical circuit used in this Response Curve Generator.

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this is not enough. try a screened lead or increase the value, up to 500K if necessary.

It should be noted that the response curve may easily come out "the wrong way up"; it depends on which way round the diode detector is connected. Leaky-grid detectors always come out wrong way up. This is no disadvantage.

This instrument will give, with a close coupling between L1 and L2 and an iron core well inserted, as much as 30 per cent. frequency deviation. This will give a band-width cover ample even on the lowest frequencies. and much more than enough at the modern television I.F.s of 30-40 Mc/s.

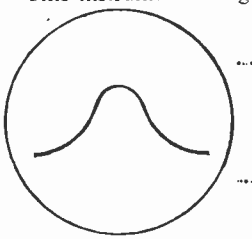
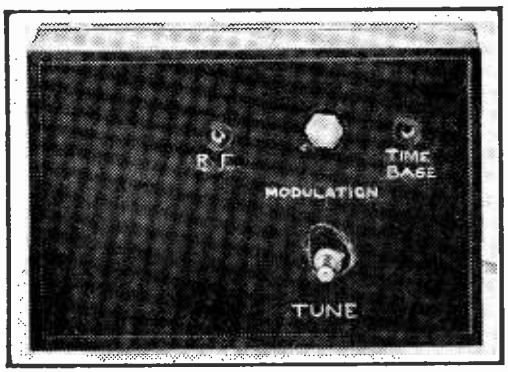


Fig. 1.—A typical trace curve for a single tuned circuit.



A general view of the finished unit.

Finally. the circuit is adaptable, by the substitution of an A.F. amplifier for the timebase input, for frequency-modulation of the oscillator by speech or music. This is, of course, for the idle minutes when the job of lining up the TV is completed!

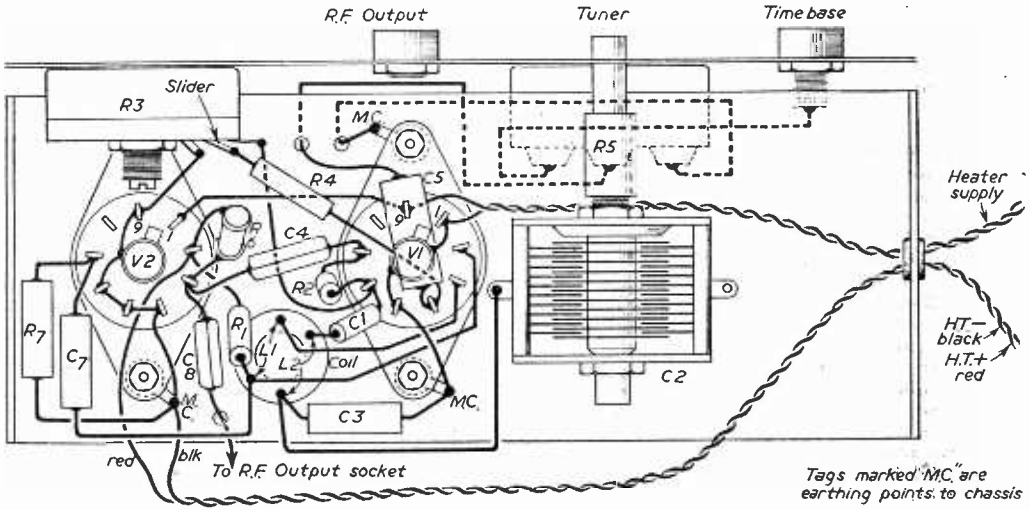


Fig. 3.—Wiring details of the generator. Note that C6 has been omitted for clarity and R6 was a fixed resistor in the original.

An Aerial Point

Band Width of Aerial

A SIMPLE dipole for television is dimensioned to be resonant at about 1.5 Mc/s below the vision carrier frequency. This is done so that the television signal will be spread evenly on either side of resonance. When, however, additional elements are added to the aerial this band width decreases. With an H-type dipole it will not decrease sufficiently to be noticeable, but with multi-element arrays it can be serious. In fringe areas this has, unfortunately, to be tolerated, as picture resolution is the most important point. In other areas, therefore, it is best not to use more directors on the aerial than are absolutely necessary for good picture resolution.

Quite a few of the additional BBC stations on Band I are horizontally polarised. Among these are Divis (N. Ireland), Rosemarkie, Inverness, Londonderry (N. Ireland), Dover, Tacolneston, (Norwich), Blaen Plwy, Meldrum, Aberdeen, Carlisle, Jersey and Pontop Pike. Horizontal areas are as directional as the vertical type, at right angles to the dipole. They are, however, more so than the vertical, even without reflectors or directors. Within a reasonable distance a horizontal dipole should give a good signal with just a reflector. The impedance is approximately 70 ohms.

Losses Other Than Through Mismatching

Attenuation in all feeder cables increases with the frequency. It is therefore often necessary to use special low-loss coaxial cable; this applies especially to fringe areas.

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Constructing "H" Aerials

HOW TO MAKE YOUR OWN SIMPLE AND MULTI-TYPE AERIALS FOR BAND I

MANY requests are received every day for details of construction of television aerials and the information is obviously beyond the scope of a letter. We have given many articles on this subject, but all back numbers are out of print and in response to the very many requests we are reprinting below the main details for making an "H" aerial. For those who require a single dipole, of course, it is only necessary to ignore the reflector portion of the standard H-type aerial, and cut out the crosspiece. The remaining details relating to the aerial dipole itself will then hold good.

The dipole and reflector, or H-type aerial, is, of course, the most generally useful, and even on fringe areas is capable of good results, and the construction of this type will be dealt with first.

The cost of the prototype aerial was 4s., the feeder 15s. and the chimney brackets a further 4s. This was accomplished by buying the necessary metal from a scrap dealer, where it is sold by weight, the insulating material being bought from government surplus stores. Although this was drilled, the holes were, after assembly, packed with Bostik glazing compound.

Design

Dealing first with the technical side of the design, refer to Fig. 1. The length (a) is a function of the wavelength and is obtained as follows:

(a) = 1.56 × M. (in feet) where M is the wavelength in metres. (Vision channel.)

or

$$(a) = \frac{467.4}{f} \text{ (in feet)}$$

where f is the frequency in kilocycles. (Vision channel.)

For all practical purposes this works out as follows: Channel 1, 10ft. 6in.; Channel 2, 9ft. 2in.; Channel 3, 8ft. 6in.; Channel 4, 7ft. 6in.; Channel 5, 7ft.; and this is the total length of the two halves of the dipole element.

The reflector (b) should be slightly longer than the dipole, and is normally .51 of the wavelength.

The dimension (c) is not quite so critical, and is usually fixed by mechanical considerations. The gain obtained by the use of a reflector is affected only slightly by variation of its spacing from the dipole between one-eighth and one-quarter of a wavelength, but, since the curve depicting this gain slopes rather steeply below one-eighth, there is more likelihood of a "flutter" through vibration of the elements with one-eighth spacing.

Construction

Turning to constructional matters, (a) and (b) are of ⅜in. dural or aluminium tube, (c) is of ⅞in. tube, again dural or aluminium. The mast can be of wood or metal, but 1¼in. dural tube was used in the original model, a 10ft. mast being used. Aluminium should not be used on the Channel 1 aerial, as the greater size imposes a greater strain on all elements.

First cut the tubing to size: two lengths ⅜in. diameter, 3ft. 9in. long; one length ⅜in. diameter, 7ft. 9in. long; one length ⅞in. diameter, 3ft. 10⅞in. long.

The mast should be not less than 1¼in. diameter and about 10ft. long.

Each end of the tubing should be plugged with either wood, ebonite or aluminium, and one end of each of the dipole lengths similarly treated. The opposite ends of these two tubes should be cut as shown in Fig. 2, and drilled with a 9/64th drill 1⅛in. from this end. An elongated ¼in. diameter hole should be drilled and filled in the centre of the ⅞in. tube.

The next step is to cut out the pieces of insulating material shown in the exploded view (Fig. 4). The best method of doing this is to cut out the pairs together, so that identical dimensions are assured. The holes in each set should be drilled with the four pieces clamped together. Note that in one set additional centre holes are required and that these are smaller than the outer.

The two dipole lengths are then positioned and bolted with 4 B.A. bolts through the holes already drilled. There should be a ⅜in. gap in the centre between the ends, and the cutaway portion faces the front. Making sure that the tubes form a straight line, drill the 7/64th holes from the paxolin into the tube, and fix *one side* of each tube with a 6 B.A. steel bolt and nut, and file

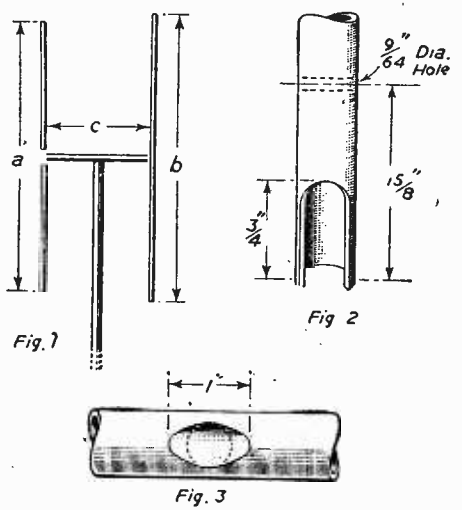

Fig. 1.—Standard "H" aerial with main measurements indicated. Fig. 2.—The lower ends of the aerial are cut as shown here. Fig. 3.—Centre of the crosspiece.

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off any of the bolt projecting through the nut inside the tube.

The reflector length is then fixed centrally in the other set of paxolin insulators and, after drilling through from the paxolin, bolted by 4 B.A. bolts, two only being necessary. This can now be fixed to the crossbar by 4 B.A. bolts, a $\frac{3}{8}$in. gap being left between the reflector tube and the end of the crossbar. Fix by one bolt

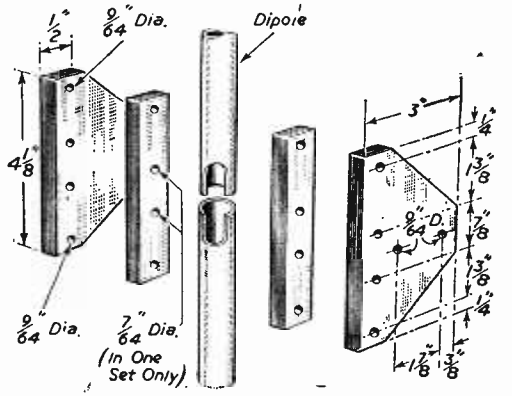

Fig. 4.—Essential details of the clamp. Two sets of these are required.

first, set at right-angles *exactly* and tighten up this bolt before drilling the second. The elongated hole in the crossbar should be facing along the line of the reflector.

The dipole must now be similarly fitted at the other end of the crossbar, a $\frac{3}{8}$in. gap again being left, but great care is essential to ensure that it is perfectly in line with the reflector as well as at right-angles to the crossbar.

The mast fitting is the next step. Two 16 s.w.g. plates of aluminium or light alloy are used, with packing pieces of either metal or paxolin between them and the $\frac{1}{8}$in. crossbar, to make up the difference between this and the mast. The run of the cable, shown dotted, makes it necessary to position the front fixing bolt off the centre of the crossbar. Four 2 B.A. bolts are used here, and again care is essential to line up the mast with the aerial assembly (see Fig. 5).

The mechanical construction complete, the coaxial cable, which should be of 75-80 ohms impedance, must be fitted. In the original model 30 yd. were fitted, and this proved to be sufficient for most needs. It is necessary to remove the dipole element from the crossbar by removing the two 4 B.A. bolts passing through the crossbar, and also to remove the mast, leaving the fixing plates attached to the crossbar. The cable must then be threaded through the mast, and via the elongated hole through the crossbar, until a foot or two projects at the dipole end of the crossbar. Strip off about an inch of the rubber sheathing, and with a pointed instrument unpick the metal sheath up to the rubber. Twist this together and solder a 6 B.A. tag to it. Bare about $\frac{1}{2}$in. of the inner conductor and solder a similar tag to this, taking care not to melt the insulation. These tags are now fixed to the dipole by means of the unused 7/64th holes in the ends of the elements. 6 B.A. bolts are used, passing through the paxolin and elements. Since there are already nuts at the opposite side of the tube, the bolts must be cut to length first, leaving room for the tag and a 6 B.A. nut.

The inner conductor goes to the upper element and the metal sheath to the lower.

Carefully reassemble the aerial, drawing the cable back slowly and making sure it is clear of all bolts passing through the tubes.

To render the assembly weatherproof, give all the connections a few coats of shellac, and from $\frac{1}{4}$in. paxolin, cut covers for the dipole and reflector assemblies and fix by 6 B.A. brass screws into tapped holes in the edges of the $\frac{1}{4}$in. paxolin, as shown in Fig. 6. The top and bottom covers are drilled $\frac{1}{8}$in. and slipped over the elements. Before screwing the covers in position, coat the edges of the $\frac{1}{4}$in. paxolin with Bostik, and spread this liberally around the elements where they will protrude. The gaps about the crossbar can also be packed with this material.

Chimney Lashings

These can be made quite cheaply from light 1in. angle iron, again obtained from a scrap dealer. Dimensions obviously depend upon the chimney stack, but the work can be completed ready for fitting by counting the bricks used in the stack and measuring this on the outer wall of the house. The 5/16in. drawbolts used will allow up to $\frac{1}{2}$in. adjustment in either direction on all dimensions. Figs. 7 and 8 show the essential details.

The drawbolts should be about $1\frac{1}{2}$in. long and threaded at least 1in. of their length. The upright angle pieces are about 9in. long and spread the strain over the corner of the brickwork. They are held in position by the frame itself. One frame gives sufficient rigidity with the lower channels, but possibly two will be necessary for the larger Channel 1 array. The bracket to which the mast is bolted is also of 1in. angle iron and must be heated to red heat to bend in a vice, and again heated to hammer out any kinks resulting from bending. It should be about 12in. between the fixing arms, and the arms should be kept as short as possible so long as the mast clears any buttress round the

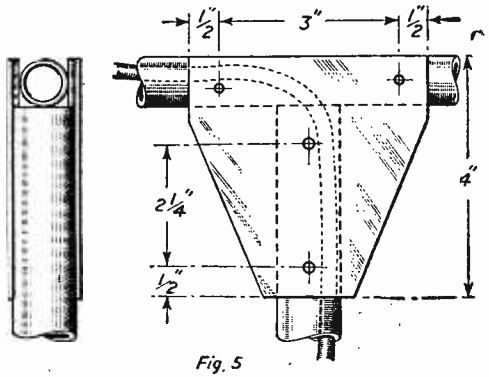

Fig. 5.—The centre clamping piece.

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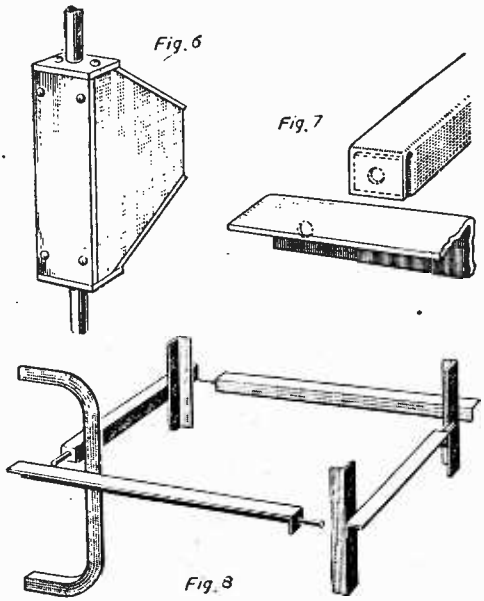
top of the chimney stack. The mast is fixed by two saddle clips and a bolt through the top clip passing through clip, mast and bracket.

General

It should be realised that the diameter of tubing used is dictated entirely by mechanical considerations. More fragile tubing would not withstand



Figs. 6, 7 and 8.— Further clamping pieces and details of a suitable chimney lashing.

the rough weather, and, although a greater diameter for dipole and reflector elements would increase the bandwidth, the result is hardly likely to be noticeable, and the increase would also mean a proportionate increase in crossbar and mast to support the array. Weight is not the main factor, but wind resistance, which increases out of proportion to weight. This is, however, the only limiting factor, and the constructor can adapt the design to available material provided a margin of strength is allowed. The ¼in. paxolin is capable of supporting any practical array without danger.

Noise

One final point, and one which has been troubling many listeners, is the question of noise. If the aerial is erected in a very open position it may be found that in high winds it hums and the noise seems to be amplified in the rooms of the house on the side adjacent to the aerial. In the majority of cases this may be prevented by filling the aerial with some light packing material, such as powdered cork, sawdust, etc. A plug should be cut and fitted firmly in the lower ends of the aerial and reflector after assembly, and then the material poured in at the upper end, after which a further plug should be inserted and painted with shellac or similar weatherproof material.

Although the H-type aerial just described is, without doubt, the most popular and generally useful type, occasionally the need for something slightly better is felt, either from the viewpoint of signal pick-up or, as in most cases, interference rejection.

In some situations ignition and other interference are prolific, and experience has shown that although signal strength is such that nothing like full gain is needed to provide a good picture, the programme value suffers from this interference. Vision and sound limiters reduce the effect to negligible proportions in the case of sound, but cutting of whites and tearing of lines on vision make an alternative desirable. The H-type aerial just described may, in such cases, be converted to a triple array, with surprisingly effective results.

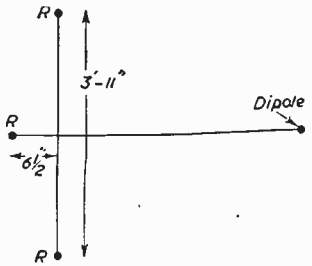


Fig. 9.— General arrangement of the complete aerial system.

The addition does not necessitate any drastic alteration to the existing aerial and can be applied to any H-type with suitable connections for spacing of the elements. The 1¼in. mast will, however, be found to be too flexible for the weight of the new array. If a wooden mast or stronger tube has been used, it is possible that no alterations will be needed even here, but, if not, the expedient described later is

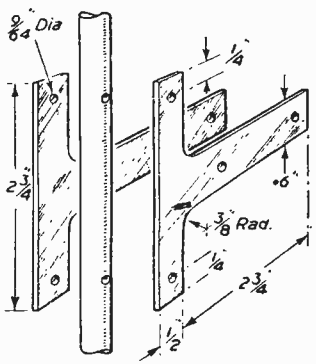


Fig. 10.— Details of the clamping pieces.

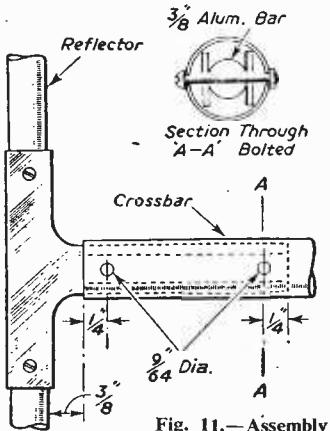


Fig. 11.— Assembly details for reflector support.

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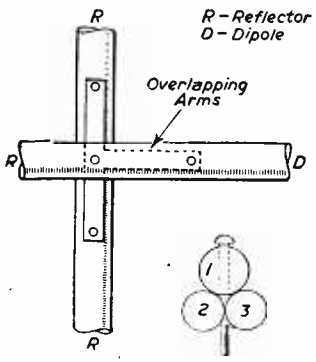
quite satisfactory, can be carried out without dismantling, and results in a very strong assembly.

Design

This array has two additional elements spaced the same distance from the dipole as the original reflector and half that distance from the existing reflector. In other words, referring to Fig. 1 on page 409, the three reflectors are each positioned on an arc, radius (c) centred about the dipole. The correct dimensions for the fitting of these can be determined mathematically, but a far simpler method of sufficient accuracy and more attractive to the non-mathematically minded is to make a scale-drawing of the assembly and take the required measurements from this. For 4ft. spacing between reflector and dipole this will show that the two additional reflectors should be 3ft. 11in. apart and 6½in. forward of the existing reflector.

Since it is impracticable to build a triple reflector Chanel 1 aerial using quarter-wave



Figs. 12 and 13.—Underside view of the junction and mast strengthening arrangement.

spacing, i.e., 5ft. 6in. between dipole and reflector, it is necessary to use these dimensions for this array also.

The materials required for the addition are as follows (for Channel 2):

One length ⅞in. diameter aluminium or dural tube 3ft. 9⅞in. long; two lengths ⅝in. diameter aluminium or dural tube 7ft. 9in. long; two lengths ⅜in. bar aluminium or dural tube (square or round); ⅛in. paxolin or bakelised fabric sheet (4in. × 8in. approx); mast (see text).

The two additional elements are plugged at each end and are fitted by paxolin insulators to the ⅞in. crossbar, which is then bolted on top of the existing crossbar 6½in. from the centre of the reflector. The plan view in Fig. 9 makes this clear. The sizes for other channels can be ascertained from the formula and the above working.

A simplified fitting for the reflectors of this array has been devised and can be used for the original reflector, if desired, with a saving of both labour and weight. This fitting has functioned perfectly, even when snow-covered, and is thus quite as efficient as the one previously described. The dipole itself, of course, must be left as before. The exploded view in Fig. 10 explains the construction, whilst Fig. 11 gives additional information. As will be seen, the paxolin fastens inside the crossbar instead of outside as before, is only ⅛in. thick instead of ¼in., and the packing between the element and this is dispensed with. Note (Fig. 11) that the edges of the paxolin are rounded to fit snugly into the crossbar. It is important that these fit tightly. Mechanical strength is ample for ⅜in. light alloy tubing.

The paxclin T-pieces should be fitted to the crossbar first, but not drilled or bolted. They should be tight enough to stay in position when the ⅜in. bar packing is in position between them. The elements can now be fitted to these T-pieces by the two 4 B.A. bolts, fitting one bolt before positioning the reflector exactly at right-angles to the crossbar and drilling the second fixing hole. Note that the T-pieces are *not central* but ⅞in. off centre, as the assembly lies above the existing ⅞in. crossbar.

This done, the T-pieces can be correctly positioned to give ⅜in. gap between reflector and the end of the crossbar and drilled and bolted in position by 4 B.A. bolts, taking care when fixing the second that it is perfectly in line with the first. The fitting of this structure to the H array follows and is the most tricky part of the assembly, particularly where no bench drill is available. However, if the following procedure is followed, accuracy is ensured.

First drill a small hole (⅛in. diameter is suitable) in the centre of the new crossbar in line with the reflectors and perfectly upright. Screwing the vice to a pair of step-ladders is a useful tip in view of the possibility of damage to the elements. A piece of ⅛in. rod inserted will enable the accuracy of drilling to be checked by set-square and sighting with the reflectors, and a small round file can correct errors in opening the hole to take a ¼in. bolt 2¼in. long. Similar accuracy and methods are necessary in drilling the H array 6½in. forward of the centre of the reflector.

The new assembly should then be bolted in position, the longer ends of the reflectors downwards, and the nut tightened just sufficiently to hold the assembly rigid. If its natural position is such that it tilts in any direction, correction is still possible. The ¼in. bolt will be found to have a square on the underside of the head which must be accommodated, and the enlarging of the topmost hole to take this enables faults to be corrected.

Many methods will be obvious to prevent pivoting about this bolt, but surfaces for the wind to play upon should be avoided. Use is therefore made of two L-shaped steel plates from the local sixpenny store, arranged about the ¼in. fixing bolt and between the two tubes, the ends being fixed by 3/16in. bolts with the two tubes at right-angles. Fig. 12 is an underside view of the junction.

Mast

The original mast is too flexible for the additional weight. Several alternatives are open: first, a larger diameter mast, about 2in. should

(*Continued on page* 441)

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AN EHT MULTIPLIER

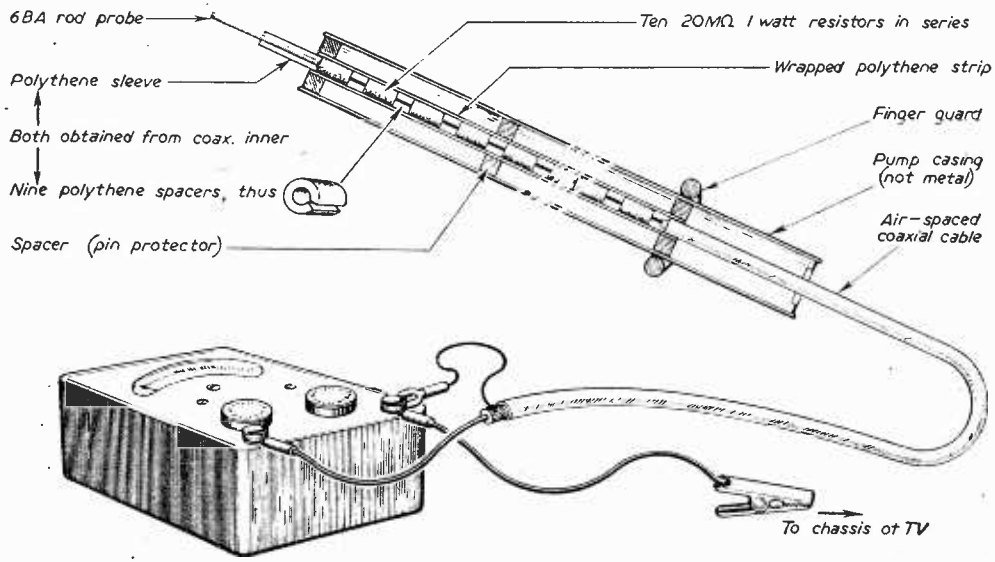
A SIMPLE, INEXPENSIVE DEVICE FOR AN EXISTING METER

By H. Peters

THE multiplier was originally constructed in order to calibrate a home-made kilovolter using an Avo 8, but has worked so well that in its present form it is used in preference to the former. It will read with 10 per cent. accuracy EHT voltages up to 12.5 kilovolt, and by applying a constant load regardless of the state of the tube it also gives a rapid indication of the EHT regulation. It can be clipped on to the EHT line so as to provide a constant reading whilst tests are carried out in other parts of the stage and is quite safe to handle.

In essence it comprises 10 one watt insulated resistors mounted inside a hollow plastic tube, which in our case is a discarded celluloid bicycle pump casing. For 20,000 ohm-per-volt meters, such as the Avo 8, the value of these resistors is 20 megohms each, whilst for the 10,000 ohm-per-volt meters the value is 10 megohms each. Although the wattage rating is thus at least 10 times greater than it need be, 1 watt resistors have been chosen for their length, to reduce the likelihood of arcing inside the multiplier. The resistor leadout wires are straightened, cut off a quarter of an inch from the body of the resistor, scraped, tinned and cleaned. The temptation to use paste flux at this stage is rigidly discouraged. The 10 resistors are then soldered together in a straight line, overlapping the leadout stubs and using the minimum of solder. At one end is soldered the probe, which in our case is a 3in. length of 6 B.A. brass rod and at the other end the leadout wire. This is made from about a yard of air-spaced low-loss coax, the outer braiding and PVC cover having previously been cut back an inch from the end and taped off. About 4in. is cut off the other end of this lead and the white polythene tube and spiral are carefully removed from this odd piece to make spacing washers to fit over the joints between the resistors. The odd 1¼in. remaining is then drilled free of the spiral, heated until pliant, and slipped over the probe end.

Starting at the taped off end of the coax, polythene tape is then bound firmly round the whole assembly and fastened off at the top with a turn of cellulose tape. Most radio dealers stock polythene tape, but if unobtainable, a thick polythene food bag can be cut down instead. Three polythene spacers are then slipped over the unit which is slid into the open end of the pump case coax first. The spacers used are blue pin protectors off noval based valves, and the upper one, which fits flush with the top of the tube is wrapped with a turn or two of insulating tape to ensure a snug fit. The bottom end of the coax is opened out to about 4in. and the inner and outer suitably terminated (i.e. with spade terminals if for use with the Avo 8). The inner is connected to the positive terminal of the meter and the outer to the negative terminal *as well as the normal croc. clip lead to chassis.* This ensures adequate screening right up into the multiplier, protecting the user against any fault which could develop. In the prototype a rubber ring was fitted around the outside at the point



Details of the multiplier and its connections.

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where the coax ended for no other purpose than to indicate the limit of safe handling.

Operation

In operation the multiplier has proved completely free from corona effects despite the fact that it has been hooked on to EHT caps for hours on end. It will read 10KV (± 10 per cent.) full scale deflection with the meter set to any of the lower D.C. volt ranges and 12.5 KV when used at the 2,500 volt terminal. This can be read directly off the Avo 8 using the 0-25 scale and dividing by two.

As a spark is drawn from the EHT terminal before the multiplier makes contact, the needle rises slowly and any voltage in excess of 12.5 KV can be detected before the meter is overloaded. On the majority of sets in good working order which were tested, the multiplier made negligible difference to the EHT regulation, as judged by picture shrinkage, but a low EHT rectifier was shown up immediately by the picture "blowing out" as the probe was applied. On a sample batch of identical new TV's variations of plus and minus 10 per cent. were measured on the EHT line, so there seemed little point in using resistors better than the standard "silver band" 10 per cent tolerance.

Mains derived EHT can be measured by the unit without damaging the rectifier as frequently happens when using a kilovolter, and the multiplier by itself is a convenient means of gently discharging the EHT line before working on the chassis nearby.

TV in Japan

TELEVISION is booming in Japan, where two systems, state and commercial, are operating in competition just as in Britain. Recently no fewer than 43 new stations were licenced, of which 36 are commercial. With the existing 16 stations and nine others about to open, this latest batch of licences will increase the national coverage to 68 stations. Japan will then rank second in the world in number of TV stations, although still far behind the 500 in the United States.

Commercial TV quickly proved its value as an advertising medium and bidding has been brisk for time on the Japanese programmes. The immediate success of the first commercial programmes has led to the great increase in number of commercial stations. The first, NTV, opened on August 26th, 1953, and the company quickly popularised TV by placing 220 receivers in railway stations parks and other public places. The present five commercial stations will soon rise to nine, while the latest batch of licences will bring the total to 45.

NHK, the Japanese Broadcasting Corporation, which opened its first Government-subsidised station in Tokyo on February 1st, 1953, has grown steadily to the present eleven stations, with five others soon to be opened and seven more now licensed, so their share will soon be 23 stations of the national total of 68.

When the first station opened in February, 1953, there were 866 families equipped with TV sets. Steady growth has brought the sets in use to near the million mark and production of receivers now runs at more than 50,000 a month. 14in. sets now cost about £40 and over 70 per cent. of the sets in use are of this size, with small numbers anything from 7in. to 27in. There are also over 10,000 kits of parts sold annually.

Programme Time

Programmes total about seven hours a day in morning and evening sessions and favourite items with Japanese viewers are Japanese films and plays, quiz games, Japanese wrestling and baseball. Much of the viewing is communal in clubs and bars. The break-down of the main daily programme items gives 2½ hours to entertainment, 1½ hours sport, 1½ hours culture and half-hour educational. The daily average is three hours studio programmes, two hours broadcasts from outside cameras and two hours films.

In Japan TV is regarded quite seriously as a visual educational medium. Ten schools were equipped with TV sets when the first station opened, but now well over 1,000 schools are receiving the special programmes. Of the latest batch of licences issued, one State and two commercial stations are licensed solely for educational programmes and all stations are at present planning longer programmes for students of all ages. It is anticipated that this will ease the present shortage of teachers.

The rapidity with which Japan's electronic industry mastered the prolems of manufacturing TV equipment is remarkable, industrial closed circuit TV is in increasing use and much research and experimental work on colour TV is under way. The first colour tests in Tokyo a year ago aroused intense interest.

Considering the low living standards and financial position of the nation, the very spectacular growth of TV in Japan is surprising and has aroused world-wide interest.

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Scanning & Synchronisation

8.—SYNCHRONISATION

By G. K. Fairfield

THE detected waveform of a television signal is shown in Fig. 55 where the carrier amplitude is seen to vary between 30 and 100 per cent. of its maximum value for the picture signal and fall to zero once every line for the synchronising impulses. In addition a series of wider pulses is transmitted at the end of every frame for frame synchronising purposes. It is necessary completely to separate the sync pulses from the picture content so that it is impossible for the timebase to be affected by the latter. Also some method is required to separate the line and frame pulses.

A simple diode circuit can be used as shown in Fig. 56, where grid modulation of the tube is used. The separating diode V2 becomes non-conducting when the signal exceeds about 1 volt more than the positive bias Eb and thus allows the negative sync pulses to be obtained across R2. This arrangement has several disadvantages, the most serious being the coupling of the picture signal, via the diode capacitance, to the timebases. This will be most evident when a white object appears at the right-hand side of the picture. The sudden transition from peak to 30 per cent. modulation will be transferred through the diode and cause premature firing of the timebase circuit; an effect sometimes known as "pulling on whites."

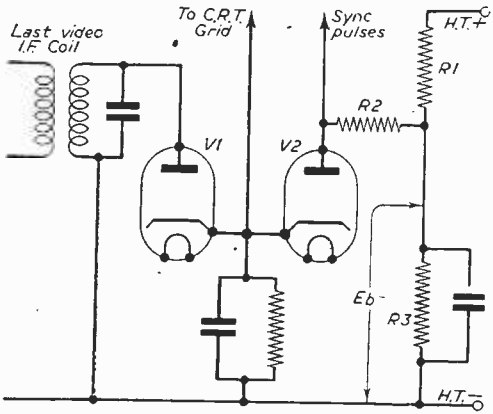

Fig. 56.—Simple diode sync-separator circuit.

Saturated Pentode Separator

The pentode circuit shown in Fig. 57 avoids this effect and finds wide use in receiver circuitry. By operating the valve with low values of anode and screen potentials a very short grid-base is obtained and by arranging that the incoming signal is positive for the synchronising signals (See Fig. 57) then extremely favourable conditions for sync separation are achieved. The valve is non-conducting during the negative picture excursion and negative amplified sync pulses appear across the anode load R1. Due to the polarity of signal applied to the grid, D.C. restoration is obtained by the grid and cathode of the valve acting as a diode and allows capacity coupling to be used from the preceding (usually vidio amplifier) stage. The capacitance between input and output is usually too small to cause the "pulling on whites" effect mentioned above.

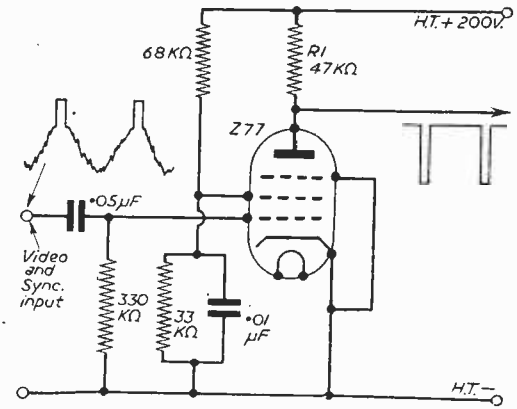

Fig. 57.—Saturated pentode sync-separator.

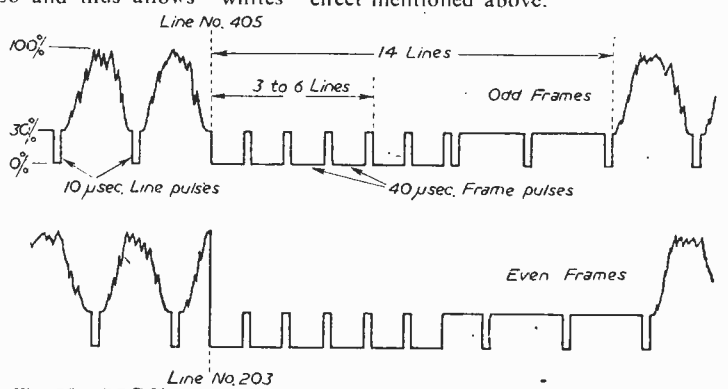

Fig. 55.—BBC Television Signal waveform showing the difference between odd and even frames.

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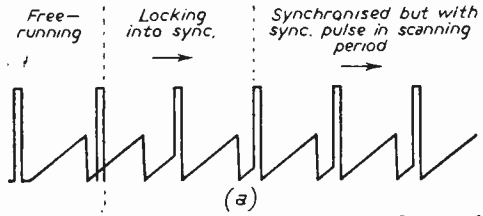
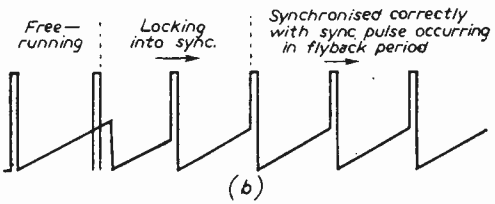
Mechanism of Synchronisation

Before going on to the question of frame sync separation it is worth looking into the actual way in which the timebase is synchronised, as this will often provide the clue to an otherwise inexplicable sync behaviour of the scanning circuit.

Consider Fig. 58 which shows the scanning and synch pulse waveforms present in the time-



(a) Oscillator frequency higher than sync pulse repetition frequency.



(b) Oscillator frequency lower than sync pulse repetition frequency.

Fig. 58.—Mechanism of synchronisation.

base circuit. If the free-running timebase frequency is slightly higher than that of the sync pulse repetition rate then the condition of Fig. 58 (a) exists. The circuit will adjust itself until successive waveforms are identical and a "double-stroking" effect will occur with the sync pulse present during the scanning period. Correct operating conditions are shown in Fig. 58 (b) where the timebase is set with its free running frequency slightly lower than that of the sync pulses. Here the oscillator gradually locks into sync with the pulse occurring during the flyback period.

Separation of the Frame Sync Signal

As the difference between line and frame sync pulses lies in their different duration then a pulse-width discriminator will be required. The simplest form of discriminator, which is used in a wide variety of frame sync circuits, is the integrating circuit in which the potential divider formed by R and the reactance of C reacts unfavourably to the higher frequency components of the input signal, attenuating these compared

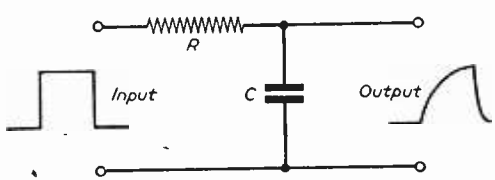


Fig. 59.—Integration of a square-wave.

with the lower frequency components (see Fig. 59). The result is the distortion of a square-wave input as shown, by an amount dependent on the relation between the pulse width and the CR time-constant.

With suitable choice of time-constant the capacitor C can be left with a charge at the end of a 40 μS period so that the successive frame pulses shown in Fig. 60 will charge C to a large potential V, compared with the smaller potential V resulting from the integration of a single line pulse.

A simple diode circuit can then be used to separate the two sets of pulses as shown in Fig. 61. The integrator circuit is included in the anode circuit to the pentode separator V1 and the coupling diode V2 set to clip at a level shown by the dotted line of Fig. 60 by the bias potentiometer R2R3. Only the clipped frame pulses are passed through the diode to the timebase circuit.

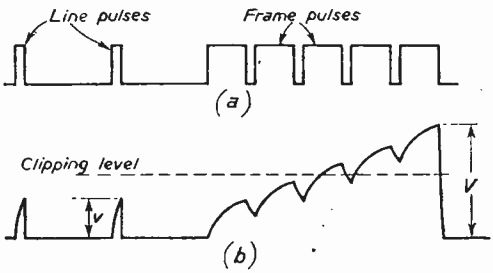


Fig. 60.—Integration of sync pulse train.

Interlacing

It is not merely sufficient, however, to provide the frame timebase with synchronising signals. Care must be taken to ensure that these arrive at the right time if interlacing of the two frames constituting the picture is not to be impaired.

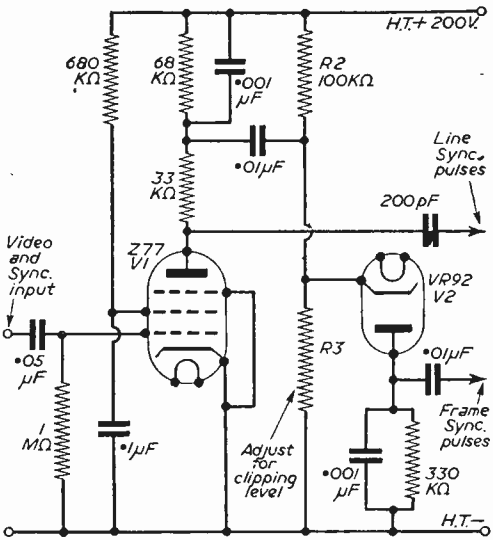


Fig. 61.—Sync separator with integration circuit and diode clipping valve.

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It is seen from Fig. 55 that the commencement of the two series of frame pulses differ in phase by half a line period, so that the frame flyback period will commence at the centre of the trace for alternate frames (Fig. 62), and if this position is varied then a good interlace will not be obtained. The integration method can suffer from this defect and if the complete series of pulses is integrated for both frames, the slope of the resulting waveform will be found to be slightly different (Fig. 63). This can cause the diode to clip at slightly different levels, resulting in a phase difference between successive frame pulses, of more than half a line period.

An improved method of using the integrator circuit is shown in Fig. 64. The composite line and frame pulses are passed to the first diode D1.

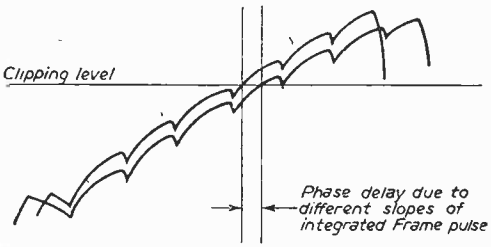

Fig. 63.—Integrated frame pulse trains for odd and even frames superimposed to show phase delay arising from their different slopes.

The time-constant of the cathode CR circuit is made comparable with the frame pulse duration, i.e., about 40 μS. During the line pulses (duration 10 μS), C is charged by D1 to a value V1 volts. The second diode D2 has its anode kept positive by potentiometer R2R3 at a potential slightly less than this and does not conduct. On arrival of the frame pulse, due to the longer duration, C begins to discharge through R and lowers the common cathode potential. D2 conducts and allows a negative frame pulse to be

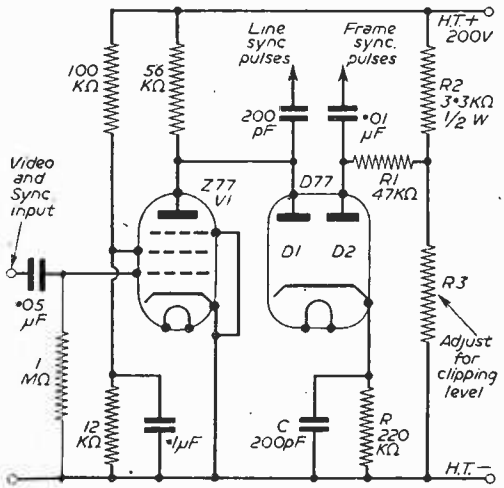

Fig. 64.—Pulse width integrator sync separator.

developed across R1. Adjustment of this circuit is best carried out whilst observing the waveform at D2 anode with an oscilloscope. As the potentiometer is adjusted to reduce D2 anode volts, so the line pulses between the larger frame pulses will be seen to reduce (Fig. 65); optimum conditions being realised slightly after they have been observed to disappear.

So far we have mentioned only accurate timing of the sync pulses as a means of securing good

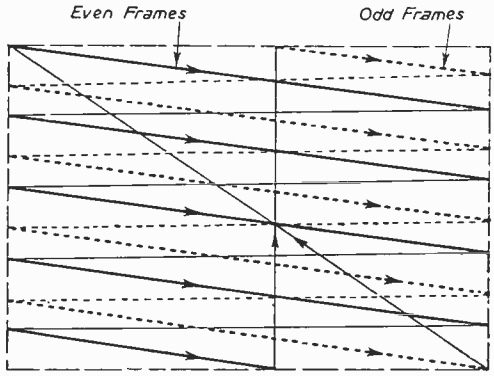

Fig. 62.—Interlaced scanning raster showing position of frame flyback during odd and even frames.

interlace. Several other features are necessary and an important one is to keep the amplitude of sawtooth generated by the frame timebase constant. Should this vary by only 0.25 per cent. from frame to frame then interlace will be completely destroyed.

The charging capacitor of the sawtooth voltage generator should have a high insulation resistance and even then care should be taken to ensure that it is completely discharged at the end of the scan period. One way of doing this is to shunt the capacitor with a diode which becomes conductive when the sawtooth potential drops to a predetermined level. This is shown in Fig. 66, where the charging capacitance C is returned, to a potential V volts and the sawtooth amplitude stabilised as the difference between H.T. potential and this voltage. This circuit, to be given next month, has been found most effective when added to receivers which, although synchronised accurately, interlaced only indifferently.

(To be continued)

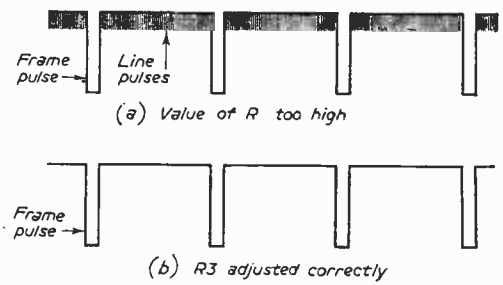

Fig. 65.—Frame output waveform at anode of second diode.

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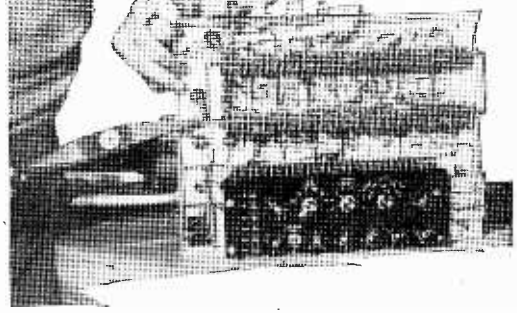
Servicing TELEVISION RECEIVERS



No. 36.—THE G.E.C. 1746

By F. E. Apps

THIS G.E.C. model is a 14in. tube table set which can be tuned to any of the thirteen channels, giving one channel on Band I and two channels on Band III. It is similar in design to the G.E.C. models 4763 and 5643, only slight electrical and mechanical modifications being involved.

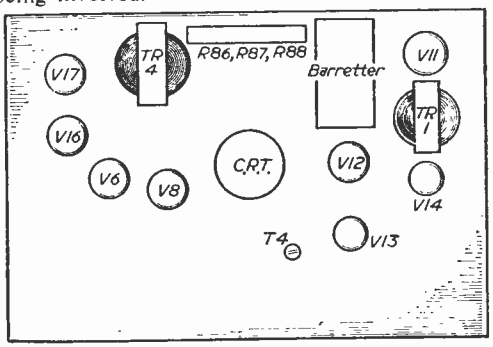


Fig. 1.—Main deck showing valves.

Circuit Description

The aerial input is 60-80 ohms unbalanced and the actual input circuit is isolated by means of C1 and C2 from the transmission line. Switch S1 connects the aerial to the primary of one of three tuned transformers. Of these L3/L5 and L6/L7 are tunable over the whole of Band III by means of dust iron cores and brass slugs. L2/L4 is tunable of Band I. L1/C3 is an I.F. trap for Band I frequencies. V1 is a double diode valve either a PCC84 or a B319 acting as a cascode amplifier. It will be noticed from the circuit diagram that the first triode is neutralised by C7. When any circuit is switched in, the other two are shorted by S2.

A tuned circuit L8, L9, L10 couples the anode circuit of V1B to the grid circuit of V2A. It will be noticed that a different value of coupling capacitor is switched in for Band I and Band III. V2 is a triode pentode, either a PCF82 or an LZ319. The triode portion acts as a Colpitts oscillator with L15, L16, L17 for the three positions of wavechange switch. C23 and C21 are special condensers of selected temperature coefficients to prevent drift due to rise in temperature whilst working. L15, L16, L17 are the oscillator tuning coils which operate at a frequency 34.125 Mc/s higher than the signal frequency. For Band III purposes T1 is the fine tuner. The output from the oscillator is applied via C15 to the control grid of the pentode section, and the intermediate frequency appears in L12 in the anode circuit. This is tapped to give an impedance of 60 ohms, so that the I.F. signal can be fed via C14 and a short length of coaxial to V3—Z77 on the sub deck. L21, C38 is an I.F. trap circuit. Sound is taken from the anode of V3 by L20, C36, C37, T2, tuned to the sound I.F. of 37,625 Mc/s.

Ignoring the sound system for the moment, the vision signal from V3 is passed by C40, L23 to the grid of V4—Z77. Here there is a sound rejector circuit consisting of L22, C43 and T3. V4 amplifies at mid band of I.F. by transformer, L24, L25, and then applies resultant to germanium crystal GR1 which acts as a video demodulator

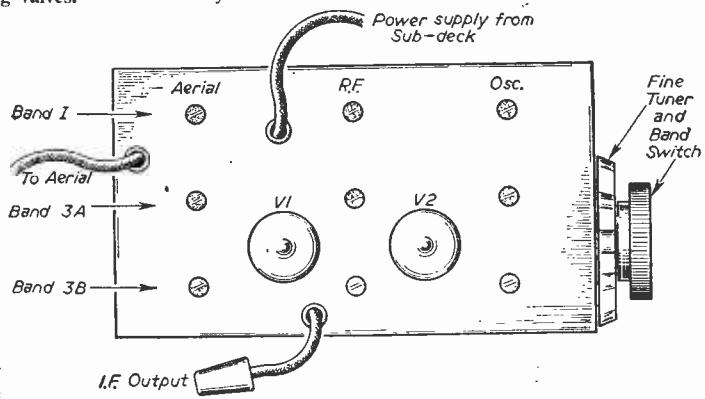


Fig. 2.—Tuner unit showing trimmers, etc.

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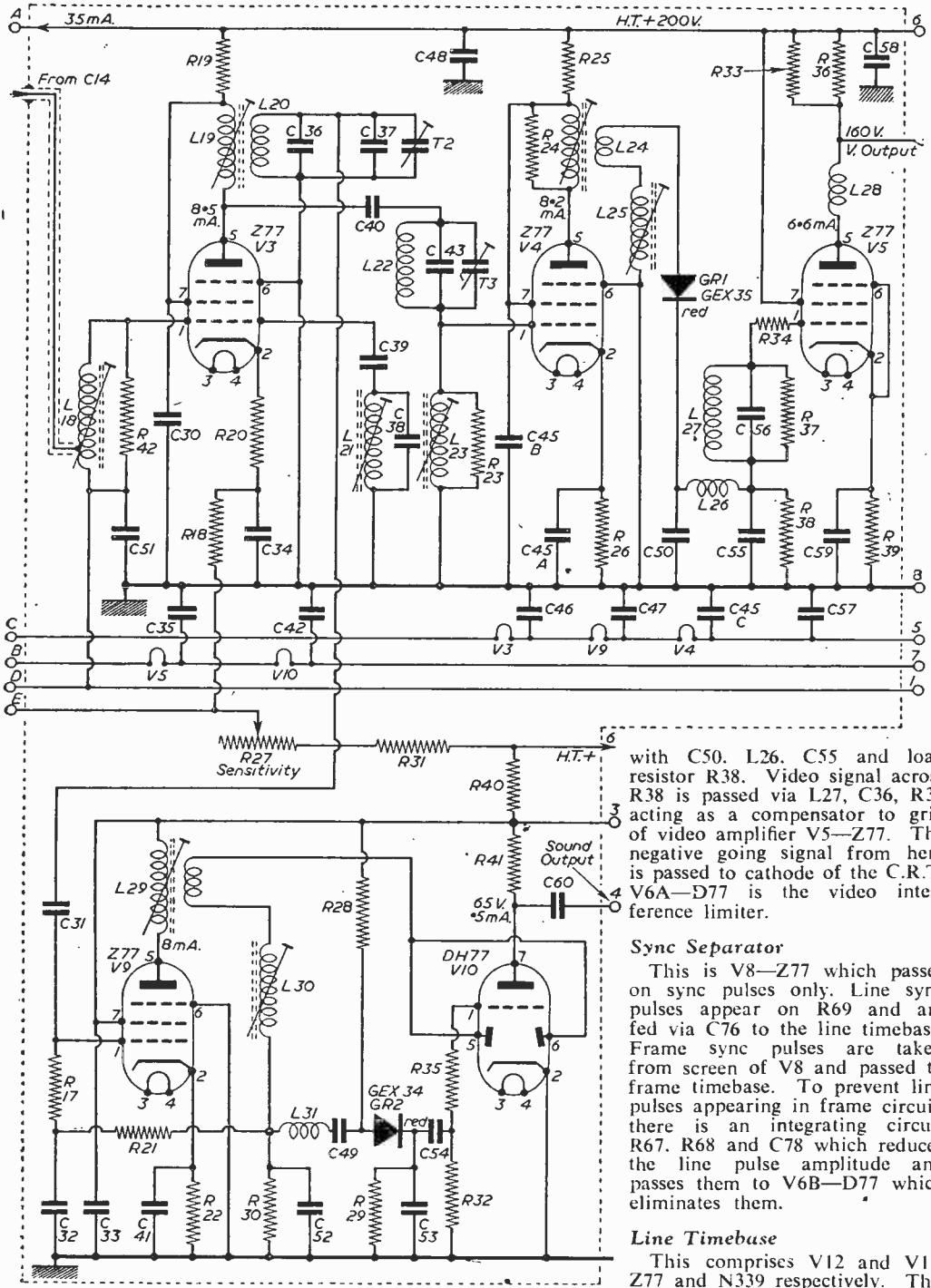

Fig. 3.—Circuit of the sub-deck layout of which is shown in Fig. 4.

with C50. L26. C55 and load resistor R38. Video signal across R38 is passed via L27, C36, R37 acting as a compensator to grid of video amplifier V5—Z77. The negative going signal from here is passed to cathode of the C.R.T. V6A—D77 is the video interference limiter.

Sync Separator

This is V8—Z77 which passes on sync pulses only. Line sync pulses appear on R69 and are fed via C76 to the line timebase. Frame sync pulses are taken from screen of V8 and passed to frame timebase. To prevent line pulses appearing in frame circuit. there is an integrating circuit R67. R68 and C78 which reduces the line pulse amplitude and passes them to V6B—D77 which eliminates them.

Line Timebase

This comprises V12 and V13. Z77 and N339 respectively. This circuit acts as a blocking oscillator which discharges C71 (charged via R57) through V12. A waveform

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appears across C71 and drives V13. The line output transformer T3 provides a matched impedance coupling for the line deflector coils, supplies EHT in conjunction with V13—U43, and also by means of an extra winding produces a boost voltage of about 250 volts which is rectified by V14—U329.

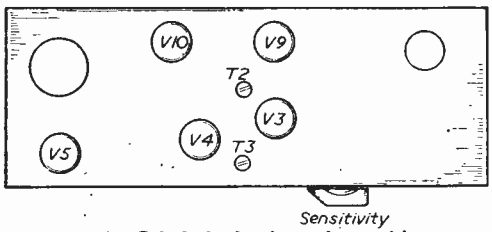

Fig. 4.—Sub-deck showing valve positions.

Line width is controlled by a variable shunt and series winding L33 and L32.

Frame Timebase

This is a multivibrator using V16—LN309. C87, R80, R81 control the frequency, and R80 is the vertical hold for locking purposes. It will be noticed that V14 acts as a double triode. Frame output transformer TR4 is matched to the impedance of frame deflector coils. Negative feedback corrects waveform, this is via R91, R92, R93, R94 and C92. V17—N329 is frame output valve.

H.T. Supply

This is supplied by metal rectifier MR1 with smoothing capacitors C85, C86. The thermistor R94 reduces current surges. The heaters of valves and C.R.T. are in series with barretter 305.

The Sound Circuit

As previously stated, the sound I.F. is taken from the anode of V3 and coupled to the grid of V9—Z77, and from there is passed to V10—DH77 for demodulation via a bandpass transformer L29, L30. The L.F. component is fed to triode section of V10 via a noise suppression circuit GR2, R28, R29 and C53. A D.C. component is fed to grid of V9 via R21. C32 for A.V.C. Signals are then passed through C60 to a volume control and thence to sound output valve V11—N329. C64 and R45 with C67 form a tone circuit. Decoupling, to prevent audio signals from entering H.T. line, is provided by R48, C63.

(To be continued)

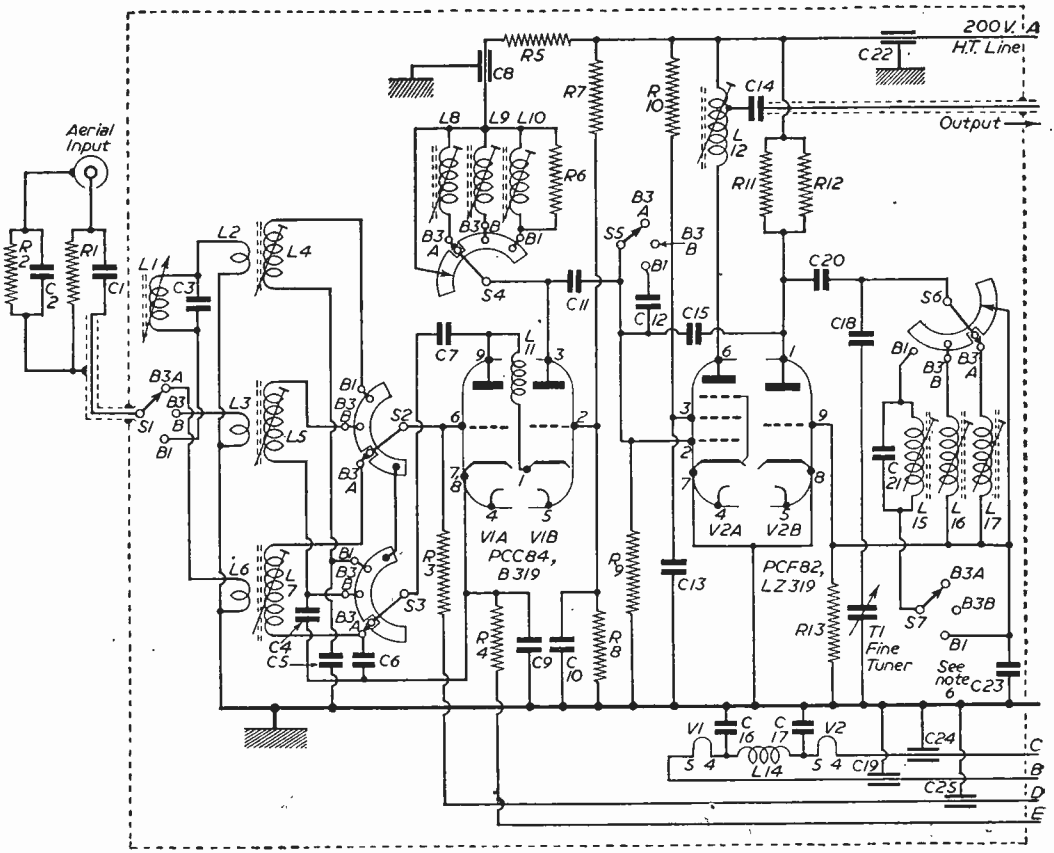

Fig. 5.—Theoretical circuit of the tuner section.

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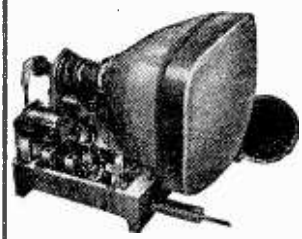

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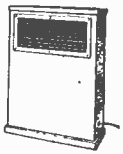

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4D1	2/9	6SG7	3/9	EF92	3/9	EF50	2/9	PEN45	6/9
6B8	3/9	77	3/9	SP61	3 9	EF91	7/9	RL37	1/9
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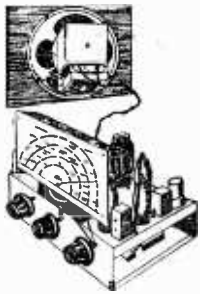

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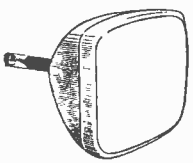

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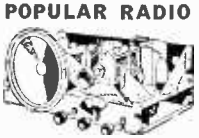

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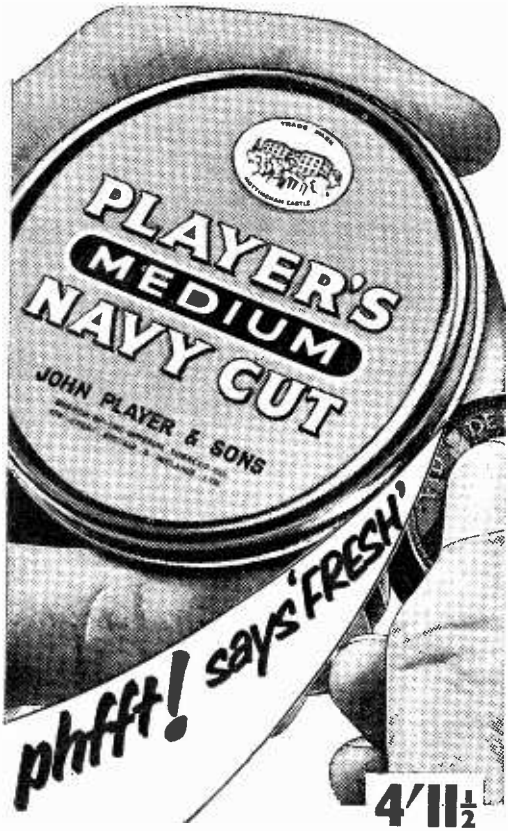

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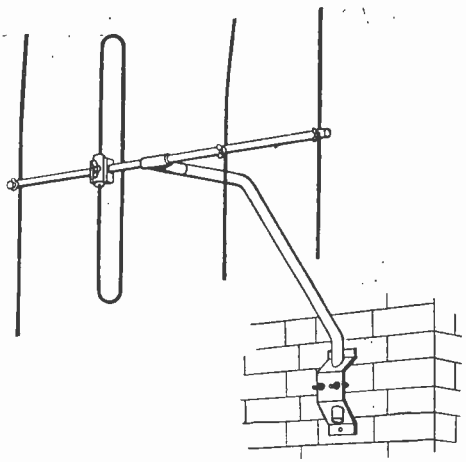

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Some Interesting Faults and Their Cure

A SERVICE ENGINEER REPORTS SOME UNUSUAL TROUBLES MET WITH IN HIS WORKSHOP

THE faults to be described in this article are perhaps not obscure, but can be baffling to an owner or a service engineer who has not run across them before. They are all faults that have actually been observed in a service workshop, and it is quite possible that they will occur again in other sets.

Fault No. 1

This occurred in a Ferguson model 989, and may occur in other models of this make that are similar. The symptom was lack of height. Valves and controls were checked. Voltages on the multivibrator frame oscillator were reasonably near. Controls and resistances in series were measured and found O.K. Finally, the fault was located in the H.T. resistor feeding the frame circuit from the cathode of the efficiency diode. This had gone high. Replacement with the correct value effected a cure.

Fault No. 2

Trouble here occurred in a Pye model CW17, and could occur on similar models. Symptoms were no sound, no vision, although a raster was obtainable. On examination it was found that H.T.3 lead supplying H.T. to

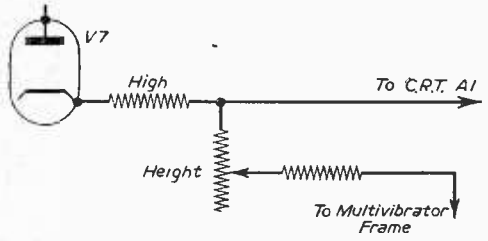

Fig. 1.—Circuit arrangement concerned in Fault No. 1.

tuner unit was dead. A 1,000 ohm resistor in this line appeared O.K., but on tapping, it fell to pieces. An H.T. short on this line therefore was apparent. It was located in the tuner unit and was due to a breakdown of a lead-in capacitor inside the tuner unit. Replacement of this and the resistor effected the cure. Should this fault be met with, the proper lead-in capacitor is essential for a successful job.

Fault No. 3

Trouble in an Ekco TMB 272 was no brightness. After switching on, the line section could be heard oscillating, but EHT appeared for a second or so, then died away. The trouble, though apparently the EHT rectifier, was not located there, but was due to a .25μF condenser going to the efficiency diode anode, shorting down.

Fault No. 4

In this case, a Murphy V202, the original trouble was sound, but no vision. There was a raster. On tuning the oscillator core, it then appeared as vision, but no sound. There was no in-between point. The trouble turned out to be due to one of the two condensers in parallel across the oscillator coil going o/c, thus preventing correct oscillator alignment.

Fault No. 5

This case was a Murphy 180C and the symptom was lack of focus. Alteration of focus control or positioning of focus coil had little effect. The sound output valve, in the anode circuit of which is the focus coil, was changed with no improvement. The fault was cured by changing line oscillator valve 6K25. This was rather baffling as the line locked quite well, and width was O.K. Apparently there was insufficient drive to the line output, and this caused alteration of EHT and thus poor focus.

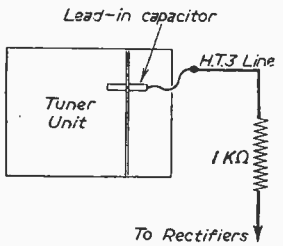

Fig. 2.—Details of the trouble described under Fault No. 2.

Fault No. 6

Symptom here was very similar to sound on vision. Set was an Ekco 267. There was also an amount of line tearing taking place. The fault was eventually found to be due to a microphonic line generator valve which was a 6/30L2. Changing this cured the fault.

Fault No. 7

The symptom here was intermittent hum, no vision, and distorted sound. The trouble was found to be due to an intermittent heater/cathode short in the triode section of the 30FL1 sound output valve. The reason for affecting vision was that it affected the whole heater chain. The set was a Murphy 310.

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Fault No. 8

This occurred in a Pye LV21C. The symptom was sound but no brightness. The line oscillator was working, but at a low frequency. In this circuit the line hold trimmer and line linearity work together to control the frequency of oscillation. The fault was located in the line linearity trimmer; this had shorting plates.

Fault No. 9

The symptoms here, in an Ekco 231, was very poor contrast with greyish blacks, although this

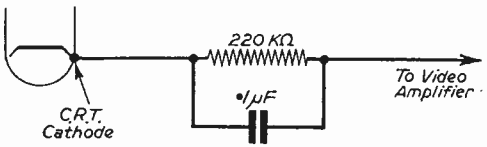

Fig. 3.—The faulty condenser described under Fault No. 9.

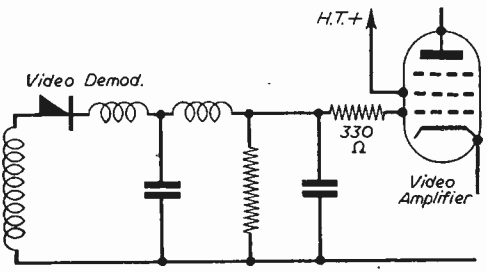

Fig. 4.—The video section of Fault No. 10.

was an intermittent fault. After an extended search trouble was located in the feed to the cathode of the C.R.T. There is a .1μF condenser C95 across a 220K ohms resistor. This was intermittently open circuit.

Fault No. 10

This fault occurred in a Pye luxury 17in. Symptoms: sound, no vision. It was found that the video amplifier, an EF80, had an internal short. Replacing the valve had no effect. Further investigation showed that the valve had shorted grid to screen, thus placing H.T. on grid circuit. The 330 ohm grid stopper had burnt out and also the video demodulator crystal, this being in the path to earth for H.T. Replacing this effected a cure.

Fault No. 11

Symptoms: sound, no vision; the set a Murphy 180C. It was found that the line output valve had gone soft. Replacement of this valve did not effect a cure because owing to the large current drawn by this valve when soft the line linearity control was burnt out as this is in the cathode circuit of the line output valve. Replacement did the trick.

Fault No. 12

Receiver was a Decca DMC17. Symptom was lack of width and line linearity poor. Valves were tried without success. The trouble was traced to a 500 pF silver mica condenser from line output transformer to line linearity coil being open circuit.

Fault No. 13

This occurred in an Ekco T221 and the symptoms were apparent line tearing with bad distortion of verticals. In this case the line output valve was checked and found O.K., and when the double triode line and frame oscillator was changed the trouble was partly cured, but picture was jumpy. It was then found that the EHT reservoir condenser .001 μF — 20 KV was intermittent. Changing this effected a complete cure.

Fault No. 14

Set a K.B. EV30. Symptoms intermittent sound. Valves were checked and found O.K. It was not expected to be a fault in connection with cathode circuit of sound output valve as the focus coil is in this circuit, and focusing was perfect. However, this happened to be the case where a supposition was wrong. It was found that the 30 μF condenser across the bias resistor was intermittent. Changing it cured the fault.

Fault No. 15

The symptoms here were bad ringing, especially to the left on picture. Usual checks and methods to cure ringing had no appreciable effect. It was eventually found that the screen decoupler of the line output valve C80, .1 μF, had gone low capacity.

PRACTICAL WIRELESS APRIL ISSUE NOW ON SALE PRICE 1s. 3d.

A new series entitled "A Beginner's Constructional Course," commences in the current issue of our companion paper "PRACTICAL WIRELESS," which is now on sale. As distinct from beginner's courses which deal mainly with the theory of radio, these articles are practical and contain little theoretical matter. In a former series on these lines we dealt with crystal and transistor sets, and now the series deals with valves. In the first article a one-valve set is described, and this is of the A.C. mains type, which will subsequently be modified in stages until it becomes a multi-valve set.

A Geiger Counter forms the subject of another constructional feature in this issue and this is on similar lines to one previously described, but is much cheaper to construct and has greater applications and sensitivity.

Converting the popular Army 19 set is yet another Ex-Government modification article, whilst a new version of the Condenser Condition Tester which was recently described is also given.

Other articles deal with the Application of Rectifiers, Transistors in Practice, Hum Troubles, Servicing Alba models 3211, 6221, 6231, 6241 and 6251. The usual features also appear in this issue.

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MAKING A PATTERN GENERATOR

HOW TO CONSTRUCT A SIMPLE TEST SET FOR LINING UP TV RECEIVERS

ONE of the instruments for which we most commonly receive requests for constructional details is the pattern generator. This type of instrument enables one to line up a TV set so that all parts are checked—without the necessity of a programme being on the air.

We described one or two units of this type in the past and one of the simplest and most popular was described back in 1932, but all issues for this are now out of print. In response to requests we are reprinting the essential details.

The majority of pattern generators have been limited to supplying a pattern of bars across the screen, the bars being either vertical or horizontal according to the selection of a switch position. Some generators supply only a "low-frequency" output—that is, they are designed to connect directly into the video amplifier of the receiver under test.

Modulated R.F.

A comprehensive pattern generator should certainly supply a modulated R.F. signal, for many televisor faults originate in the early stages of a receiver, whilst it is very desirable to have a reliable signal on which to align receivers in out-of-transmission periods. At the same time the modulation, and thus the test-pattern shown on the screen, should, if at all possible, be more comprehensive than a set of bars. Commercial pattern generators show quite complicated figures, consisting of various crossing patterns with tone modulation of the background areas, but probably the best that can be done with simple, home-constructed equipment is the setting up of crossing bars on the screen, with squares of full-white modulation between them. Such a pattern shows at a glance whether the spot deflection is linear, even a slight degree of non-linearity being shown up very clearly, whether the spot focus is even over the whole screen and whether there are any side or corner "shadows." At the same time the low- and high-frequency responses of the receiver as a whole are tested reasonably well, since the transition from full white to deep black should be well marked in both the horizontal and vertical planes, whilst ringing, black-after-white or similar defects are clearly shown on the edges of the vertical bars.

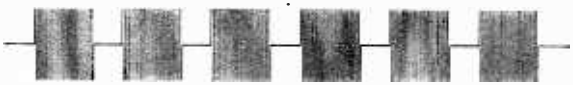
By turning the tuning control, the pattern generator can supply an audio test signal, whilst the tuning scale can be calibrated to show a band of coverage for the vision carrier and a sharp tuning point for the audio carrier. Coverage for only the local Band I television channel is envisaged.

The test-pattern generator is ideal for home construction since its various functions are all derived from a single-valve circuit, a double triode of the ECC91 (6J6) type being used. A simple power pack consisting of a heater transformer, selenium rectifier and a resistance smoothing system supplies the circuit from A.C. mains, and since there is no direct connection between the generator and receiver, such a half-wave rectification system is perfectly satisfactory; the case of the instrument must be connected to the neutral side of the mains, of course, for safety.

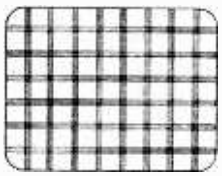
Circuit

Constructors whose mains supplies are D.C. can also build the test-pattern generator. In their case it will only be necessary to employ a suitable line cord in place of the heater transformer, the smoothing resistor being increased by trial to give a main H.T. line voltage of 150 volts. In the A.C. version of the unit no reservoir capacitor is employed, the H.T. voltage being suitably low and space being saved as a result. C7 may be omitted in a D.C. version of the unit since this feeds a 50 c.p.s. pulse to the frame oscillator as a synchronising pulse. The circuit will be found sufficiently stable, however, to give little trouble without the sync pulse.

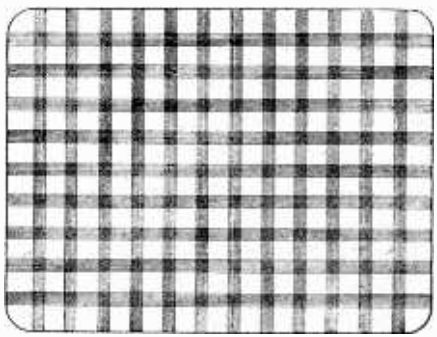
The R.F. oscillator is built up round the first



(a) Typical oscillograph trace obtained from point "A" (Fig.1)



(b)



(c)

Typical patterns for (b) small and (c) large screens

Fig. 2.—Waveform and typical patterns produced by the unit.

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or left-hand triode section of the valve in Fig. 1, and consists of a tuned grid coil, L1, with an anode feedback coil L2. As is normally found at television frequencies, the usual proportion of grid turns (approximately one-third) in the anode circuit are insufficient for regeneration, and it is necessary to have at least as many turns in the anode as in the grid coil.

The grid circuit is returned to earth through a second tuned circuit consisting of a long-wave

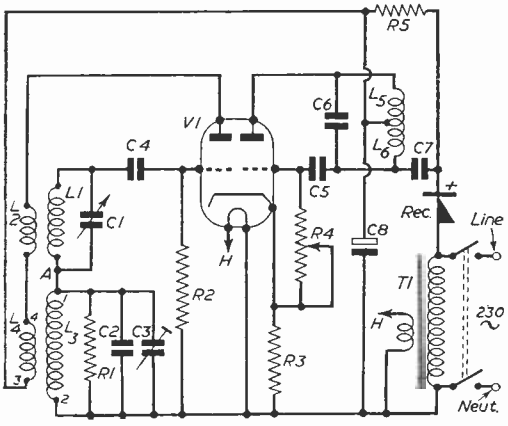
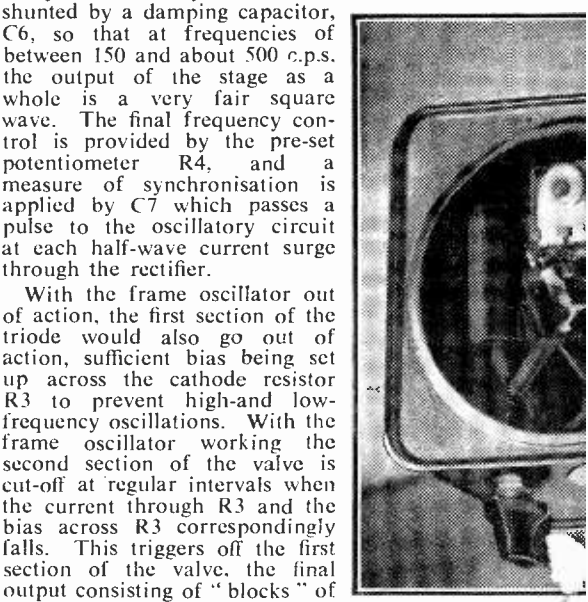


Fig. 1.—Theoretical circuit of the generator.

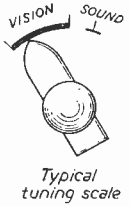
tuning coil with a relatively high capacitance shunted across it. The anode circuit of the triode is completed through the secondary winding of the long-wave coil, oscillation thus being obtained at a relatively low frequency determined by the value of C2 and C3. This oscillation deeply modulates the high-frequency carrier due to L1 and L2 so that the output from this first section of the triode could be received by a televisor and would produce a series of vertical bars across the screen. The number of bars would, of course, depend on the final frequency of the L3, L4 oscillatory circuit. The line frequency of a televisor is 10,125 c.p.s., so that an oscillatory frequency in L3, L4 of 101,250 c.p.s. would set up a series of 10 bars across the screen, of which nine would actually be visible, the tenth serving as a sync and black-out bar.

The second section of the triode is connected into a low-frequency oscillating circuit built up round a normal frame blocking oscillator transformer, L5, L6. The transformer is not allowed to operate normally, but is connected as shown and shunted by a damping capacitor, C6, so that at frequencies of between 150 and about 500 c.p.s. the output of the stage as a whole is a very fair square wave. The final frequency control is provided by the pre-set potentiometer R4, and a measure of synchronisation is applied by C7 which passes a pulse to the oscillatory circuit at each half-wave current surge through the rectifier.

With the frame oscillator out of action, the first section of the triode would also go out of action, sufficient bias being set up across the cathode resistor R3 to prevent high-and low-frequency oscillations. With the frame oscillator working the second section of the valve is cut-off at regular intervals when the current through R3 and the bias across R3 correspondingly falls. This triggers off the first section of the valve, the final output consisting of "blocks" of line frequency modulation interrupted by cut-off periods at a frequency sufficiently low to make these serve as frame bars. The final pattern on the screen is, therefore, as shown in Fig. 2.



A finished model house



Typical tuning scale

Fig. 5.—Suggested tuning control.

Small Screens

If the pattern generator is to be employed with small-screen televisors it is recommended that the pattern of Fig. 2b be set up, consisting of eight vertical and six horizontal bars. For this the oscillators will actually need to supply nine verticals, a frequency of 91,125 c.p.s. in the L3, L4 circuit, and seven horizontals, a frequency of 350 c.p.s. in the frame oscillator. The extra bars, as already mentioned, are used

LIST OF COMPONENTS

L1, L2—
Channels 1 and 2, 6 turns 28 S.W.G. enam.
Channel 3, 5 turns 28 S.W.G. enam.
Channels 4 and 5, 4 turns 28 S.W.G. enam.
All air-cored windings on ¾in. diameter former closewound, with L2 close beside L1.
L3, L4—Wearite PA1 coil.
L5, L6—Frame blocking oscillator transformer.
C1—50 pF. tuner, Jackson Bros. type C 804 Air Tune.
C2—For small screens, 0.0015 μF. mica, 350 v.w. For large screens 500 pF. mica, 350 v.w.
C3—500 pF. max. padder type semi-variable.
C4—100 pF. silver-mica, 350 v.w.
C5, C6—0.01 μF. mica or tubular, 500 v.w.
C7—0.001 μF. mica, 350 v.w.
C8—8 μF. electrolytic, 350 v.w.
R1—10,000 ohms, ½ watt.
R2—100,000 ohms, ½ watt.
R3—1,000 ohms, ½ watt.
R4—1 meg. pre-set potentiometer.
R5—1,000 ohms, 1 watt.
V1—Mullard ECC91 (American 6J6).
B7G valveholder.
Rec.—SenTerCel 250 v. 30 mA.
T1—Heater transformer, 6.3v. 1 A. output.
S1—D.P. mains on-off switch.
Metal case and scrap metal for valve mounting.
Rubber grommets.
Pointer knob for tuning.
Mains lead, wire, sleeving, nuts, bolts, etc., etc.

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automatically in the televisor as sync bars and do not appear on the screen.

Large Screens

When the generator is to be used with large-screen televisors the number of bars should be increased to at least 12 verticals and 9 horizontals, though for 17in. tubes it might be as well to have 16 verticals and 12 horizontals. It is recommended that the ratio of 4 : 3 be maintained so that the intersections of the bars leave practically square bright-ups.

in a domestic tin box.

The original generator was constructed in a small metal case which served as a screen round the oscillator. In use the case lid is removed for ventilation and also for greater output. If desired, a short rod aerial can be connected to the point A in Fig. 1 between the L1 and L3 tuned circuits; this will increase the coverage of the oscillator and the unit can remain entirely screened. The layout shown in Fig. 3 is that of the original unit and, as can be seen, it led to some crowding of the components. A quite different layout could be employed, for the circuit is not at all critical so long as normal television techniques are followed in the construction. The valve, in the prototype, was mounted by sweating

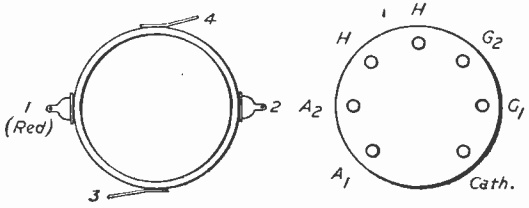

Fig. 6.—Coil and valve base connections.

the valveholder on to a semi-cylindrical tinplate bracket of suitable length, the other end of this bracket being sweated to the tinplate wall of the case. This placed the valveholder pins close to the tuned circuits, permitting short wiring, without the use of a sub-chassis to support the valve.

Observe that the main tuning capacitor, C1, must have both sides insulated from earth so that it cannot be mounted directly on a metal chassis. In the original instrument it was found satisfactory to mount this component in a rubber grommet, large-diameter washers on either side of the grommet giving adequate grip for a firm support. Connect the rotor to the "earthy" side of L1.

The connections to L1, L2 and to L5, L6

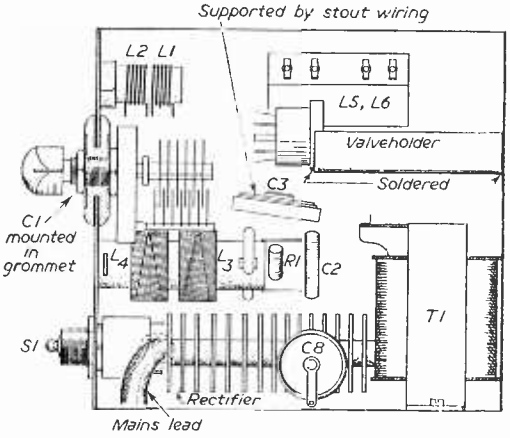

Fig. 3.—Wiring details and layout.

must be checked by trial. In the case of the blocking oscillator transformer it is generally satisfactory to make the larger winding the grid side of the tapped inductance, the grid being taken to the start of the coil. The end of this winding should be taken to the start of the smaller winding, the junction serving as the H.T. connecting point, the anode being connected to the end of the second winding.

Operation

The operation of the circuit as a whole (apart from the carrier oscillator) can be checked by connecting point A to the Y amplifier of an oscilloscope, the 'scope earth being taken to the chassis of the generator. (Ensure that the oscilloscope may be connected in this way to a half-wave

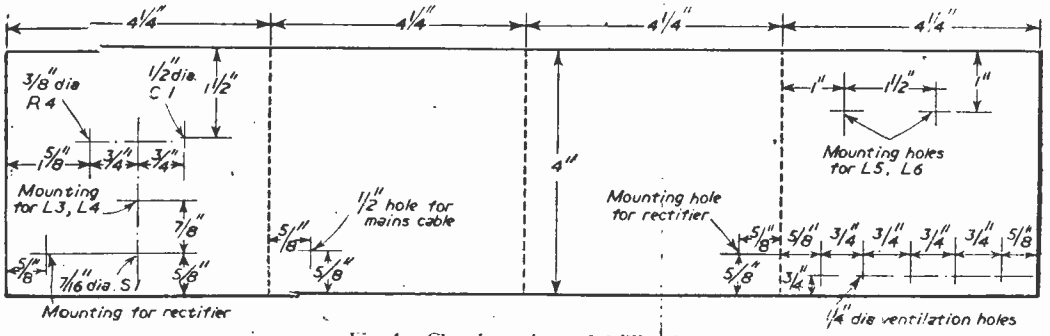

Fig. 4.—Chassis cutting and drilling data.

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rectifier circuit before making the connection. and make sure that the generator case is neutral.) The pattern obtained for a low-sweep speed should be that shown in Fig. 2a. If the blocks of line oscillation seem to be low in amplitude try the effect of reducing R3 slightly, to, say, 820 or 680 ohms : the reduction must not be so great as to stop cut-off of the line oscillations at the correct periods. Variations in R3 should not be required, but if a 6J6 is employed in the generator it may need slightly modified working conditions from those obtaining in the prototype, this valve being a little subject to broad tolerances.

The generator is best set up by watching the pattern on a televisor known to be working correctly, the pre-set controls C3 and R4 being adjusted to give the required numbers of vertical and horizontal bars. The tuning control, C1, can be calibrated against a good signal generator, the televisor being employed as an indicator, or it may be set with reasonable accuracy against the televisor itself, the tuning arc being marked out as that swing of C1 which will produce a pattern on the screen and the audio tuning point being marked with the generator set to give maximum audio volume.

If the generator appears to have dead spots over its tuning range, or if it fails to come into oscillation easily, first check by reversing the connections to L2, then, if this does not improve matters, increase L2 by a further turn or so.

Remember that the circuit is connected directly to the mains and see that the case is made the neutral or earthed line. Do not make direct connections between the instrument and a televisor under test.

ITV in Bristol

RECEPTION in Bristol from the new I.T.A. transmitting station in South Wales, according to widely spread tests made in the city recently, is in line with the Authority's predictions. These had placed part of the town in the primary and part in the secondary service area. Because of its many hills and valleys, Bristol is bound to show wide variations in signal strength, and to call for much individual attention in installation.

The frequencies in Band III allocated to the Authority are much higher than those in Band I occupied by the BBC, and signals in Band III are more easily deflected, reflected and dispersed by obstacles. Special care is therefore always necessary when installing aerials and adjusting sets. To ensure reliable reception aerials must possess high directivity and gain: so far as possible they should be clear of chimney pots and metal on roofs and they should be accurately aligned. Efficient downleads from aerials to sets are essential to good reception, for in Band III any loss of signal strength on the downlead is many times greater than it would be in Band I.

The Authority has done all it can to ensure that the strongest signal possible is being transmitted. St. Hilary is one of the most powerful Band III stations in the world, and towards Bristol it is radiating 200 kilowatts, the maximum power permitted.

House-to-house Variations

As was to be expected, the lowest signal strengths in the Bristol area were registered beside the banks of the Avon and viewers there will need to have carefully installed, very high gain aerials. In the centre of the city a substantial proportion of the viewers should be able to receive a satisfactory service on normal aerials, but in places screened by high buildings or hard in the lee of rising ground reception may be poor. In other parts of the city, the average signal strength was found to be sufficient to provide a first-class picture.

There are often marked variations in reception conditions between neighbouring streets and in some cases repositioning of an aerial in a different spot on the roof or at a slightly different height can bring about a distinct improvement in picture quality. Each aerial installation must be suited to local conditions and viewers who desire good and consistent reception are strongly advised to consult their local dealers who are in the best position to assist them.

The "Deccafax"

DECCAFAX is the name given to a new picture transmission system introduced by Decca Radar Limited. This low cost system transmits television-style pictures and sound between points interconnected with co-axial cable at distances up to 2,000 yards.

Based on new applications of television receiver principles, the Deccafax Master Unit can relay both sound and picture to modified standard television receiving sets for one-way announcements, etc., or to other master units for two-way speech/vision intercommunication in office, store or factory.

The most interesting feature of Deccafax is its versatility. The transmitted picture or message can take many different forms, ranging from complete 35 mm. cine-films to simple transparencies of a diagram or *pro forma*. By employing standard television sets as receivers Decca Radar Limited have ensured a multiplicity of uses for the Deccafax system. As an example, announcements could be routed from a single Master Unit to all or any of a number of television receivers at an airport terminal, these receivers being also used to receive the normal television programmes for entertainment purposes.

Pictures derived from slides or strip films represent an ideal medium for advertisement purposes and Deccafax can relay them to television receivers appropriately placed in large stores, etc. Equipment to move the film on or change slides automatically is available.

An important application of the Deccafax system is to meet the requirement of information collation and filtering at centres where complicated visual displays are necessary, such as at Air Traffic Control centres and Defence Operations rooms.

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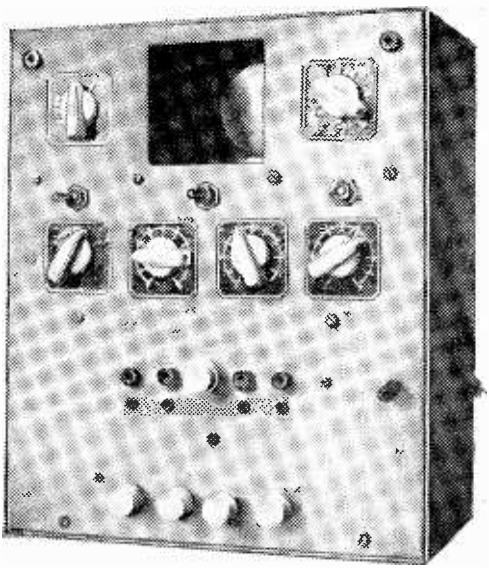
A Modified 'Scope Layout

A READER'S SUGGESTION FOR A VERTICAL TUBE LAYOUT FOR OUR MAY, 1956 DESIGN

By L. G. German

TO the amateur with limited space, the oscilloscope is usually an inconvenient piece of apparatus which occupies a large amount of bench-space. The 'scope described in PRACTICAL TELEVISION, May, 1956, is no exception, although it is an excellent instrument in all other respects. In an endeavour to minimise the bench-space required, I have rebuilt it into a form measuring 11in. wide, 13in. high and only 5½in. from front to rear.

This was achieved by mounting the tube vertically, the trace being viewed through a mirror. So successful has this proved that this article is written to assist others who may care to follow my example. Although full constructional details are not given, I hope I have included sufficient, which, in conjunction with the photographs and figures, should enable the average constructor to carry out the modification.



The finished 'scope.

No alteration has been made to the circuit, only the layout of components is affected.

Layout

As may be seen, all controls are mounted on the front panel, the valves being accommodated on two shelves, with the power pack at the bottom.

As much metal as possible is cut away from the sides and bottom in order to give the maximum access to the interior of the chassis.

The following sequence of operations is probably the best.

Construction

Cut out and drill the front panel, and fit controls and input and output sockets. Wire up the shift network, clipping the tubular condensers to the panel.

Construct the top shelf, complete with mirror support and valveholders as shown in Fig. 1.

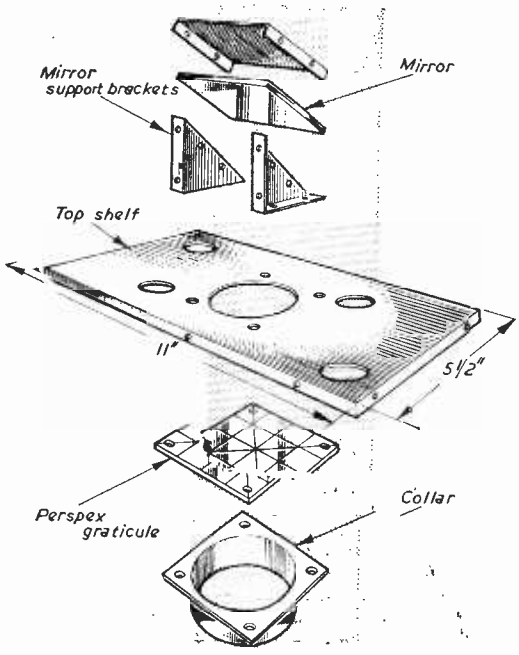


Fig. 1.—Exploded view of top shelf and tube collar.

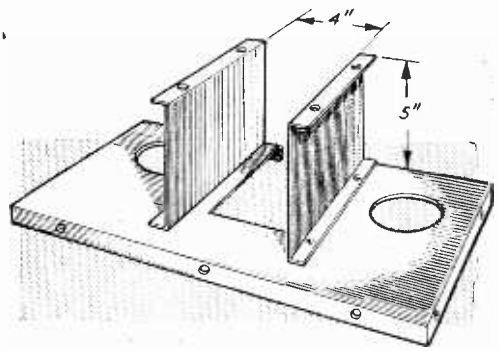


Fig. 2.—Middle shelf and partitions.

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The collar which supported the front of the tube in the original 'scope is transferred, with the Perspex graticule, to its new position.

The timebase and Y amplifier circuits may then be wired up, after which the shelf may be bolted to the front panel.

The second shelf is simpler, and carries only the rectifier valve and sync amplifier. The two vertical partitions give added support to the shelves and provide accommodation for the large .5 μF capacitors (Fig. 2).

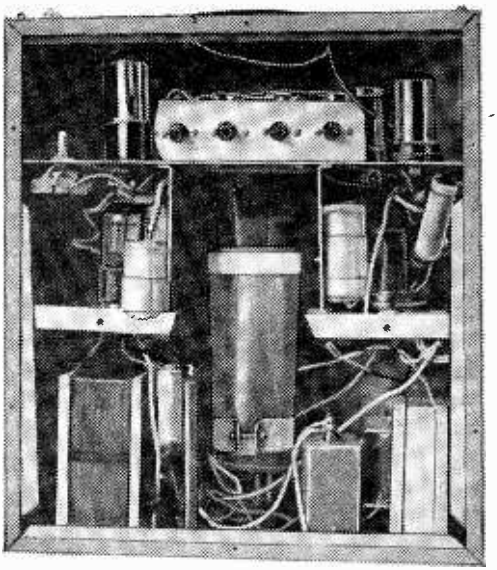
The Power Pack

The power pack is assembled on its base and wired in.

Some trouble was experienced due to the proximity of the mains transformer to the base of the tube, but orienting the transformer almost eliminated distortion. Fitting a mu-metal screen to the tube gave complete freedom.

Using the 'Scope

In use, it is found that the trace can be viewed either direct or through the mirror, and the instrument may be used in any position. No external light shield is required.



An interior view showing the vertical tube.

TV For the Blind

IN 1946 I was a scientific consultant for the United States Government. We scoured Europe immediately following the second World War in quest of scientific information. During this process of study and experiment, we came to the belief that it was possible to secure TV for the blind. The project is not complete, but so near completion that it is far beyond the theoretical stage.

We base our entire thesis on the normal functions of the senses. When I say "we" I include a staff of helpers from the Lear Company, makers of electronic aviation equipment. The idea behind our project is based on the process that commercial television is taken as it comes in over the ethers, and picked up by an aerial in the usual fashion, but before it is directed into a TV receiver, it is processed through transduction apparatus, designed to convert the oncoming wave to a frequency capable of resonating with the receiving portion of the brain (optic thalmus). After conversion to the proper frequency the beam is scanned and screened somewhat as is done in the TV tube of the usual receiver. It is believed that a two dimensional image is trapped on the sensitive tissues of the thalmus in ordinary sight. Here we have the light striking the retina after being focused by the crystalline lens. The rods and cones of the retina transduce the light impulses into nerve impulses which are conducted over the optic nerves back to the interpreting centres of the brain. In other words, we do not see with the eyes. They are but end organs for pickup purposes. The actual sight is in a registration in the thalmus. Success of the device depends primarily on whether or not the target tissues will respond to a specific frequency, and at what level.

Staggering Implications

If this is successful it may have staggering implications. It will mean that specific cell groups can be influenced accurately by the proper election of energies at predetermind frequencies. It has been the dream of many a physician to have at his disposal some form of therapy wherein he could influence certain tissues without the risk of disturbing other tissues or functions. Evidence is strong, but not incontestible at present that specific frequencies resonate specific cell groups (tissues).

Then we have to answer the natural question, do the cells in the thalmus atrophy after a short time of lack of use? Reports from the Cedars of Lebanon Hospital in Los Angeles, California, describe a series of experiments in which a woman, blind for eighteen years, was operated upon by drilling the skull in order to admit fine wire electrodes down into the thalamus. Stimuli produced by the induction of mild electrical impulses into the area produced the impression of light flashes, and in some cases similar to the electric light bulb being turned on. The researchers were satisfied that the cells were not atrophied. This offers considerable gratification as to the feasibility of continued work on the development of TV for the blind.

All of the work in connection with experiments was based upon the area of subliminal impressions delivered to normal people through the medium of flashing pictures, numbers, phrases, etc., on a movie screen with such speed that it is not consciously registered. It seems to be registered on the subconscious level, so that the viewer simply gains an impression of the material so flashed.—DR. R. T. LUSTIG.

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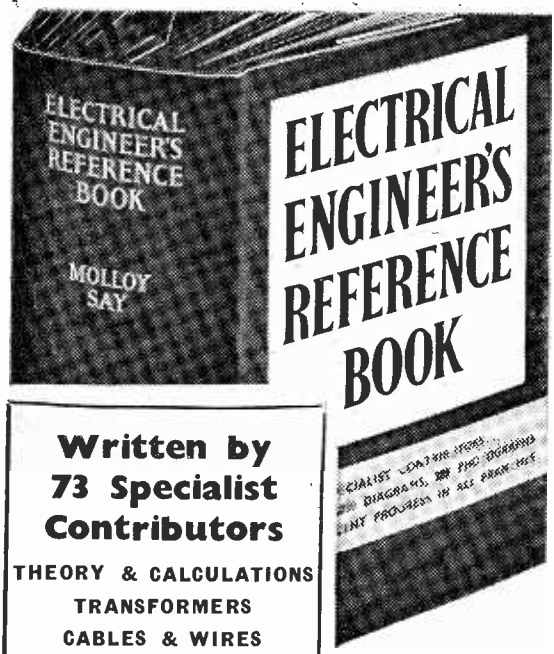

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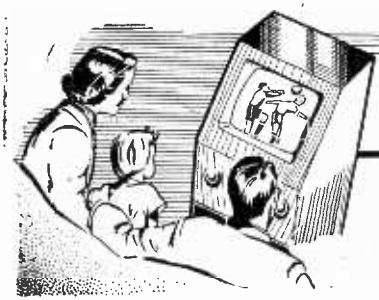

UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

THE opening of T.W.W.'s Pontcanna Studios, Cardiff and the inauguration of the commercial television transmissions in Wales and the West passed off fairly smoothly after all. Good reception over a wide area was reported; a happy ending to the strange "on-off" history of the I.T.A. transmitter aerial which wouldn't radiate properly. Notwithstanding the delay of several weeks caused by this transmitter trouble, there was still the usual rush and tumble at the studio end, according to a friend who was present. This seems to be the usual characteristic of all I.T.A. openings, applying equally to both programme and engineering sides. After about six weeks steady operation, the crews settle down and the blood pressure drops. The Chief Engineer of one of the first commercial programme companies told me that it took almost a year for the technical crews to acquire the professional touch.

Training

THERE is a tendency for engineers new to the transmitting side of television to acquire a "know it all" attitude to their work within a very short time. Technically, they may be on firm ground—but the successful television engineer who is on the staff of a television programme company must, in many jobs, be an artist and a showman as well. Not enough attention is paid by studio cameramen and lighting engineers to the elements of picture composition and lighting. There have recently been some horrifying examples of unflattering television portraiture on both I.T.A. and BBC. *This Is Your Life* has been running quite a long time, but there have been occasions when the cameras have treated the "victims" of this programme and their friends most unkindly, turning good-looking people into lined and ugly ghosts of themselves. This may be partly due to the peculiar compression effects obtained with image orthicon cameras or to the Producer directing the cameras into the wrong position for the lighting rig. Engineers and producers should be given a course in the principles of portraiture, pictorial composition and lighting.

B.K.S. Forum

IT is, therefore, not surprising that the Programme Companies and the BBC are encouraging their personnel to attend lectures and discussions at the meetings of the Television Division of the British Kinematograph Society. At one recent meeting, Howard Thomas, Managing Director of the ABC-TV took the Chair of a large panel of specialists in different fields of television, including telerecording and television films. A panel which included such eminent backroom television personalities as L. C. Jesty, J. K. Byers, J. Partington, Norman Leevers and John Elliot were bombarded with questions from a professional film and television audience, mostly engineers. Many of the questions concerned the poor quality transmission of certain popular American filmed television series, including the *Phil Silvers (Sergeant Bilco) Show* and *I Love Lucy*. It was revealed that many of these films, though photographed most carefully on 35 mm. film,

Members of the Guild of Television Producers and Directors transferred their usual meeting from the Café Royal to Rank Precision Industries, Ltd., recently to see two new items of equipment—the Gaumont-Kalee transistor recording unit for use with Arriflex 16 mm. cine cameras, and the G.B.-Bell & Howell Model 640 16 mm. magnetic optical projector.

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are optically reduced to 16 mm. film for circulation to the American television networks and to England. 16 mm. film is the "coinage" of most American television stations. said Mr. Thomas, and only the larger network stations are equipped for scanning 35 mm. film. Cost of copies and transport is the reason for this. Knowing the large sums of money paid for the English rights of these series, the B.K.S. audience could not understand why the relatively small additional cost of 35 mm. prints could not be found. Sound has suffered just as much as picture. This was a case, somebody suggested. for a 35 mm. combined print with a magnetic sound track by the side of the picture. Another point of criticism was the apparent unevenness of live and filmed scenes as regards brilliance, contrast and tonal values. L. C. Jesty admitted that at least part of this trouble was due to lack of D.C. restoration in the circuits of many commercial television receivers. a practice which reduced the effects of aeroplane interference but sacrificed control of the black level. The debate was long and lively and there is no doubt that studio television engineers in Manchester and Birmingham will soon be taking an active interest in similar debates to be organised in those cities by the British Kinematograph Society.

Audience Polls

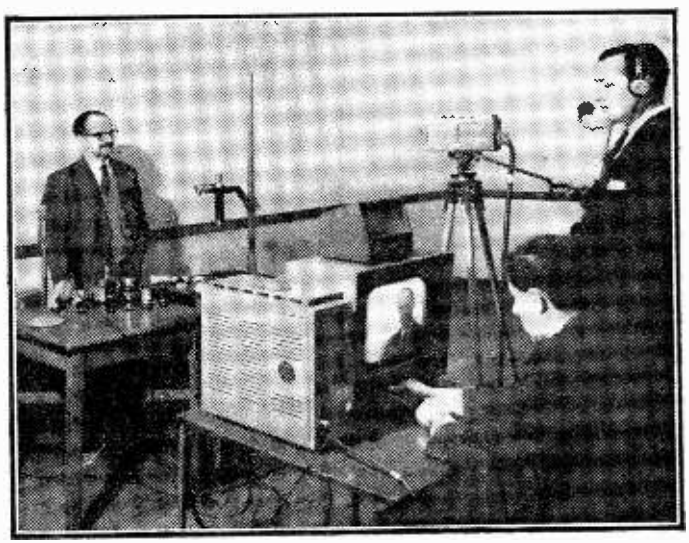
NINETEEN - FIFTY - SEVEN has been a wonderful year for commercial television—and also for that interesting by-product, the specialised public opinion polls. The BBC have always had their own somewhat dignified methods of obtaining listener and viewer opinions of their programmes. The commercial companies have taken up the television audience assessment services organised by Nielsen Television Service and also Television Audience Measurement Limited in a big way. T.W.W. is the latest programme company to make agreements with both of these organisations for the supply of information on television viewers opinions in all areas. in addition to their own. Television Audience Measurement Limited have announced that out of a total of 2.596 programmes listed in their regular *Top Ten* lists over a period of two years. up to the end of August 1957. 98% were from I.T.V. companies. *Sunday Night At The Palladium* figured at the top of their *Top Ten* lists no less than fifteen times. with *Gun Law* as runner up. with a score of thirteen. This is an interesting result. but it is a measurement of popularity and not necessarily quality. I do not think that the BBC should be very despondent about it. I have the feeling that their popularity suffers because of the lack of commercials ! A good many viewers have become thoroughly accustomed to the commercials and like them ! One somewhat low-brow viewer said to me : "Looking at a programme without commercials in it is like looking at a newspaper or magazine without adverts—dull as ditchwater." This is an angle that hadn't occurred to me before.

BBC Television Films

THE BBC have standardised on 35 mm. films for their own film units. excepting when they send the camera units abroad. Then they equip their cameramen with 16 mm. cameras and accessories. The BBC are considerably expanding the facilities at their Ealing Centre for dealing with both types of film. Storage space for filmed features, telerecordings. picture negatives and sound tracks has been provided in a grand manner by the construction of a large building. housing no less than forty film vaults. Six more viewing theatres. more cutting and editing rooms and a large sound transfer suite are almost complete. The cartoon and caption studio. fitted with two 35 mm. cameras and one 16 mm. camera, with all kinds of trick photography accessories available. is now in full operation.

Billy Cotton

THE Billy Cotton *Saturday Show* scored an instant hit. thanks to Jimmy Grafton's lively script and Billy Cotton Jnr.'s expert direction—but not forgetting the amazing energy and engaging television personality of Billy Cotton himself. Years ago I remember Billy Cotton as a dashing racing car driver at Brooklands who. I was then told. also ran a dance band. He dominates the television scene now just as he did that old car-racing track then. His selection of guest artistes such as Peter Sellers, Alma Cogan. Kathie Kay—and, of course. Alan Breeze—blends in with his band show admirably.



Mr. John Gilbert, of the Northern Polytechnic, demonstrating a closed-circuit TV lecture.

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6AB7	8/-	6J5GTG	5/6	8D2	3/6	25Z5	10/6	AL60	10/-	EBC41	10/-	EM34	10/-	MU14	10/-	U52	8/6	XFY12	6/6
6AB8	14/-	6J5GTM	6/-	8D3	9/-	25Z4G	10/-	AP4	7/6	EBF80	10/-	EM80	10/6	OA10	12/6	U76	8/-	XH(1.5)	6/6
6AC7	6/6	6J6	5/6	9D2	4/-	25Z6G	10/-	ATP4	5/-	EBF89	9/6	EY51		OA70	5/-	U78	7/-	XSG(1.5)	6/6
6AG5	6/6	6J7G	6/-	10C1	15/-	28D7	7/-	AZ31	12/6	EC52	5/6	(Small)	12/6	OA71	5/-	U251	15/-	Y63	7/6
6AJ8	9/-	6J7GT	10/6	10F1	19/6	30	7/6	BL63	7/6	EC54	6/-	EY51		OC72	30/-	U404	10/6	Z63	10/6
6AK5	8/-	6K7G	5/-	10F9	11/6	30C1	14/-	CK505	6/6	ECC31	12/6	(Large)	12/6	P61	3/6	UABC80		Z66	20/-
6AL5	6/6	6K7GT	6/-	10F18	12/6	30F5	12/6	CK506	6/6	ECC32	15/-	EZ35	6/6	PABC80	15/-		10/6	Z77	9/-
6AM6	9/-	6K7GT	6/-	10LD3	9/6	30FL1	12/6	CK523	6/6	ECC33	10/6	EZ40	8/-	PCC84	10/-	UAF42	10/6	Z719	14/-
6AQ5	7/6	6K8G	8/-	10P13	17/6	30L1	12/6	CV63	10/6	ECC33	8/6	EZ41	10/6	PCC85	12/6	UB41	12/7	Z729	14/6

TERMS OF BUSINESS :—CASH WITH ORDER OR C.O.D. ONLY. POST/PACKING CHARGES 6d. PER VALVE ; ORDERS VALUE £3 OR MORE POST FREE. MINIMUM C.O.D. FEE AND POSTAGE 3/-. EACH ADDITIONAL VALVE 6d. EXTRA. WE ARE OPEN FOR PERSONAL SHOPPERS MON.-FRI. 8.30-5.30. SATS. 8.30-1 P.M.

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

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

BENTLEY ACOUSTIC CORPORATION LTD.

THE VALVE SPECIALISTS

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PRImrose 9090

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

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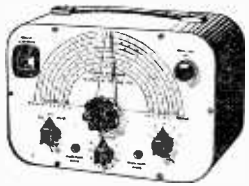
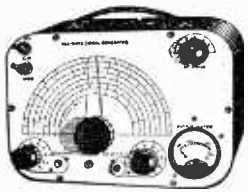
SIGNAL GENERATORS

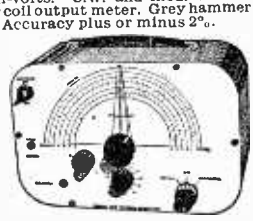


£8.19.6 or 25/- deposit and 6 monthly payments of 21/6. P. & P. 5/- extra. **Coverage 100 Kc/s-100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics.** Metal case 10in. x 6½in. x 5½in., grey hammer finish. Incorporating three miniature valves and Metal Rectifier. A.C. Mains 200/250. Internal Modulation of 400 c.p.s. to a depth of 30%: modulated or unmodulated R.F., output continuously variable. 100 milli-volts, A.F. output. Incorporating C.W. and mod. switch, variable magic-eye as output indicator. Accuracy plus or minus 2%.



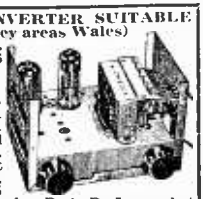
£4.19.6 or 25/- deposit and 4 monthly payments of 21 6 P. & P. 5/- extra. Coverage 120 Kc/s-230 Kc/s. 300 Kc s-900 Kc/s. 900 Kc/s-2.75 Mc's. 2.75 Mc s-3.5 Mc s 8 Mc's. 23 Mc/s. 16 Mc s-56 Mc's. 21 Mc/s-84 Mc/s. Metal case 10in. x 6½in. x 4½in. Size of scale. 6½in. x 3½in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent., modulated or unmodulated R.F. output continuously variable 100 milli-volts. C.W. and mod. switch. variable A.F. output and moving coil output meter. Grey hammer finished case and white panel. Accuracy plus or minus 2%.

SIGNAL & PATTERN GENERATOR



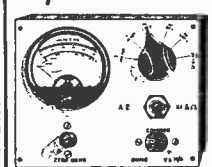
25/- deposit plus P. & P. 5/- and 6 monthly payments of 21/8. Cash £6.19.6 plus P. & P. 5/-. Coverage 7.6 Mc/s-210 Mc/s in five bands, all on fundamentals, slow-motion tuning, audio output. 8 vertical and horizontal bars, logging scale. In grey hammer finished case with carrying handle. Accuracy ± 1%. A.C. mains 200-250 v.

COMMERCIAL TELEVISION CONVERTER SUITABLE ANY T.V. (Except Philips and valley areas Wales) WITHIN 35 MILES OF I.T.A. TRANSMITTER, ALL CHANNELS NO ALTERATIONS TO SET.



Complete with built-in power supply. 200-250 v. A.C. mains. Crackle finish case 5¼in. long, 3¼in. wide, 4¼in. high. Incorporating gain control and band switch. Illus. with cover removed. Complete with Wolsey 3 element I.T.A. outdoor or loft aerial, 36 ft. I.T.A. lead and 2 plugs. (Wolsey 5 element 10/- extra). 25/- deposit, plus P. & P. 5 -. and 4 monthly payments of £1.5.6. Cash £5.17.0 plus P & P 5/-. Converter only £3.19.6 plus P. & P. 2/6.

AC/DC POCKET MULTI-METER KIT



Comprising 2in. moving coil meter scale calibrated in AC/DC volts, ohms and milli-amps. Voltage range AC/DC 0-50, 0-100, 0-250, 0-500, milli-amps 0-10, 0-100. Ohms range 0-10,000. Front panel, range switch, wire-wound pot (for ohms zero setting) toggle switch, resistors and meter rectifier. Basic movement 2 mA. In grey hammer-finish case.

19/6 P. & P. 1/6. Built and tested 7/6 extra.

Point to point wiring diagram 1/-. free with kit

COMPLETELY BUILT PORTABLE AMPLIFIER approx. size 6½in. x 2½in. incorporating 2 valves, contact-cooled metal rectifier. bass and treble lift controls and double wound mains transformer 230-250 v. **39/6** Plus P. & P. 3/6. 5in. **P.M. SPEAKER & O.P. TRANSFORMER,** if purchased with the above. 18/6. Plus P. & P. 1/6.

COLLARO 4-SPEED AUTOMATIC CHANGER

Model 457 (suitable for use with above amplifier). A.C. mains. 200-250 v., turnover crystal head. **£8. 19. 6** Plus P. & P. 5/-. Brand new, fully guaranteed. Or 25/- deposit and 7 monthly payments of £1.5.0.

RADIO & T.V. COMPONENTS (Acton) LTD.

23, HIGH STREET, ACTON, LONDON, W.3

All enquiries S.A.E. GOODS NOT DESPATCHED OUTSIDE U.K.

EDDY'S (Nottm.) LTD.

(DEPT. P.T.)

172, ALFRETON ROAD, NOTTINGHAM

MIDGET BATTERY ELIMINATORS to convert all types Battery Portables (Please state Make and Model No.) to Mains Operation, 57/6 each. Post and Packing 2/6 extra.

SINGLE PIECE THROAT MIKES, 1/- each. Post, etc., 6d. extra.

6K7G Valves 2/11 each Post 6d. extra.

GERMANIUM DIODES 1/- each. 10/- dozen. Post, etc., 4d. each

All New and Guaranteed.

Any Parcel Insured against damage in transit, 6d. extra.

SURPLUS, NEW AND GUARANTEED

VALVES

Post, etc., 6d. per valve extra. Over £3 free.

NO LISTS. S.A.E. WITH ALL ENQUIRIES.

EB91	6/6	MU14	8/6	1T4	7/3	7H7	8/11
EBC41	9/6	KT36	17/6	3S4	8/6	7S7	8/11
EBF80	9/6	PCC84	9/6	3V4	8/6	7Y4	7/11
ECC81	8/11	PCF80	16/11	5U4G	6/6	10F1	15/11
ECC82	8/11	PCL83	17/6	5Z4G	9/11	12AH7	7/11
ECC83	8/11	PL82	9/11	6B8G	3/11	12AH8	9/11
ECC84	10/6	PL83	10/11	6BA6	6/6	12K7G	7/6
ECC85	9/6	PY80	8/6	6BJ6	7/6	12Q7G	7/6
ECH42	9/11	PY81	8/6	6F1	13/11	12SK7GT	8/6
EF40	13/11	PY82	8/6	6F13	13/11	12SJ7GT	7/6
EF41	9/6	U25	13/6	6F15	13/11	1437	15/11
EF80	9/11	UBC41	8/6	6J5G	3/11	35L6G	10/11
EF83	9/11	UBF80	9/6	6K7G	2/11	35A5	10/11
EF91	7/11	UCH42	8/11	6K8G	7/11	35W4	7/6
EL41	9/11	UF41	8/11	6L6G	7/11	35Z4	7/6
EL84	9/11	UL41	9/6	6SK7GT	7/11	807	4/11
EY51	11/6	UL84	10/6	65N7GT	7/11	954	1/5
EY86	15/11	U35	19/6	7B7	8/11	955	3/11
EZ80	8/3	UY41	7/6	7C5	8/11	956	2/11
GZ32	12/6	1R5	7/11	7C6	8/11	953	3/11
KT33C	8/6	155	7/3				

St. Mary's Electronics

(Tel. : AMBassador 9795)

18, PRAED STREET, LONDON, W.2

T/V TUBES

	12 in.	14 in.	17 in.
MULLARD ...	£5	£6	£7
MAZDA ...	£5	£6	£7
EMITRON ...	£5	£6	£7

ALL OTHER TYPES EX-STOCK.

TERMS : 3 MONTHS' GUARANTEE. P.P. INS. 10/- C.W.O.

REBUILT TUBES

	12 in.	14 in.	17 in.
MAZDA ...	£9	£11	£12.10.0
MULLARD ...	£9	£11	£12.10.0

ALL PRICES INC. P.P. & INS.

ALL REBUILT TUBES ARE GUARANTEED

SIX MONTHS

PLEASE SEND S.A.E. FOR ANY ENQUIRIES

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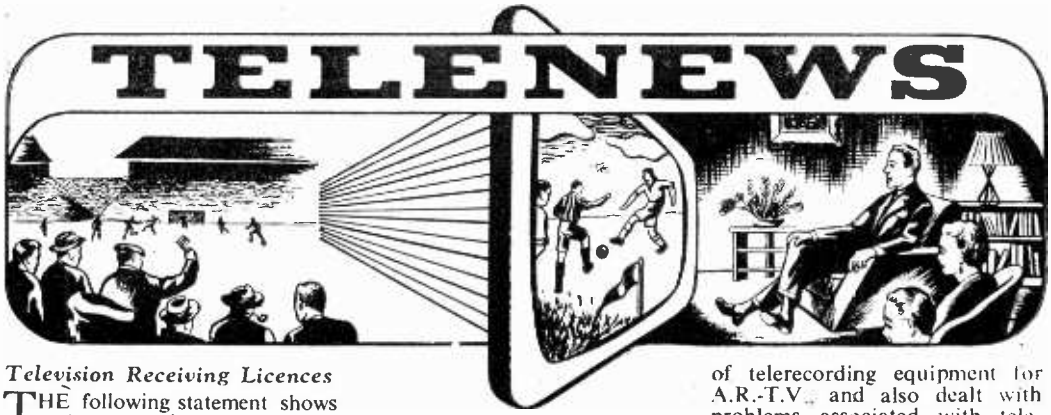

Television Receiving Licences

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

Region	*Total*
London Postal	1,560,073
Home Counties	965,533
Midland	1,278,346
North Eastern	1,265,643
North Western	1,109,409
South Western	605,363
Wales and Border Counties ...	450,390
Total England and Wales ...	7,234,757
Scotland	583,063
Northern Ireland	80,427
Grand Total	7,898,247

ITV in the North-east

THE Independent Television Authority announces that it has decided to accept, subject to contract, the application of a company to be formed from a group of prominent citizens in North-east England in association with the *News Chronicle*. Messrs. George and Alfred Black and Mr. Sydney Box to become programme contractors for its North-east station. The chairman of the new company will be Sir Richard A. Pease, Bart., and among the directors will be Viscount Ridley, Col. E. G. Angus, Mr. E. G. Fairburn, Mr. C. C. Darling, Mr. D. A. Pease, Lord Layton, Mr. Peter Cadbury and Professor E. J. R. Eaglesham, as well as Messrs. George and Alfred Black and Mr. Box.

T.T.Tv. Appoint Chief Engineer

TYNE TEES TELEVISION LTD., programme contractor for the North-east England Independent Television Station, have appointed Mr. Dennis George Packham, at present head of the Television Broadcasting Department of Central Rediffusion Services Ltd., to be chief engineer.

Mr. Packham joined the BBC in 1944 as an engineer trainee, afterwards becoming technical assistant in the Lines Dept. In 1947 he transferred to the television section of this department and later the design department (television transmission section).

In 1955 he joined Central Rediffusion Services Ltd., technical consultants to Associated-Rediffusion Ltd., as an engineer in the television department specifically responsible for the development and installation of telerecording equipment for A.R.-T.V., and also dealt with problems associated with telecine equipment. He became head of the department in November, 1957.

Peterborough Diesel Company on Panorama

A PETERBOROUGH diesel engine company recently featured in Panorama.

A television production team visited F. Perkins Ltd., to obtain film shots and interviews for a special Panorama report dealing with the problem of resettling Regular officers and other ranks in industry following reductions in Britain's armed forces.

A number of general shots of F. Perkins Ltd.'s Eastfield factory—one of the most up-to-date plants in Europe—were filmed by the unit, which was

A scene in a corner of F. Perkins' factory when Panorama visited them for a recording.

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headed by Jeremy Murray-Brown, a member of the Panorama production team.

TAM Surveys Scottish I.T.V. Area

A SURVEY carried out by Television Audience Measurement Limited in the Scottish I.T.V. area during January showed that the number of homes in the area able to receive I.T.V. had increased by 70,000 to 345,000 since TAM's previous survey of the area last November.

Part of this increase was undoubtedly due to the increased power of the Blackhill transmissions, and the first effects of this power increase were apparent in the November survey.

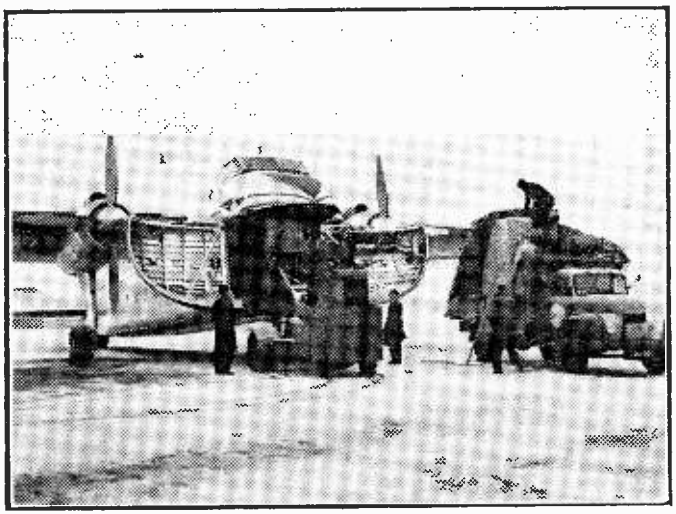
The survey, which was based on 1,000 interviews in a stratified random sample of households, showed that whereas 36 per cent. of all homes in the area were of A, B or C social class, the number of I.T.V. homes in these categories totalled 40 per cent. —139,000. Further, 67 per cent. of all housewives in the area under the age of 50 were now in I.T.V. homes, compared with 54 per cent. in all homes.

The number of persons in each I.T.V. household was shown to average 3.7. This means, adds TAM, that while some 28 per cent. of homes in the Scottish area were able to receive I.T.V., the number of persons able to watch I.T.V. in their homes was approximately 33 per cent.

The latest TAM estimate of the number of I.T.V. homes in the Scottish area is 362,000.

Flying Television Station

THE complete transmitting equipment for a new television station under construction at Aalborg, in Denmark, has been flown out from Britain by Marconi's Wireless Telegraph Company, Ltd. This consignment is part of a £90,000 order for the transmitters, aerials and ancillary equipment for three new stations planned by the Danish Posts and Telegraphs Department to bring television within the reach of a large part of the Danish population.



This picture shows the on-loading of the Danish TV station proceeding under wintry conditions at Southend Airport in Essex. The aircraft is a Bristol Freighter of Air Charter Ltd.

The equipment in the consignment included the new compact Marconi 4 kW. vision and 1 kW. sound transmitters.

Marconi Television at Leipzig Fair

A CENTRE of attraction at the Leipzig Fair this year will be the television demonstrations on the Marconi stand. The items displayed will include a completely equipped mobile television vehicle for outside broadcasts and the new vidicon telecine equipment.

The exhibit will be displayed on a specially constructed stand occupying approximately 950 sq. ft., built in the company's Chelmsford works and transported by road and sea right across Europe. The stand will be erected close to the Electro-technical Pavilion by a team of workers from England.

Continuous demonstrations of the television equipment will be given and, as in the case of the Poznan Fair last year, it is expected that this will attract many thousands of visitors to the stand. In addition to the television exhibit a selection of marine radio and test equipment will be shown.

"Kidnappers" Caught by Television

AN annual event in the south of Holland is the Police Rally in which all the police forces—state, municipal, customs and military—of the Province of North Brabant take part. This year some 165 units participated, each district being represented by teams on motor-cycles, motor-cycle combinations and in cars. The programme included all the conventional features of this type of rally such as map-reading, use of teleprinter, radio-telephony, etc.

In addition an interesting experiment was carried out using television for the distribution of vital police information. This took the form of a fake kidnapping and the result was the "arrest" of the "Criminals" within an hour and fifty minutes of the "crime" being reported.

New Aid to TV Advertising

A CLOSED circuit television system for auditioning artistes and for direct viewing of packaging and films on a television screen has been installed by Marconi's for G. S. Royds Ltd., a leading British advertising agency.

The system, which uses the Marconi industrial vidicon camera, enables the telegenic qualities of a product and its packaging, as well as the artistes and action of a TV commercial, to be assessed in conditions identical with TV viewing in the home. Rehearsals and packaging can be viewed direct through the camera channel on a television screen, so that a producer can judge the qualities of a commercial before it is filmed.

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PREMIER RADIO CO.

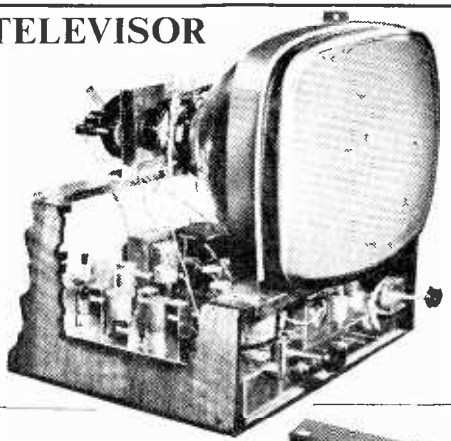
(Regd.) B. H. MORRIS & CO. (RADIO) LTD.

207, EDGWARE ROAD, LONDON, W.2.
Telephone : AMBassador 4033. PADdington 3271/2.

23, TOTTENHAM COURT ROAD, LONDON, W.1.
Telephone : MUSeum 3451.

Build the NEW "MAYFAIR" TELEVISOR

which gives complete SAFETY to the constructor !



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

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

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

The "Petite" PORTABLE

MAY BE BUILT FOR

£7 · 7 · 0

plus 3/- post & packing.

★ Size only 8in. x 8in. x 4½in.

Batteries extra.

HT 10/- (Type B126) or equivalent.

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

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

SAVE POUNDS and put it together yourself ! !

TOTAL COST ONLY

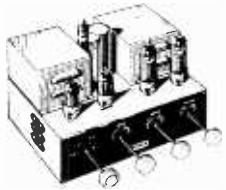
£9.19.6

plus 5/- post & pack

Each Unit may be purchased separately as follows :—

Amplifier Cabinet in maroon and fawn (size 13¾ x 11 x 6½in.)	£2/10/–
1 Valve Amplifier	£2/19/6
7 x 4in. Elliptical Speaker	£1/1/6
B.S.R. TU8 Turntable and Pickup	£3/19/6

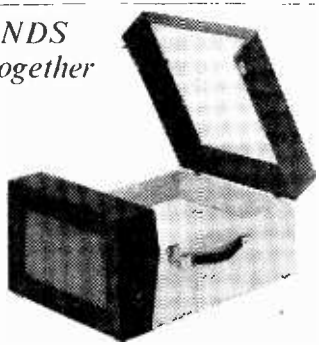
This can also be supplied complete with the **Latest Collaro 4-speed Junior Turntable and Pickup** for only **£10/12/6** plus 5/- packing and postage.
If any of the individual items are purchased, kindly add the postage as follows : Cabinet 3/-, Amplifier and Speaker 3/-, Turntable 2/6.



8-WATT AMPLIFIER

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

SAVE POUNDS and put it together yourself ! !



Cabinet, £2/19/6
plus 5/- pkg. & post.
Premier 1-valve Gram. Amplifier, £2/19/6
plus 2/6 pkg. & post.
Premier 2-valve Printed Circuit Amplifier, £3/5/6
plus 2/6 pkg. & post.
8in. x 5in. Speaker, 27/6
plus 1/6 pkg. & post.

Collaro 4-speed Changer, £8/19/6 plus 5/– pkg. & post.
BSR 4-speed Changer, £8/15/0 plus 5/– pkg. & post.
If a set of parts are purchased together, pkg. & post will be 10/-.

RECORD CHANGERS

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

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

RECORD PLAYERS

Collaro 3/544 — £6.19.6
Collaro Junior — £4.14.6

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

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

PLEASE ADDRESS ALL MAIL ORDER ENQUIRIES TO (Dept. PT3), 207 EDGWARE RD., LONDON, W.2

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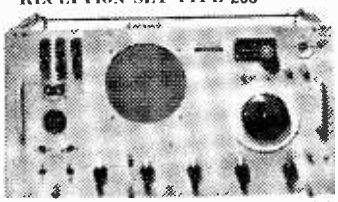
SPUTNIK SPECIAL

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



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

£6/19/6 Carr. 15 6.

BE PREPARED TO LISTEN TO THE SATELLITES

"TRANSISTOR—8"

Push-Pull Portable Superhet Can be built for **£11/10/-**

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

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

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

"EAVESDROPPER"

THREE TRANSISTOR POCKET RADIO
(No Aerial or Earth required)

Variable Tuning. Total cost, as specified including Transistors, Transformers, Coils, Condensers and Battery, etc., with circuit and plastic case. **77/6** POST FREE.
All items sold separately.
With Balanced Armature, 81 -. With Acos Mike, 90 -. With Min. Hearing Aid, 90 .

MINI-TWO

TWO-TRANSISTOR MINIATURE POCKET RADIO

The smallest Transistor set offered on the market. Variable Tuning, Drilled Chassis, Plastic Case size 3in. x 2in. x ¾in., Miniature Hearing Aid, 2 Transistors and all components including 1½ volt Battery. Circuits and full practical layout diagrams. All items sold separately.

Total Cost **49/6** Complete

"HOMELIGHT" 2-TRANSISTOR PERSONAL PORTABLE
Variable Tuning

We can supply all components including 2 Transistors, Diode, Resistors, Condensers and Miniature Hearing Aid and Plastic Case size 4¼ x 2¾ x 1¼in. and 1½ v. Battery. FOR **52/6**
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JUNCTION TYPE P-N-P
(British Manufacture)

RED-SPOT 800 kc's Audio Frequency. 10'-.
BLUE-SPOT 1.6 Mc's Mixer and Frequency Changer. 15 -.
WHITE-SPOT 2.5 Mc s R.F. and I.F. Amp., 20 -.

A.C./D.C. 200 50v. PORTABLE-GRAM AMPLIFIER

Completely assembled on Baffle Board size 12¼ x 4¾in. Depth 3in. Containing two Mullard valves type UL84 and UY85. Elac. 7 x 4. Elliptical Speaker. Volume Control. Tone Control. Nothing else to buy, just plug in to mains and connect your Pick-up to Amplifier. **67/6** Carr. 2/6.
ABSOLUTE BARGAIN.

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BAND III CONVERTOR

for ANY SET in ANY AREA

This unit has been widely used since I.T.A. Transmissions began to convert all types of sets, Superhet and T.R.F., to receive on Band III.

Unlike many other convertors this unit is small enough to be fitted inside your cabinet, enabling the job to appear finished and perfectly safe for all to use.

The wiring is simple to follow, and alignment is not difficult.

★ IT will convert any set, any age, T.R.F. or Superhet.
★ IT includes station switching.
★ IT provides pre-set contrast balancing.
★ IT uses only one aerial input for both bands
★ IT provides manual tuning on Band III.
★ IT is totally screened.
★ IT completely rejects unwanted signals.
★ IT requires no additional power supply where either 6.3 v. or .3 amp. heater line is available.

CONVERTOR wired and aligned with fitting instructions **£3 10 6**
KIT complete in every detail, less knobs **£2 10 6**
KNOBS each **1 0**
CIRCUIT and instructions in detail (free with kit) **1 6**
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When ordering please state present B.B.C. Station and I.T.A.

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C. & G. KITS

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14	MW 36-22	5	10	0
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17	MW 43-43	7	10	0
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14	C14BM	5	10	0
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14 in. Marconi, Emitron, Ferranti, G.E.C. **£5 10 0.**
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CORRESPONDENCE

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

TRANSISTORISED TV

SIR,—I have spoken to one or two friends of late and have been surprised to find that there is an impression abroad that sooner or later TV sets will be available entirely without valves. In at least two cases old sets are being retained instead of new ones being bought because the owners think that there will soon be transistor sets which will not take any power from the mains and thus be cheaper to run. No doubt some of the adverts and the writings of newspaper critics are responsible for this opinion, but it seems to me to be quite wrong. The tube itself will surely never be "transistorised," and many parts of the modern TV set cannot be made to work with transistors. It would be interesting, however, to try to visualise the form the set will take say, in two years' time, judging by present progress and the possible development of the shallow tube.— G. R. TREEBY (N.W.).

SPECIAL NOTE

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

PRINTED CIRCUITS

SIR,—It appears that more and more "printed circuits" are coming into favour with our manufacturers.

But is this a good thing?

In an American radio magazine of recent date there is an advert which states that although one of their company directors was a pioneer of printed circuits they do not use this method of construction. They say—for one thing—"it isn't fair to servicemen."

I gather from this that the replacement of components isn't an easy matter? Could any readers (who have practical knowledge on this subject) give their views.—"WINDY" (Workington).

AERIAL DESIGN

SIR,—I was glad to see the note in the February issue on aerials, and I am sure that many more readers will be interested in this aspect of the hobby. In my travels round the country I am very intrigued by some of the mixed arrays one sees on houses in various districts, and I have even seen mixed vertical and horizontals in one street. I am sure many readers would be glad of more information on this aspect of the hobby.—H. G. BEST (Wimbledon).

[*Another article on this subject will be found in this issue.*—ED.].

PECULIAR FAULTS

SIR,—You have mentioned several interesting faults under the above heading but I should like to point out one possibility which occurred to me in actual practice and which may be the source of similar trouble to someone else. I have a set which was intermittent and like all such troubles it proved almost impossible to trace. The moment one went near it to try and take voltage readings, etc., it worked, only to stop after a short time for no apparent reason. After a lot of probing and headaches it was found to be due to a faulty valveholder. This was of the B9A type and the small metal clip which forms the socket on the holder had become loose in the paxolin. When the valve had been inserted in the holder it had pushed the clip out of the holder, but the tip of the pin on the valve was just lodged in between the two "blades" of the clip. The wire soldered to the socket was sufficiently thick to hold the clip in position and when no vibration took place the pin made sufficiently good contact for the set to work. On vibration from a loud note or loud speech, the pin shook loose and at times remained in such a position that the pin was not touching. The slightest vibration and it contacted again. The valve had been twice removed and tested and on placing back had made contact, but the third time of testing when it was returned I was lucky, and it did not touch the loose socket. Hence the location of the "fault."—F. H. J. WHITELY (Bedford).

CONSTRUCTING "H" AERIALS

(*Continued from page* 412)

be sufficient, but this was not readily available. Second, a steel mast, which raises problems of weight and weatherproofing. The third alternative of a wooden mast was also rejected from the angle of weight and less secure fixing points. The final alternative is the composite mast, which proved simple and strong as well as light.

Additional Parts

Two additional tubes of light alloy 1in. in diameter and of the same length as the mast are bolted to the existing mast along its full length, cut away to fit close up to the mast fixing plates at the H crossbar and bolted with a ¼in. bolt through both the fixing brackets and the ⅞in. tube. Fig. 13 shows the existing mast section (1) and the new tubes (2) and (3). Beginning at the bottom of the mast, these are bolted together by ¼in. bolts in the following order: (2) to (3), (3) to (1), (1) to (2), and so on at 15in. intervals. This assumes that the line of the aerial lies at right-angles to the tangent to (2) and (3), or sufficiently so to enable slight packing to correct the lie of the array when bolted. If not, choose the tubes which are to lie against the chimney bracket and bolt these together first, continuing as before. With care in drilling the cable need not be withdrawn.

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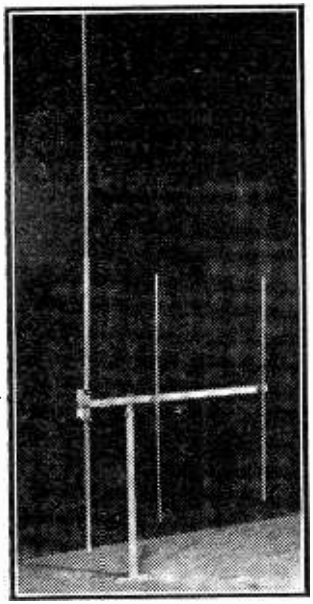
News From the Trade

The Super Loft

IN view of the great popularity of the co-linear type aerial, known as the Twin-Super that was put on the market by Wolsey at the Radio Show, they have now developed a loft aerial working on this principle.



The Wolsey super-loft aerial.

The Wolsey Super Loft has a driven element composed of a Twin-Super and two dipoles mounted on their standard vertical arm and their standard arm and ball joint, thus enabling it to be fitted either on the joist or the sloping side of a roof.

Performance figures are: Band III, forward gain better than 6 Db. Band I, dipole equality. Price 37s. 6d.—Wolsey Electronics Ltd., Cray Avenue, St. Mary Cray, Orpington, Kent.

Antiference Aerials

THE following modifications have been made to Antiference aerials and incorporated in all models now being despatched to distributors:

1. Variable Locking Plates ("Antex-Plus" models X04, X04/4K). Variable locking plates are now fitted to all "Antex-Plus" models to give a positive lock to the "Antex" section in any position.

2. New Mast Type "K" ("Antex-Plus" and "Hilo" models). To provide additional stand-off our mast Type "K" has been redesigned and all "Antex-Plus" and "Hilo" models with catalogue suffix /4K or /3K are now supplied with this mast.

3. Alternative position for Universal Mast Clamp ("Antex-Plus" models X04, X04/4K). To give even greater stand-off for difficult installations an alternative position for the universal mast clamp is now provided on the "Antex-Plus" next to the Antex junction unit.—Antiference Ltd., Bicester Road, Aylesbury, Bucks.

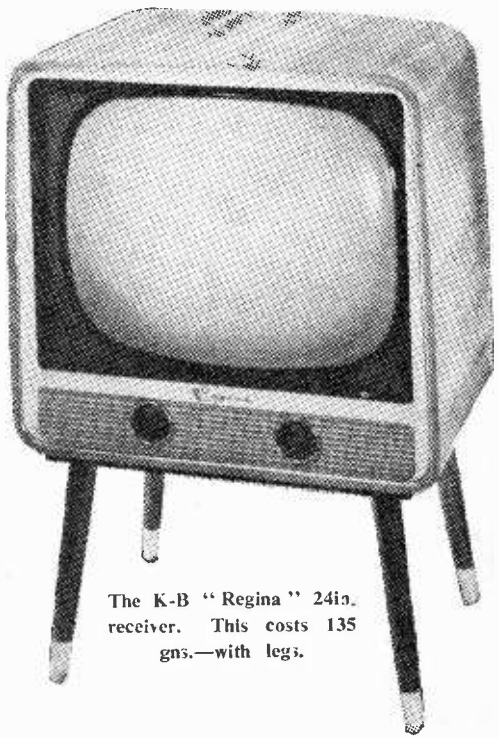
G.E.C. 21in. FM/TV Receiver

A NEW F.M. table television receiver is announced by The General Electric Co. Ltd. Retailing at £101 17s. (including £29 6s. 5d. P.T.), the model is housed in a polished walnut veneer cabinet and has a 21in. aluminised filter-faced tube operating at 18 kW. The 18-valve high-sensitivity chassis, positive action synchronising and automatic picture control, ensure first-class reception in all signal areas. Twin high-fidelity loudspeakers are fitted.

The 12-position turret tuner, covering all available BBC and commercial television programmes, has three positions which select the Home, Light and Third programmes of the BBC's V.H.F./F.M. service. The catalogue No. is BT.3747.—G.E.C., Magnet House, Kingsway, W.C.2.

K.-B. "Regina"

THIS 24in. receiver, shown for the first time at the last Radio Show, has now been released and is proving very successful. The chassis used in this is similar to that used for the 17in. and 21in. K.-B. models excepting for the necessary changes to obtain higher EHT and scanning power. A new miniature 13 channel turret tuner has been incorporated and the internal aerial, so popular in the "New Queen" series has been included. The cabinet design also follows the popular "New Queen" styling and is available in dark high-gloss walnut veneer or contemporary light figured walnut veneer, and cabinet details are similar to Model PV70 except for the 90 deg. C24KM Brimar tube and the frame mask to reveal the whole screen area. Price, completed with legs, 135 gns., tax paid. —Kolster-Brandes Ltd., Footscray, Sidcup, Kent.



The K-B "Regina" 24in. receiver. This costs 135 gns.—with legs.

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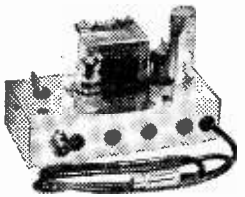


BAND 3 T/V CONVERTER
185 Mc/s—199 Mc/s

Suitable London, Birmingham, Northern and Scottish ITA Transmissions

Mk. 2 Model, as illustrated. Latest Cascode circuit using ECC84 and EF80 valves giving improved sensitivity (12 db.) over standard circuits, built-in Power Supply A.C. 200-250 v. Dimensions only 6½in. x 3in. Ht. 4in. Simple and easy to fit—only external plug-in connections. **Wired, aligned and tested ready for use. State Channel Required. Guar. Bargain Offer**—good results or full refund, only

£3.19.6. Carr. & Pkg. 2/6.

Mk. 1 Model. Using 2 803s or EF80s. Full constructor's Kit of Parts including drilled chassis 7in. x 4in. x 2½in., blueprint, valves and all components, etc., excluding Power Supplies to modified W/W design. Many 100's in satisfactory use. **Bargain Offer only 2 gns.** P. & P. 2/6. Power Supply Kit, complete, 20/-. P. & P. 1/6. Band 1-Band 3 Switch Kit, 6/6.

CONVERTER ACCESSORIES. Band 1-Band 3 Cross-over Unit, 7/6. Var. Attenuators 6db-36db, 6/9. BBC Pattern Filter, 8/6. Band 3 Aerials—outside single dipole with 4 yds. coax., 13/9. 3 element Beam, 27/6. 5 element, 35/-. etc., etc.

Volume Controls

Log. ratios, 10,000 ohms —2 Megohms. Long spindles. 1 year guarantee. Midget Edison type.

No. Sw. S.P. Sw. D.P. Sw.
3/- 4/- 4/9

Linear Ratio, 10,000 ohms — 2 Mehogms. Less switch. 3/- each. **Coax plugs, 1/2. Coax sockets, 1/-. Couplers 1/3. Outlet boxes, 4/6.**

80 ohm CABLE COAX

STANDARD ¼in. diam Polythene insulated. GRADE "A" ONLY.

8d. yd.

SPECIAL — Semi-air spaced polythene, 80 ohm. **Coax.** ¼in. diam. Stranded core. Losses cut 50%.

9d. yd.

Ideal Band 3.

TWIN FEEDER, 80 ohms, 6d. yd. ; 300 ohms, 8d. yd

TWIN SCREEN FEEDER, 80 ohms, 1/3 yd.

50 OHM CABLE, 8d. per yd., ¼in. dia.

TRIMMERS, Ceramic, 4 pf.-70 pf., 9d. 100 pf., 150 pf., 1/3 ; 250 pf., 1/6 ; 600 pf., 1/9. **PHILIPS** Beehive Type—2 to 8 pf. or 3 to 30 pf., 1/- each.

RESISTORS.—Pref. values 10 ohms to 10 megohms

CARBON		WIRE WOUND	
20% Type, ½ w., 3d. ; ¼ w., 5d. ; 1 w., 6d. ; 2 w., 9d.	5w.	25 ohms—10,000 ohms	1/3
	10w.		1/6
	15w.		2/-
10% Type, ½ w., 9d. ; 5% Type, ½ w., 1/- ; 1% Hi-Stab., ¼ w., 2/-.	5w.	15,000— 33,000 ohms	1/9
	10w.		2/3

WIRE-WOUND POTS. Pre-Set Min. T.V. Type Knurled Slotted Knob. All values 25 ohms to 30 K., 3/- ea. 50 K., 4/-. Ditto Carbon Track. 50 K. to 2 Meg., 3/-.

3w. LAB. COLVERN, etc. Standard Size Pots, 2½in. Spindle. High Grade. All Values. 100 ohms to 50 K., 5/6 ; 100 K., 6/6.

W/W EXT. SPEAKER CONTROL 10Ω, 3/-.

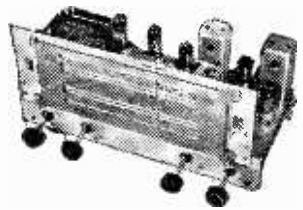
SOLON SOLDERING IRONS (200-220 v. or 230/250 v.), 25 watt Instrument Type, 21/6 ; 65 watt Pencil Bit Type, 28/8 ; 65 watt Oval Bit Type, 25/-. Comprehensive stock of spares available.

SPEAKER FRET.—Expanded Bronze anodised metal 8 x 8in., 2/3 ; 12 x 8in., 3/- ; 12 x 12in., 4/8 ; 12 x 16in., 6/- ; 24 x 12in., 9/-, etc.

TYGAN FRET (Murphy pattern) 12in. x 12in., 2/- ; 12 x 18 in., 3/- ; 12 x 24in., 4/-, etc.

8" P.M. SPEAKER (3 ohms)

Ex Mfrs. Units : Rola. W.B., Celestion, etc. All reconditioned and guaranteed. Ideal Ext. Unit. Bargain, 7/6. Carr. 1/6. Ditto with O/P Trans., 9/6.



ALL WAVE RADIOGRAM CHASSIS
3 WAVEBANDS 5 VALVES

S.W. 16 m.—50 m. LATEST MIDGET
M.W. 200 m.—550 m. BVA
L.W. 800 m.—2,000 m. SERIES

Brand new and guar. A.C. 200 250 v. 4 pos. W/C. sw. Short-Medium-Long-Gram. P.U. socket. High Q dust core coils. Latest circuit technique, delayed AVC and neg. feedback. O/P 4 watts. Chassis size, 13½ x 5½ x 2½in. Dial, 10in. x 4½in. Hor. or vert. station names. Walnut or ivory knobs to choice. Aligned and calibrated ready for use. **Sensitivity and Quality at Low Cost.** Double wound mains trans. **BARGAIN PRICE 9½ gns.** Carr. and ins., 4/6.

8 or 10in. speaker to match, 20/- and 25/-.

7 Valve De Luxe, push-pull EL41 version, 7 watt output with H/Duty Trans. **£12.10.0.** Carr. & ins. 5/-.

RECORD PLAYER BARGAINS
SINGLE PLAYERS—LATEST MODELS.

4 Speed BSR (Model TA.99), **99/6.**
4 Speed COLLARO (Junior), **5 gns.**
4 Speed GARRARD (4.SP), **£7.10.0.**
Carriage and Insurance, 3/6.

AUTOCHANGERS—LATEST MODELS.

4 speed BSR (Model UA8), **£8.15.0.**
4 speed COLLARO (RC455, etc.), **£9.15.0.**
4 speed GARRARD (RC4 120D), 9½ gns.
Carriage and Insurance, 4/6.

All above models Brand New and Guar. Fitted latest style Pweight Xtal. P.U. with turnover head and twin sapphire stylii.

RECORD PLAYER CABINETS

Contemporary style rexine covered cabinet in mottled red with cream interior. Size 18½ x 13½ x ht. 8½in., fitted with all accessories, including speaker baffle board and plastic fret. Space available for all modern amplifiers and autochangers, etc. Uncut record player mounting board 14 x 13in. Cut mounting boards available.

Cabinet Price, £3.3.0. Carr. and in. 3/6.

2 VALVE AMPLIFIER (to fit above cabinet), modern circuit with EL81 output, ready built, with 6in. speaker and output transformer, **£3.12.6,** carr. and ins. 2/6.

SCOTCH BOY. EMITAPE, etc., 1,200ft., 27/-. Long playing, 1,800ft. reels, 45/-. Paper tape, good quality, 1,200ft., 12/6. Reels only, 3in., 3/- ; 5 in. 3/8 ; 5½in., 4/- ; 7in., 4/3.

I.F. TRANSFORMER—465 kc/s.

Brand new ex-manufacturer's midget I.F.T. size 2½in. x ¾in. x ¾in. dust core tuning. Litz wound coils, High Q. Bargain offer, **7/6** pair.

CONDENSERS.—Mica or S. Mica. All pref. values. 3 pf. to 680 pf., 6d. ea. Ceramic types, 2.2 pf. to 5,000 pf., 9d. each. **Tubulars,** 450 v.. Hunts and T.C.C. .0005, .001, .005, .01 and .1. 350 v., 9d. .02, .5, .1/500v. Hunts, TCC, 1/-. .25 Hunts, 1/6. .5 Hunts, 1/9. .1, 1,500 v. T.C.C. (Simplex), 3/6. .001 6 kV. T.C.C., 5/6. .001 20 kV. T.C.C., 9/6.

SILVER MICA CONDENSERS—
10% 5 pf. to 500 pf., 1/-. 600 pf. to 3,000 pf., 1/3. 1% 1.5 pf. to 500 pf., 1/9. 515 pf. to 5,000 pf., 2/-.

SPEAKERS.—PM 3 ohm, 2½ in. Elac., 16/6 ; 3½in. Goodmans, 18/6 ; 5in. R.A., 17/6 ; 6in. Celestion, 18/6 ; 7 x 4 Goodmans, 18/6 ; 8in. Elac, 20/- ; 10in. R.A., 25/- ; 12in. Plessey, 35/-.

JASON F.M. TUNER UNIT (87 mc/s-105 mc/s). As described in Radio Constructor. Designer Approved Kit of parts to build this modern highly successful unit, drilled chassis and superior type illuminated glass dial, coils, cans and all quality components, etc., for only 5 gns., post free. Set of 4 Specified Miniature Valves, 30/-, post free.
Illustrated handbook with full details, 2/-, post free
2-DAY ALIGNMENT SERVICE NOW AVAILABLE.

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NEW BOXED			ALL GUARANTEED		
1R5, 1T4	7 6	DAF95	8/-	ECL80	10 6
1S5, 1S4	7 6	DF96	8/-	EF41	10 6
3S4, 3V4	8/-	DK96	9/-	EF80	10 6
5Z4	9 6	DL96	9/-	EF86	12 6
6AT6	8 6	35L6	10 6	EF91	8 6
6K7	6 6	EABC80	9 6	EL41	10 6
6K8	8 6	EB91	6 6	EL84	11 6
6Q7	8 6	EBC41	10 6	EY51	10 6
6SN7	8 6	ECC83	9 6	EZ40	8 6
6V6	7 6	ECC84	12 6	EZ80	8 6
6X4	7 6	ECF80	12 6	MU14	8 6
6X5	7 6	ECF82	12 6	PCC84	10 6
7C5	9/-	ECH42	10 6	PCF80	10 6
7Y4	8 6	ECH81	10 6	PCF82	10 6

PL83	12 6	PY33	10 6	U22	8 6
PL82	10 -	PY81	9 6	U25	11 6
PL83	11 6	PY82	8 6	UABC80	8 6
PY80	9 6	PY83	10 6	UCC84	12 6
PY81	9 6	UCH42	10 6	UCH81	10 6
PY82	8 6	UF41	10 -	UL41	10 6
				UY41	8 6

SPECIAL PRICE PER SET

1R5, 1T4, 1S5, 1S4 or 3S4 or 3V4 ... ... 27 3
DK96, DF96, DAF96, DL96 ... ... 35 -
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5 ... ... 35 -

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends		Can. Type, Clips 3J. ea.	
25 25 v., 50/12 v.	1/9	8/450 v.	2 6
50 50 v., 4 500 v.	2/-	8+8/450 v. T.C.C.	4 6
100/25 v., 2,450 v.	2/-	8+16/450 v. Hunts.	5 -
8/450 v. B.E.C.	2/3	16+16/450 v. T.C.C.	5 6
8 500 v. Dub.	2 9	32/350 v.	4 -
8+8 500 v. Dub.	4 6	32+32/275 v. Hunts	4 6
8+16 450 v. T.C.C.	5/-	32+32/450 v. T.C.C.	6 6
16/450 v. B.E.C.	3 6	250/350 v. B.E.C.	8 6
16-500 v. Dub.	4 -	60/350 v. T.C.C.	6 6
16+16 450 v. T.C.C.	5/6	60+100 350 v.	11 6
32 350 v. Dub.	4/-	64+120/275 v.	11 6
32 500 v. Dub.	5/-	60+250/275 v.	12 6
50+50 350 v. B.E.C.	6/6	100+200/275 v.	12 6
32+32 350 v. B.E.C.	5/6	3,000 mfd. 6 v.	3 3

TRANSISTOR.—Midget electrolytics, 2 mfd., 4 mfd., 8 mfd., 6 v., 3/6. 6 mfd., 10 mfd., 16 mfd., 3 v., 3/6. 32 mfd., 1½ v., 3/6.

SENTERCEL RECTIFIERS. E.H.T. TYPE FLYBACK VOLTAGES.—K3/25 2 kV., 5/- ; K3/30 3 2 kV., 6/9 ; K3/45 3.6 kV., 7/3 ; K3/5) 4 kV., 7/9 ; K3/100S kV., 13/3, etc.

MAINS TYPES.—RM1 125 v., 60 mA., 4/9 ; RM2 125 v. 100 mA., 5/6 ; RM3 125 v. 120 mA., 7/6 ; RM1 250 v., 250 mA., 16/- ; RM4B Type 270 mA, 17/6. RM5, 250 v. 300 mA. 21/-.

MAINS TRANSFORMERS.—Made in our own Workshops to Top Grade spec. Fully interleaved and impregnated. **RADIO AND AMPLIFIER TYPE.**—250 v., 60 mA., F.W. sec. 5 v. or 6.3 v., 1 a. rect. 6.3 v. 2.5 a. set Htrs., 22/6, etc., **C.R.T. HTR. ISOLATION TYPE.**—Low leakage with or without 25% sec. boost voltage. Ratio 1 : 1 or 1.25, 2 v., 10/6 ; 4 v., 10/6 ; 6.3 v., 10/6 ; 13.3, v., 10/6. Ditto with mains primaries 200/250 v., 12/6.

SPECIAL TRANS.—Wound to your requirements.

TRANSISTORS

Mfr's. surplus PNP Junction type.
Audio Type, 800 Kc/s, 250 m.w., **9/6.**
R.F. and L.O. Mixer Type. 2.5 Mc/s, **19/6.**
All tested and guaranteed.
Transistor Components.—Midget I.F. transf. 315 kc/s, 5/- ; Ferrite Slab Aerial (dual range), 13/6 ; M. and L.W. Osc. and 1st I.F., 11/6 ; Push Pull interstage transf., 8/6 ; Push Pull output transf., 8/-.
M/Coil Earpiece, 2in. diam., 150 ohm, 4/3.
Bal. Arm. Phone Inserts, 2in., 50 ohm, 3/9.

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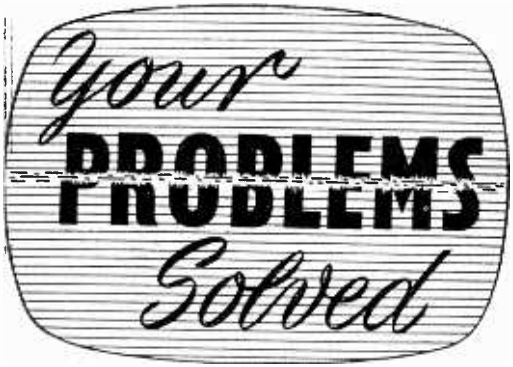

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 449 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

H.M.V. 3807

Having on hand a Mullard tube Type MW31/16, which was supposed to have a low emission but no other faults, I decided to take a chance and connect it up to the set in place of the Emitron tube (which was faulty) after changing the base and arranging second anode H.T. from the booster; but although I got a picture I could not get it in satisfactory focus except at one end of focus control and then the picture was insipid and without contrast. I forgot to say that I used an ion trap magnet intended for a larger tube as I had not got one specially for this 12in. tube. Could you offer me any advice regarding any further modification or adjustments required which might help to make this tube suitable for use with this set?—W. Marler (Manchester).

The Mullard tetrode tube requires less focusing field than the tube for which the chassis is designed. Reasonable results may be obtained, however, by adjusting the focus control almost fully clockwise and then moving the focus unit along the neck of the tube until optimum focus is achieved. If this is not successful it may be found necessary to adopt magnetic shunts on the focus unit to reduce the field.

REGENTONE "BIG 12"

I could get nothing from the tube except a thick blue line which appeared in the centre of the tube on switching off the set. The sound is very good. After a few days the tube ceased to show anything at all. I had a TV engineer to examine the set and he told my wife the tube was finished and it also had been "boosted." I know very little about the working side of a TV receiver but lately I have been reading a lot about it in these pages, and I wish to try my hand at replacing the tube in this set myself. The arrangement at the rear of the receiver is this: A small C.R.T. transformer is screwed to the side of the cabinet, from the output side of this two coloured leads, red and brown, go to the tube base. I think this is the heater arrangement. I wish to replace the original wiring.—G. Kemp (Liverpool).

Remove the transformer from the cabinet together with the leads from the tube base and rectifier. The two leads on the mains transformer which have been cut back are the original heater wires. These should be extended and reconnected to the heater tags on the tube base.

FERGUSON 992T

Picture and sound went off and inspection showed no heaters lighting up. A resistance in series with the main ballast resistance and heaters appeared to have overheated and broken off. This was so discoloured that its value couldn't be seen (or measured). I tried a number of resistances but they all burnt out. I have two 150Ω resistances in parallel at the moment and the set is working O.K. A heater voltage check on the C.R.T. shows 5 volts. The only service sheet I could get was for Model 991T and this shows no such resistance. Could you please tell me the size and rating of the correct resistance?—R. C. Ashford (Leeds, 8).

The component to which you refer is not a normal resistor but a thermistor whose resistance decreases as the valve heaters warm up. A Brimistor Type CZ1 should be used.

ALBA T492

Screen went blank. I refitted line o/p transformer valve EY51, valve PZ30. I now get a rather dark picture. The brilliance R44 increases brilliance to about centre of its travel and blacks out again when it should increase brightness.—Thos. S. Stewart (Glasgow).

If an ion trap tube is used in this model ensure that the ion trap magnet is orientated for maximum brightness of the picture. The symptom is essentially that of poor EHT regulation usually attributed to a low emission EHT rectifier valve. However, low emission PL38 may cause the same effect.

17in. R.G.D.

A few days after installation the sound was faint. The service engineer diagnosed valve PCL83 as the source of the trouble. Last night he brought a replacement, but it made no difference. He took off the right-hand control with the aid of a knitting needle filed as a screwdriver and made an adjustment in a coil. Later he pressed all visible valves in a little harder and eventually the sound became normal and the left-hand control reduced as it was so loud. He said he did not know what the trouble was but it appeared to be all right now. The sound was maintained all through the evening, but now it has gone again, i.e., only received faintly. From this scanty but complete information would it be possible for you to offer a solution to the problem or make suggestions where to look for the trouble?—F. A. Kirkaldy (Trowbridge).

Do not interfere with the set yourself but demand that it is put into correct working order

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under the terms of the guarantee. In case of difficulty, contact the makers direct, plainly indicating that the set is only a few weeks old. The trouble is possibly caused by a poor soldered connection on the base of the PCL83.

EKCO T164

All I can obtain on the screen are horizontal and several diagonal lines, these can be varied by the height control from one thin white line to a full screen with lines approximately $\frac{1}{8}$in. apart, further adjustment widens them up to $\frac{1}{4}$in. apart, but there is no suggestion of any picture. I have a service sheet for this model and have carried out the usual routine checking, but cannot discover any apparent fault. I am using an "X" type aerial indoors and I am getting sound O.K. I have had the valves checked and am informed that they are O.K. The set is fitted with a transformer for the C.R.T. giving 20 per cent. boost, and gives a reasonably bright screen. I have been informed that the C.R.T. has gone but I am dubious if this is so.—H. Stinton (Cheltenham).

If a normal raster is obtained with correct adjustment of the height control, the trouble is caused by lack of video signal on the tube cathode. This may well be caused by a fault in the tube (poor heater to cathode insulation).

COSSOR MODEL No. 916

The set was on one evening when the line scan closed into the centre, leaving the sound on. Have no test gear so I looked through some old copies of "Practical Television" and found "Simplified Fault Finding" in July, 1956, on how to test for faults with earphones and condenser. Have tried the EHT with screwdriver and got none, so checked for line oscillator whistle with earphone, tracing it through into amplifier valve with nothing at anode. Have had valve tested and it is good, so now I take it my line transformer has broken down, if so could you please tell me whether I could fit a bigger tube, 17in. if possible, and conversion data. —G. Seaton (E.C.1).

It is not possible to use a modern wide-angle tube in this chassis. Insufficient power is available even if the line and frame circuits were completely rebuilt, which does not represent an economic proposition.

BUSH TV53

On test card C, channel 4, this shows a mass of ghosts, everything duplicated. I have made a double array slot aerial of seven elements on each boom and with a slot and delta match for channel 8 from sugestions in your article on "Slot Aerials." The above has improved reception to nearly that of Band I; we are at the fringe. Of late channel 8 shows slight ghosting. H aerial is mounted on chimney and slot aerial on a 20ft. mast on wall brackets. The distance between each aerial is such that they are isolated from each other. I have replaced the five EF80s which were well down and have tried another video amplifier, also oscillator/mixer and R.F. amplifier, gain too improved but I still have the above fault. Another fault is arcing at final anode till set is really warmed up; this has been present for a long while. I cured this with anti-tracking varnish but it does not respond to this treatment now.—R. G. Stevenson (Northampton).

The ghosting is possibly caused by reflected signals arriving at the aerial a fraction of a second after the direct signal, and not a set fault. This trouble can often be alleviated by altering the position of the aerial and re-orientating for minimum ghosting, whilst maintaining a reasonable pick-up of wanted signal. Corona at the final anode is often aggravated by a high humidity factor, particularly during winter months if the room is not heated adequately during the whole of the day. This trouble should be suspected if there are no sharp points on the connection soldered to the EHT clip.

FERGUSON MODEL 951T

I successfully converted the set to receive I.T.V. having made up one of the converters in a 1956 issue. My trouble is alignment of set (not converter). I have studied test card "C" and decided the response could be improved and with a few adjustments I have done this to some extent. I have the service sheet for set which gives a list of adjustments for alignment. Would it be possible for you to give me the order of alignment and whether to peak on vision or between sound and vision, etc.? Of course, sound trimmers are adjusted for maximum sound, I suppose? I mean, of course, to use test card "C" when making the adjustments as I am not the fortunate possessor of a signal generator.—G. E. Mason (Manchester).

You may be able to improve the response by making experimental adjustments to the cores associated with the vision channel, aided by the test card. In this respect we can only suggest that first you adjust all the vision channel cores for maximum picture brightness and then slightly detune them, one at a time, aiming for maximum resolution of the bandwidth gratings. This is a tedious process which can never result in the optimum response condition.

H.M.V. 1814 HIGHLIGHT

The trouble is intermittent loss of line sync. Set may work without attention for perhaps an hour, then line will break up and controls have to be adjusted. Have tried replacing sync separator, line output, line oscillator valves, but no success. Trouble can be remedied by adjustment of the controls but will not stay put.—E. R. Willatt (Edmonton).

Replace the 1 μF electrolytic capacitor connected to the screen of the video amplifier valve.

FERGUSON 204T

The picture has gradually become dull even with brightness control full on. Sound is normal. I tested EHT with screwdriver and a good spark was obtained on anode cap of tube. I then inserted a milliammeter in series with cathode and video output lead to check emission of tube, and to my surprise picture became very much

(Continued on page 449)

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brighter but lacked contrast. Would this be a faulty tube?—A. E. Feary (N.19).

The introduction of resistance in the form of the meter altered the video loading and was responsible for the increased brightness—this is normal. From your description we would say that the tube is to blame for the poor picture.

DECCA MODEL III

Could you tell me if it is possible to convert this set into a 17in. rectangular C.R.T., if so, which are the best components to buy?—G. Hensy (Liverpool).

It is not possible to use a modern wide-angle tube in this chassis without serious modifications.

H.M.V. MODEL 3815

I find that the U31 appears to be heating up before any other valve. The EHT begins to build up and then does not complete its process. If left alone the U31 would break down but if switched off for a moment and then switched on the U31 heats up normally and a very good picture is received. Now and again, but not regularly, the picture fades and then comes back. I have replaced the U31 with a new tested valve and find it is O.K. I have replaced the C52 on the service sheet which I have in my possession.—G. Lewis (near Bolton).

Suspect a heater to cathode short either in the frame triode section of the B36 or in the sync separator valve.

MURPHY TYPE V280

I found that the dropping resistor (6 taps, each tap 33 ohms), has been heating up too much, so much so it is beginning to glow. Also the EHT rectifier is overheating. I cannot give you the number of this rectifier as it has been rubbed off. It is next to the 30P4. I get sound for about two minutes, then it fades. Cannot get vision. Could you please enlighten me on what to do?—J. O'Donnell (Glasgow).

The valve next to the 30P4 is the boost rectifier type U251. The U25 EHT rectifier is sealed inside the line transformer. Your most probable fault is the failure of the U251. This can be quickly checked by removing its top tap connector and running the set. You will not, of course, get a picture, but if the U251 is the fault your sound will remain and the 33 ohm resistors will not glow.

EKCO TS46

This set is unserviceable as the EHT and UU8 circuitry and valves need overhauling and replacing. I gather from your "Practical Television," August, 1956, that H.T. generally on this set is a potential source of failure. I would like to bring the TS46 more up-to-date and would like your opinions and suggestions on a number of items. 1. Is it possible to replace U22 and UU8 by metal rectifiers, and if so what kind? 2. As a working proposition would you recommend I modified the set to receive Band III (a) as per Viewmaster modifications, "Practical Television," December, 1955, onwards, or (b) as per converter, "Practical Television," August and September, 1955?—H. Thompson (Letchworth).

The UU8 can be replaced by a couple of RM5s if desired and a more modern valve to use in place of the U22 is the U26 which is on a B9A base. We have not tried to convert this set by either manner you suggest but did once tune the sound and vision strips down to 38.25 and 34.75 Mc/s respectively, when they made a satisfactory I.F. strip for a conventional turret tuner.

BUSH TV32

Although set is giving good sound and picture the line timebase EHT, etc., seems to take rather a long time to begin operating, approximately four minutes, which after this period as picture appears it comes on slowly, building up from centre. Is this normal with this type of set, as if it is I should not bother to take chassis out and test components, etc.—F. Tonkin (Grangetown).

We would be inclined to suspect the PY81 valve and this should be replaced. If there is no improvement, let us have more information about the manner in which the picture builds up.

FERGUSON 995T

There are frequent drops in tube brightness (MW43164) and sometimes complete loss of raster. The tube will black out and light again without any controls being touched. EHT can be obtained at tube (screwdriver test) even when tube is blank. I have renewed the EY51 but this has not improved matters. There is further trouble—loss of horizontal frame hold. I have replacement ECL80 and EF80 valves but interchange of these valves makes no difference. This trouble occurs mainly at 5-7 p.m. (peak hours). The set is O.K. for three or four weeks at a time and then both these thoubles will occur for a few days and then clear.—S. Coste (Liverpool).

From your description a useful diagnosis is difficult. You will have to make a few tests in order to "narrow the field." First notice the tube heater when the picture blanks out. If this remains at normal temperature check the PL83 video amplifier. We do not understand your term "frame horizontal hold." Does this mean that control of vertical (frame) hold is being lost, control of horizontal (line) hold, or both? If horizontal hold only, check left side EF80; substitute new valve only.

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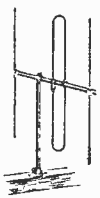

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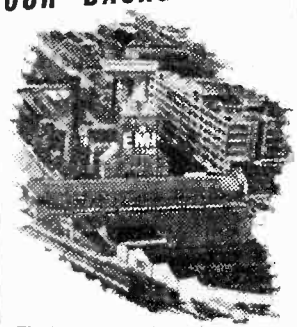

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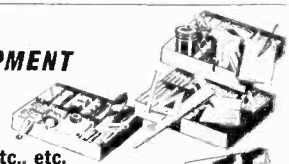

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AC/PEN 6 6	ECH35 10/6	EZ80 8/9	PL83 11/6	UCH42 10 6	4D6 12/6	6C5GT 6/6	6K25 20/11	7B7 8 6	12Q7GT 8/6	30FL1 12 6
AC TH1 34/9	ECH42 10/-	EZ81 11/10	PP225 3/11	UCH81 11 6	1H5GT 10/6	6C6 5/-	6L6G 9/-	7C5 8/-	12SC7 2/6	35L6GT 9 6
ATP4 3/6	ECH81 9/-	EZ90 8/-	PX25 12/6	UCL82 23/-	1L4 6/6	6C8G 5/-	6L7 7/6	7C6 8/-	12SG7 7/6	35W4 8 6
AZ31 17/5	ECL80 13/6	E1148 2/-	PY80 9/-	UCL83 25 9	1LD5 3/6	6CD6G 31/4	6N7 7/6	7H7 9/-	12SH7 5/6	35Z4GT 8/-
CBL31 24/4	ECL82 13/6	GZ32 12/-	PY81 10/-	UF41 10 6	1N5 10 6	6CH6 7/6	6P25 13/6	7Q7 9/-	12SJ7 8/-	35Z5GT 9/-
CCH35 24/4	EF22 8/6	H30 5/-	PY82 8/6	UF80 19/6	1R5 8/-	6D6 5/-	6P28 27/10	7S7 9 6	12SK7 6/-	42 8/-
CL33 20/2	EF36 6/-	HL23DD8/6	PY83 10/-	UF85 19 6	1S4 10/6	6F6G 7/6	6Q7GT 9/-	7X4 8/6	12SL7 8/-	50C5 11/6
CY31 17/5	EF37A 12/-	HL92 12/6	UF89 16/-	1S5 7/6	6F6M 7/6	6SA7GT 8/-	8D2 2/9	12SN7GT 17/6	50CD6G31/4
DAF96 10 6	EF39 6/6	K40N 9/-	27/10	UL41 10 6	1T4 7/6	6SG7 7 6	9D2 3/6	12SQ7 8/6	50L6GT 8 6
DF96 10,6	EF40 13/6	KF35 8/6	PEN25 5/-	UL44 27/10	2C26 2/6	6F13 14/-	10F1 27/10	14S7 14/6	75 11 6
DK96 10/6	EF41 9/9	KK32 23/-	PEN44 27/10	UL46 24/4	2X2 4/6	6F15 14/-	10P13 11/6	15D2 7/9	77 7 6
DL96 10/6	EF42 14/-	KLL32 8/6	PEN46 7/-	UL84 10/6	3A4 7/-	6F23 5/6	12A6 6/6	19BG6G 24/4	80 8 6
DM70 8/6	EF50 4/-	KT24 5/-	PEN220A 4/-	UU6 20/11	3D6 5/-	6G6G 4/6	12AH8 11/6	20D1 16/-	142BT 3 6
EA50 1/6	EF55 10/-	KT33C 10/-	PENA4 15/-	UU8 27/10	3Q4 9/-	6H6 2/6	12AT6 10 6	20P2 24/4	185BT 34/9
EABC80 10/-	EF80 9/6	KT36 27/10	QP21 7/6	UU9 8/6	3Q5GT 9/6	6H6GT 2/6	12AT7 9/-	20P3 20/11	210DDT 4/6
EAC91 7/6	EF85 9/-	KT66 15/-	R16 27/10	UY41 8/6	3S4 8/-	6J5GT 5/6	12AU7 7/6	20P4 27/10	210VPT 3 6
EAF42 10/6	EF86 13/6	KTW63 7/6	SP41 3/-	UY85 10/-	3V4 9/-	6J5M 6/6	12AX7 8/6	20P5 20/11	807 6/6
EB34 2/-	EF89 10/-	KTZ41 8/6	SP61 3/-	VP2B 8/-	4D1 3/-	6J6 6/-	12BA6 9/-	25A6G 20/2	954 2/-
EB41 9/-	EF91 7/6	MH4 7/6	SP220 3/11	VP23 6/6	5R4GY 9/6	6J7G 6/-	12BE6 10/-	25L6GT 10/-	955 4/9
EBC33 7/6	EF92 20/2	ML4 10/6	T41 24/4	VP41 3/6	5U4G 8/-	6J7M 9/-	12BH7 11/6	25Z5 10/-	956 3/6
EBC41 10/6	EF93 27/10	MS4B 10/6	TH2 9/-	VR105/30 6/6	5Y3G 8/-	6K6GT 7/-	12H6GT 3/-	25Z6G 10/-	9001 5/6
EBF80 10/6	EF94 10/6	N37 18/1	TH30C 8/-	VR116 4/-	5Y3GT 8/-	6K7G 5/-	12J5GT 4/6	25Z6GT 10/-	9002 5/6
EBF89 18/1	EF95 12/6	N78 12/6	U10 10/6	VR150/30 5/-	5Z4G 10/-	6K7GT 7/-	12J7GT 10/6	25Y5G 9/9	9003 5/6
EBL21 24/4	EF98 13/6	P61 3/6	U25 14/6	VS70 3/-	6A8G 10/-	6K7M 6/9	12K7GT 8/6	25Z5 10/-	9004 5/6
EBL31 24/4	EF183 11/6	PC84 10/-	U26 12/6	VU120A 3/6	6AG7 6/6	6K8G 8/6	12K8GT 13/6	25Z6 10/-	9006 5/6
EC52 6/-	EF184 11/6	PC86 13/6	U37 27/10	VU133A 6/6	6AK5 6/6	6K8GT 9/6	12Q7GT 8/6	27SU 20/11	
ECC40 12/6	EH90 10/6	PC88 12/6	U45 15/-	VU133A 12/14) 8/9	6AL5 6/6	6L5G 6/3	12SC7 2/6	30P5 12/6	
ECC84 10/3	EL32 5/6	PC97 12/6	U50 17/5	VU111 2/6	6AM6 9/-	6L6GC 31/4	12SG7 7/6		
ECC85 9/6	EL33 20/2	PC900 11/6	U403 17/5	W77 8/6	6AQ5 7/6	6Q7G 10/6	12SH7 5/6		
ECF80 12/6	EL34 27/10	PCC84 10/-	U404 11/10	W729 13/6	6AT6 8/6	6SN7GT 13/6	12SJ7 8/-		
ECF82 12/6	EL41 10/6	PCC89 18/1	U801 31/4	X65 12/6	6AV6 5/6	6V6G 7/-	12SK7 6/-		
ECH21 24/4	EL84 10/6	PCF80 13/6	UABC80 18/1	X78 22/3	6B4 5/-	6V6GT 7/-	12SL7 8/-		
ECH35 10/6	EM34 10/-	PCF82 12/6	Y63 9/-	X79 11/6	6B8G 4/-	6X4 7/6	12SN7GT 17/6		
ECH42 10/-	EM80 10/6	PCL82 14/6	Z309 11/6	Y63 9/-	6BA6 7/6	6X5G 7/-	12SQ7 8/6		
ECH81 9/-	EM81 11/6	PCL83 14/6	Z359 11/6	Z759 11/6	6BE6 8/-	6X5GT 7/-	12SR7 8/-		
ECL80 13/6	EY51 12/6	PL38 27/10	Z759 11/6	1A3 3/6	6BH6 16/-	6/3GL2 12/6	12SR7 8/-		
ECL82 13/6	EY86 17/6	PL81 16/-	1A5GT 6/-	6BJ6 9/-					
EF22 8/6	EZ40 9/-	PL82 9/6	1A7 12/6	6BR7 11/6					
EF36 6/-	EZ41 10/-		1C2 11/6	6BW6 8/6					
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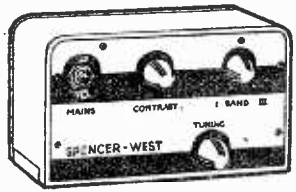

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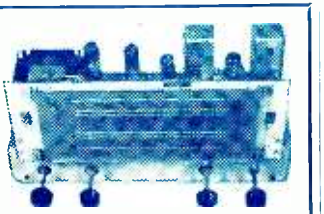
1T4	8/6	6S7	7/6	ECC81	12/6
2X2	3/6	6SN7	8/6	ECC82	10/6
5Y4	8/6	6V6G	7/6	ECC83	12/6
5Z4	8/6	6V6GT	8/6	ECF82	10/6
5Y3	8/6	6X4	7/6	ECH42	10/6
5Z1	10/6	6X5	7/6	ECL80	12/6
6AM6	8/6	12A6	7/6	ECL82	12/6
6B8	8/6	12AH8	10/6	EF37	7/6
6BA6	7/6	12AT7	10/6	EF41	10/6
6BH6	10/6	12AU7	10/6	EF50	5/6
6BW6	8/6	12AX7	10/6	Equip.	
6BW7	8/6	12BE6	10/6	EF80	5/6
6C4	10/6	12BH7	10/6	Selv.	8/6
6F13	7/6	12K7	8/6	EF89	10/6
6F23	7/6	12Q7	8/6	EF92	5/6
6F33	3/6	35Z4	10/6	EL32	5/6
6J5	6/6	80	8/6	EL84	10/6
6J6	7/6	954	1/6	EY51	12/6
6J7	8/6	EA50	1/6	EZ40	10/6
6K6	6/6	EAC91	8/6	EZ81	11/6
6K7	5/6	EB91	6/6	F1132	10/6

HABC80	12/6	PL81	10/6
HVR2A	7/6	PL82	8/6
MU14	10/6	PL83	8/6
PC86	10/6	PY32	10/6
PCC84	12/6	PY81	10/6
PCC85	12/6	PY82	10/6
PCF80	10/6	U22	10/6
PCF82	10/6	U25	10/6
PCL82	10/6	U26	10/6
PEN25	6/6	U191	10/6
PL36	10/6	U251	10/6



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COSSOR COMPANION
SUPERHET MODEL 527 X FOR ALL-DRY BATTERY OPERATION

S.W.1 13.6 to 42 metres, S.W.2 42.8 to 136 metres. Medium 187 to 375 metres.
A fine All-wave receiver giving world-wide reception on three wavebands. 6in. speaker. The cabinet is maroon and beige with gold trimmings. Valves: DK92, DF96, DAF96, DL96.
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Semi-air spaced Polythene insulated, ¼in. dia. Stranded core. Losses cut 50%. Fringe Quality Air Spaced. **9d.** yd **1/6** yd.

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BALANCED TWIN FEEDER yd. 6d. 80 or 300 ohms
DITTO SCREENED per yd. 1/-. 80 ohms only.
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CERAMIC CONDS. 500 v., 3 pf. to .01 mfd., **10d.**
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