A SOUND-ONLY POCKET TELEVISION RECEIVER

Practical Television

1/3

AND TELEVISION TIMES

NOVEMBER 1958

EDITOR: F.J. CAMM

CONTENTS

Unrepeatable Bargains

Metal Rectifier. Equivalent of RM5—250 mA., 250 v., **12/6.**

Welding Transformer. 12v.-59 amp. continuous rating—intermittent rating for spot welding—exceeds 2,000 amps. **45 -.** carriage and packing 5/-.

6ft. Unbreakable Mains Lead. Type of lead fitted to electric razors, makes fine lead for test meters and any other devices where subject to continuous bending. Twin figure eight construction, soft cream P.V.C. covered. Normally costs 2/- per yard—we offer three leads for 2/-.

.1 mFd 350. Small tubular metal cased condensers made by Dubilier. **2 6** doz.

Connecting Wire P.V.C. Covering. All colours. Sale price **2/6** per 100 ft. coil or 5 coils different colours, **10/-** the lot.

50 Assorted Resistors. Well mixed and useful values ½ and ¼ watt. **5 -** for 50.

Ditto, but 1 watt, **6'6** for 50.

Mains Transformer. Standard 230 v., input 250-0-250 at 80 mA., 6.3 v. at 5 A. **12/6.**

Toggle Switch. Standard metal body, type with round dolly, fixing ring and on/off indicating plate. **1 3** or **12/-** doz.

Metal Rectifier. 250 v. 60-30 milliamps, ideal for mains set or instrument or to replace that expensive valve. **4/6.**

Screened Cable. Rubber covered flexible with metal braiding, ideal for microphone or gramophone extensions. **4d.** per yd., **30/-** per 100 yds.

Install 2-way Switches. Our outfit comprises : 30 yd. multicore cable, two 2-way switches, two wood blocks. Full instructions. **9 6** each, post and insurance 2/6.

Long, Medium and Short Wave Coil Pack. An exceptionally well made coil pack which covers the standard long, medium and short wave bands for 465 Kc. I.F. complete with diagram of connections. **14/6** plus 1/6 postage and insurance—limited quantity only.

Neon Lamp, midget wire ended. Ideal for making mains tester or for any of the dozen-and-one applications to which a neon can be put. **2/-.**

Instrument Transformer. Input 200-230 v., output 6.3 v. at 3/4 amps., and two separate 85 v. 10 milliamp windings which can be joined in series or parallel, **8 6.** plus 1/6 post & packing.

3½in. Meter Moving Coil, flush mounting, really beautifully made by G.E.C. Two types available 500-0-500 microamp and 1 milliamp f.s.d. **37 6.** plus 2/- p. & i.

Winking Eye, telephone or circuit indicator. **5 -.**

Cathode Ray Tube VCR517, **7 6.** carriage, etc. 3 6.

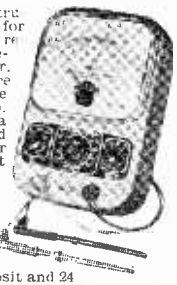
Install These Extra Power Points: 3 core cable 7.029 (15 Amps) 500 v. grade—a big purchase enables us to sell this at **37'6** per coil (50 yds.) carriage 7 6.

Auto Transformer. Totally enclosed, primary 200-250 v., secondary 110-120 rated 200-250. **27'6.** carriage and insurance 2/6.

Dimmer or Regulator. Total resistance 1,000 ohms. Maximum current of .59 amps. This is a beautiful unit which uses a 32 position stud switch, resistance is divided into 31 sections each approx. 30 ohms. In ventilated metal case, size approx. 7in. x 7in. x 5½in. with wall mounting brackets and large control knob. **15/-** plus 2/6 post & insurance.

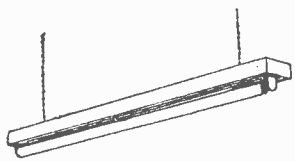
E.H.T. Transformers. Standard mains input, three secondaries, one gives 1,540 v. at 20 mA, another gives 2 v. at 2 amps, the third 4 v. at 1 amp. This is a heavy duty potted transformer in a cast case but where extreme ruggedness is not required it can be taken out of its case. Price **20/-,** carriage 3/6.

FULLIN SERIES 100 TEST SET



Undoubtedly a most useful instrument by a firm long famous for fine instruments, entirely re designed, it has a square movement with diacon plastic cover, this makes for a brighter more readable scale, extra scale length and wider angle of vision. With the test set is included a pair of combined test prods and crocodile clips also a stand for inclining the meter at the best reading positions. Ranges A.C. Volts : 0-10, 0-25, 0-100, 0-250, 0-500, 0-1,000, ditto D.C. A.C. Current 0-100 mA. D.C. Current 0-2.5, 0-10, 0-100, 0-500 m.A. Resistance : 0-1M and 0-10K. All at 10,000 ohms per volt—Price **£12,7,6,** or **£1** deposit and 24 weekly payments of **10 -.** non callers add 5/- carr. & ins **FREE GIFT.**—All purchasers of the above item this month will receive Range Extender scale and data which add : capacity 2pF.—1 mFd., in two ranges. Inductance 0-100 henrys. etc. etc.

THE INDUCTOR 80

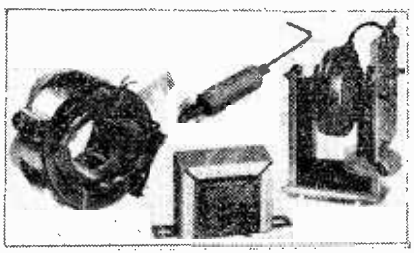


80 w 5ft. fluorescent fitting with a 5 year guarantee —latest type (choke) control gear— absolutely quiet in operation—all steel batten type construction stove enamelled white—suitable for direct mounting or for suspending. Will last a lifetime. Type A, price **39.6.** Type B. Variable for 200-250 v., price **45/-,** carriage and insurance up to 150 miles **5/6** ; up to 250 miles 7/6. Tubes, latest type which give more light for same electricity, daylight or natural to your choice. **14 6** each—no extra carriage if ordered with fitting.

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

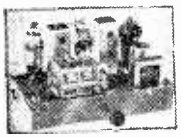
17 ranges including D.C. volts to 1,000 v., A.C. volts to 1,000 v., D.C. milliamps to 500, ohms to 2 meg., capacity and inductance. All the essential parts, including metal case, selected resistors, wire for shunts, selected switches, calibrated scale and instructions. **32/6,** plus 2'6 post and ins.

FOUR ITEMS FOR PRICE OF ONE



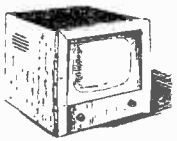
This set of modern T.V. parts is equally suitable for modernising an old televisor or for building into a new one. Suitable for wide angle 14in. or 17in. tubes using E.H.T. or 12-14 kV. The four items comprise : (1) Line output E.H.T. transformer. (2) 70° scanning coils on ferrite yokes. (3) Width control with ferrite core. (4) Frame output transformer. With these parts we also give free, complete circuit diagram of a modern televisor which uses them. We offer the whole lot at the price of the Line output transformer only, namely. **57'6,** plus 2/6 post and insurance.

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 insurance.

14in. T.V. CABINET



14in. T.V. cabinet of latest styling made for one of our most famous firms—beautifully veneered and polished—limited quantity—**15/-** each. Carriage and packing 3/6 extra.

Avo Prodclips

The advantage of these test prods is that by pressing the trigger at the side they become crocodile clips and can be left in circuit. This is a great time saver, when servicing. Price **15'-** pair.

Novelty Radio

Completely wired tunable medium and long wave, originally intended for B7G valves and external batteries but could easily be converted for transistors with internal batteries. Less valves and speaker, otherwise complete **15 -,** plus 1 6 postage.

Miniature Microphone

American made. Dynamic type, real bargain at **1'6.**

Simplex Transistor Kit.

Makes ideal bedroom radio, uses one transistor and one crystal diode. Complete less case **19/6.** case 5/- extra, post 1 6.

ELECTRONIC PRECISION EQUIPMENT LTD.

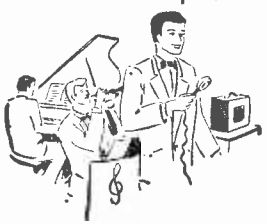
66, GROVE ROAD, EASTBOURNE, SUSSEX.

This is the correct address for post orders and for prompt attention please mark your envelope Dept. 5., also enough for postage.

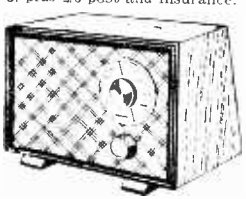
Band III Converter

Suitable Wales, London, Midlands, North, Scotland, etc. All the parts including 2 EF80 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**.

All-Mains Amplifier



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



The Skysearcher

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

A.C./D.C. Multimeter Kit

Ranges: D.C. volts 0-5, 0-50, 0-100, 0-500, 0-1,000. A.C. volts 0-5, 0-50, 0-100, -0500, 0-1,000. D.C. milliamps 0-5, 0-100, 0-500. Ohms 0-50,000 with internal batteries, 0-500,000 with external batteries. 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 insurance.

50 More T.V. Service Sheets

Readers already possessing our service sheets numbers 1-100 will be glad to know that 101-150 are now ready, price **10/-**, post free.

BUILD THIS 17" TV FOR 22 GUINEAS

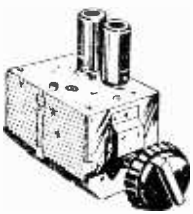
This is a very modern circuit and when you have completed it it will be equal to any factory made model. Note these special features:

- Miniature valves and metal rectifier.
- 12 channel turret tuner.
- Ferrox E.H.T. and scan coils.
- A.G.C. and A.V.C.

Supplied in component form with all metal work prepared and supplied with pictorial layout and theoretical wiring diagram (these are available separately, price **3.6**). Total cost is only **£23.2.0.**

This Month's Snip

Stereo Amplifier outfit comprising 8-watt twin channel amplifier for A.C. mains working and two 8in. P.M. speakers on veneered and polished corner baffles. Whole output giving really terrific reproduction and amazing 3-D effects—**£14** complete, plus carriage and insurance. Or £1 down and 28 weekly payments of 10/-.



Now 2 Models Turret Tuner

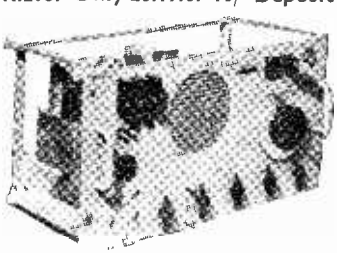
Brand new stock not surplus, with coils for Band I and III complete with valves. Model I I.F. output 33/33 Mc/s. Series heaters Model 2 I.F. output 16/19 Mc/s. Parallel heaters. With instructions and circuit diagram, **79/6**. With knobs **3/6** extra, post and insurance 2/6.

Medresco Hearing Aid

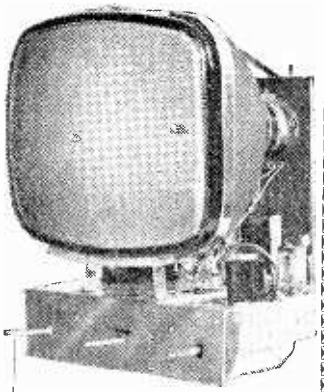
As supplied by National Health, completely overhauled and in good working order with six months' guarantee. Only **£2.15.0** plus 2/6 post and ins. Complete with earphone and *new* ear plug but not batteries, these can be supplied as an extra for 5/- per set.

Special Offer.—Latest luxury model, smaller and with self-contained batteries new and unused—normally 20 gns., limited quantity, only £10 each or 20/- deposit and 20 weekly payments of 10/-. Willingly sent on approval against cash.

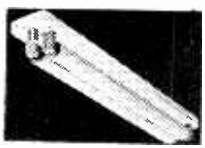
Short Wave Communications Receiver R.208. Only £6.19.6. 10/- Deposit



This is a super short-wave receiver covering 5-30 metres (10-60 Mc/s). Uses 6 valves. Has R.F. stage, 2 I.F. stages, B.F.O., etc. Muirhead instrument drive, two internal power packs, mains and battery vibrator pack. Complete with own P.M. speaker. Provision for phones and speaker muting. Complete in metal transit case; size approx. 24 x 18 x 12in.; weight 70lb. Suitable A.C. mains 100-250 and 6 volt battery. In perfect condition, practically unused. Tested before despatch and guaranteed. Handbook free with each. Price **£6.19.6**, carriage and insurance 15/-. Or 10/- deposit plus 15/- carriage and ins., then 15 weekly payments of 10/- each.



FLUORESCENT LIGHTS



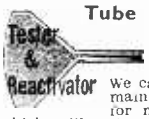
These are complete fluorescent lighting fittings. Built-in ballast and starters—stove enamelled white and ready to work. Ideal for the kitchen, over the work-bench and in similar locations.

Single 40. 4 ft. 3 in. long, uses a 40 watt tube.

Twin 20. Uses 2 20-watt standard tubes.

Price for either type **39/6**, with tubes. Carriage and ins. up to 150 miles 5/6, up to 250 miles 7/6.

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.

Unused and Boxed Valves

OZ4	9/-	6F5	9/6	7B5	12/6
1A4	9/-	6F6	7/6	7C7	12/6
1A6	9/-	6F7	12/6	7D5	9/6
1F7	12/6	6F8	9/6	7D3	9/6
1L18	8/6	6F32	10/6	7H7	8/-
1LA6	8/6	6G6	7/6	7K8	12/6
1N6G	3/6	6H6	2/6	7R7	10/-
1LD5	3/6	6J5	5/6	7S7	10/-
1T4	7/6	6J7	8/-	12H6	8/6
1R5	7/6	6K6	7/-	12SH7	8/6
1S5	7/6	6K7	5/-	12SJ7	8/6
1T5	8/-	6L5	9/-	12SK7	8/6
2A5	12/6	6L6	9/-	25B5	12/6
2A6	12/6	6L7	10/7	26	10/-
2A7	12/6	6N7	8/6	27	10/-
2D13C	5/-	6R7	9/-	28D7	3/6
2X2	4/6	6S7	9/-	31	7/6
3A4	7/-	6SA7	8/-	32	7/6
3D6	5/-	6SG7	8/-	34	12/6
3Q4	7/6	6SH7	8/-	39/44	10/-
4D1	2/6	6SJ7	8/6	41	9/6
5U4	8/-	6SK7	6/-	42	8/-
5Z3	12/-	6SL7	8/-	43	10/-
5Z4	9/6	6SN7	7/6	57	10/-
6A6	12/6	6SQ7	9/-	58	10/-
6AG5	6/6	6SS7	9/-	71	9/6
6AC7	6/6	6T7	12/6	75	12/6
6A8	10/-	6TH8	12/-	77	8/-
6B4	5/-	6U5	8/6	83	12/6
6B7	10/6	6V6	8/6	84	8/6
6B8	4/-	6X5	7/6	807	6/6
6BQ6	12/6	6Y6	9/-	954	3/6
6C4	6/6	6Z5	15/-	1625	10/6
6C6	6/6	7A2	12/6	805	80/-
6C8	5/-	7A7	9/6	913	90/-
6D6	6/6				

For convenience of callers all items advertised may be obtained by the following companies:

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

Electronics (Croydon) Ltd.
266, London Road, Croydon.
Phone: CRO 6558
Half day, Wednesday.

Electronics (Finsbury Park) Ltd.
29, Stroud Green Rd., Finsbury Park, N.4.
Phone: ARChway 1049
Half day, Thursday.

Practical Television

& TELEVISION TIMES

Editor : F. J. CAMM

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CONTENTS :

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

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

TELEVIEWS

RADIO INTERFERENCE REGULATIONS

THE Postmaster-General has accepted the recommendations of the committee set up to advise him on the problem of electrical interference with radio and TV. Regulations designed to reduce the effects of interference are now being prepared. The recommendations of the committee are that the regulations should cover the manufacture and use of new electro-medical equipment and the use of existing apparatus on the site. Regulations dealing with new equipment should come into force one year after being laid before Parliament, and those dealing with existing equipment in three years. The committee has also recommended in principle that there should be regulations on the manufacture and use of industrial radio frequency apparatus, although it has made no final recommendations until further study.

THE "P.T." AND "P.W." CAXTON HALL FILM SHOW

THE film show which we are organising in conjunction with Mullard Ltd. takes place at the Caxton Hall, Westminster, at 7.30 p.m. on January 22nd, 1959, when I shall take the chair. Applications for tickets, which are free, should be made at once, as accommodation is limited to 500 seats. Members of the I.P.R.E. should apply to their secretaries direct for tickets, as they will be our guests on this occasion. The films are, of course, entirely different from those shown last year. This year they will deal with the principles of the transistor, the manufacture of junction transistors, and "The Conquest of the Atom," which will be in Eastman Colour. There will be an interval for refreshments, which also are free. Mark envelopes containing applications for tickets, Caxton Hall, in the top left-hand corner.

NOISY SWITCHES AND TUNERS

SERVICE engineers are well aware of the complaint that some TV switches and turret tuners are noisy and that the usual cleaner fluids do not provide a permanent remedy. One of the largest tuner unit manufacturers states that only M.S.4 silicone grease should be used on tuner units. It is recommended for use on all wave-change and tuner unit contacts. The wiping action associated with most switches causes the fine film of grease to be removed from the point of contact. M.S.4 grease repells moisture, and does not harden or melt with changes of temperature.

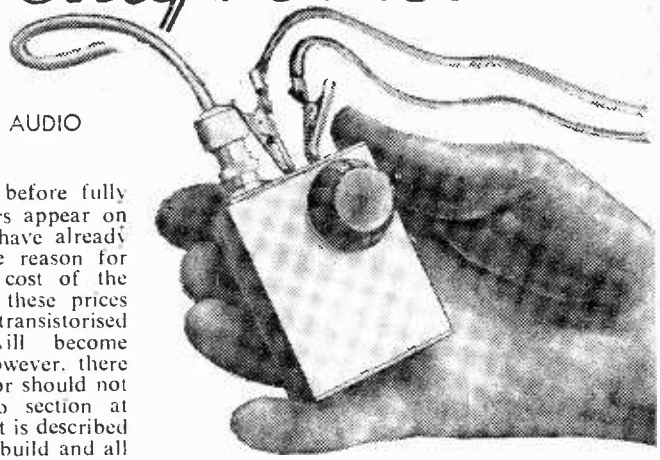
WIDESCAN

ELSEWHERE in this issue, we discuss the BBC experiments with the aspect ratio of viewing screens. It is a portent of what we may expect in, say, 10 years time, if direct viewing is still in existence ! The suggested alteration from 4 : 3 to 7 : 4 is an undoubted improvement.—F. J. C.

Our next issue, dated December, will be published on November 21st

A Sound only Pocket T.V. Receiver

BUILDING A TRANSISTORISED AUDIO SECTION



IT is likely to be some time yet before fully transistorised television receivers appear on the market, although several have already been built by the large firms. The reason for this is, of course, the very high cost of the transistors themselves; as soon as these prices drop to those of valves, fully transistorised battery-operated TV portables will become commonplace. In the meantime, however, there is no reason why the home constructor should not build himself a transistorised audio section at very reasonable cost, and that is what is described here. The prototype cost only £2 to build and all the parts are very easily obtainable.

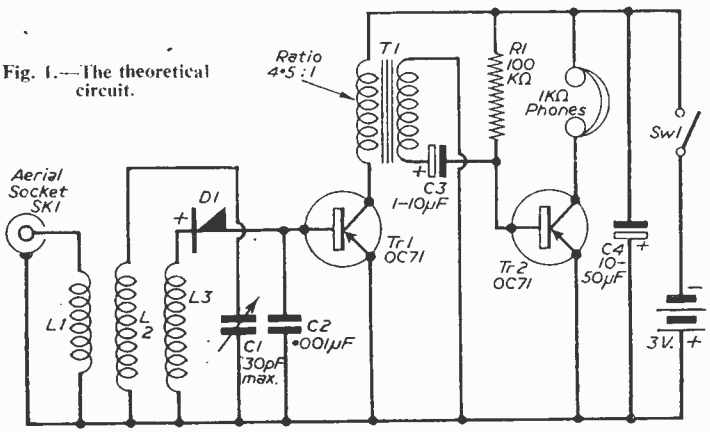


Fig. 1.—The theoretical circuit.

The Circuit

The theoretical circuit diagram is shown in Fig. 1. The aerial is fed to L1, which is the primary winding of an ordinary television aerial coil. A signal is then induced in L2-C1, which forms the tuned circuit of the receiver. When tuned correctly, the circuit rejects only the required signal and this is fed to L3 which consists of one-third the number of turns of the tuning coil, and is tightly coupled to it. The purpose of this R.F. transformation is to match the signal into the relatively low impedance detector. The detection is performed by a germanium diode of the video type. As the sensitivity of the set depends upon this diode, it is preferable to use a good quality make, such as the Mullard OA70, although surplus crystals were found to operate quite successfully in the prototype. Any residual R.F. component is now removed by C2 which offers a high impedance to the A.F. signal. At first sight it might appear that the condenser would seriously reduce the A.F. strength, but it must be remembered that the input impedance of the transistor is extremely low when compared with a valve. Thus the loss is negligible.

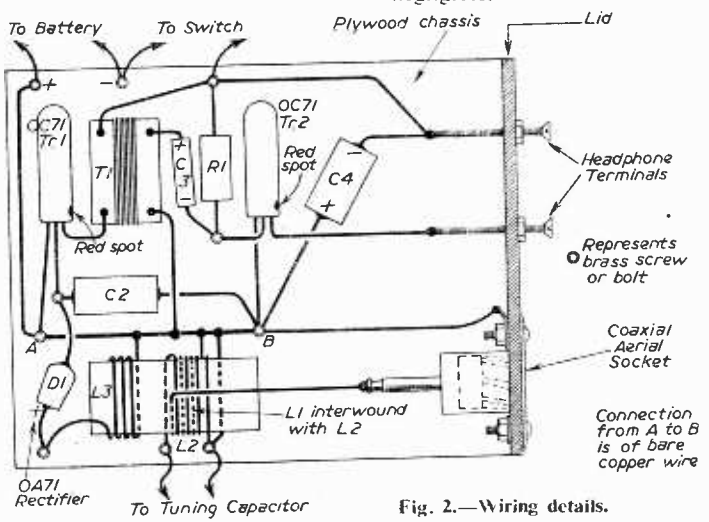


Fig. 2.—Wiring details.

Tr1 is a common emitter amplifier, and should give a gain of about 30 db. The common emitter configuration is used as this gives both current and voltage gain and has the highest overall power increase of the three different systems.

The Output Stage

In order to provide optimum matching between the driver and output stages, and at the same time maximum gain, transformer coupling has been used. T1 is a miniature transistor interstage transformer and has a step-down ratio of 4.5 : 1. The coupling condenser C3 must have a value of 1 μF or more because of the low input impedance of Tr2. However, as the H.T. is so low a 3- or 6-volt subminiature type may be used with full satisfaction. R1 supplies the base bias to the output transistor and has a value of 100 kΩ. The output is directly coupled into a pair of high impedance headphones, 1,000 ohms being the optimum value. Crystal types must not be used as these would prevent any H.T. current from reaching the transistor. The battery is made from two 1.5 v. slim penlight cells fixed side by side and wired in series to give 3 v. If a smaller receiver is required for some reason, then a single cell could well be used with only slightly reduced volume. A wiring diagram is given in Fig. 2.

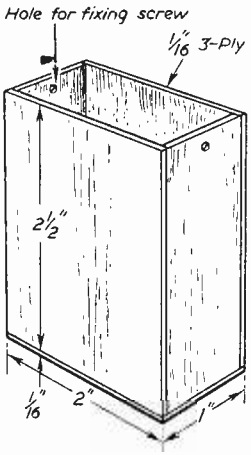


Fig. 3.—Structure of the box.

COMPONENTS LIST

Tr1 } OC71 or similar.
Tr2 }
D1, OA71 or similar.
L1, L2, L3, see text.
SK1, flush-mounting coaxial socket.
C1, 30 pF maximum trimmer for tuning.
C2, 0.001 μF.
C3, 1-10 μF electrolytic (sub-miniature).
C4, 10-50 μF electrolytic (sub-miniature).
R1, 100 KΩ ¼ or ½ watt.
T1, 4-5 : 1 miniature interstage transformer.
SW, single-pole, one-way switch.
1.5 v. or 3.0 v. battery.
Headphones (1 kΩ).

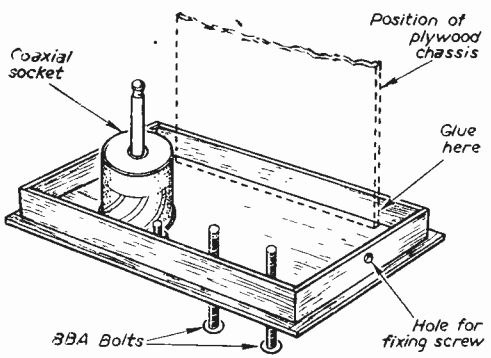


Fig. 4.—Underside of the lid.

The Case

The case is made from 1/16in. three-plywood and measures 2½in. × 1in. × 2in. It consists of a small box with a closely fitting lid to which are attached a plywood chassis and the input and output terminals.

To make the box, five pieces of plywood are required: two 2in. × 2½in., two ⅞in. × 2½in. and one 2in. × 1in. (Two pieces 2in. × 1in. may be cut; the second is used for the lid.) These five pieces of wood are glued together using unreinforced butt joints (Fig. 3). Almost any quick-setting glue is suitable except a latex type.

For the lid, five pieces of plywood are necessary—one 2in. × 1in.; two ¼in. × 3/16in.; and two ¼in. × 1 23/32in. The construction of the lid is shown in Figs. 4 and 5. Small holes are drilled in the lid and in the box for fixing screws (Figs. 3 and 4). Other holes are drilled in the lid for the coaxial socket and its fixing bolts and for the bolts-cum-headphone terminals (Figs. 4 and 5).

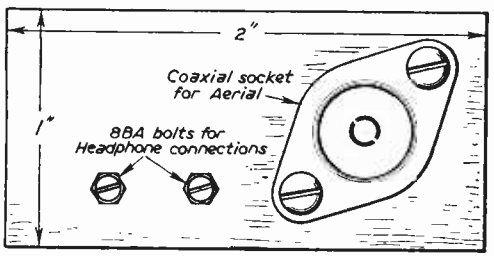


Fig. 5.—Plan view of the lid.

The box and lid are sanded smooth and painted with a grain filler, and then with a coloured cellulose paint of the constructor's choice.

Operation

As this receiver has only one tuned circuit no problems of alignment arise; furthermore, the circuit is inherently extremely stable and unless the leads from the input to the tuned circuit are unusually long no problems are likely to arise. If a sensitive power-output meter is connected across the output terminals, the receiver is very useful as an aerial alignment aid. It is, of course, possible to align an aerial by comparing signal strengths on headphones, but it is preferable to use a meter.

If standard broadcast band reception is wanted the coil and condenser may be replaced by ones for the required wavelength. Used on the medium waveband, the set is capable of loudspeaker strength signals with a fairly short aerial.

TELEVISION TROUBLES

Their Symptoms and How They May be Cured—4

By G. J. King

STILL dealing with the symptoms which are produced by faults in the timebase and sync circuits, this month consideration is given to further models in the popular range of Bush receivers.

Bush TUG36: Distorted Raster

In common with certain other makes of receiver, the Bush range utilises the boosted H.T. voltage obtained from the line amplifier section to energise the tube first anode and the timebase oscillator circuits. The arrangement employed in the Bush TUG36 and TUG34A receivers is shown in Fig. 1(a), with component references as given in the makers' service manual. The boosted H.T. voltage will depend to a large degree upon the setting of the horizontal form control and whether or not the line timebase is synchronised. Under normal operating conditions, however, the boosted H.T. should be in the region of 400 volts, as shown on the diagram, relative to chassis.

All is well provided the filter capacitor C21 (8 μF electrolytic) is in good order. Should it go open-circuit the curious symptom as depicted in Fig. 1 (b) is produced. The boosted H.T. drops below the normal 400 volts and the frame timebase is considerably influenced by the line flyback pulses. The height of the picture is affected mainly, though in some cases the width may also be reduced; the actual twisting and distortion of the raster varies as the brightness control is adjusted and as this effects the EHT loading.

The capacitor is of the wire-ended type and is situated beneath the main deck in the corner of the chassis near the volume control.

Impaired Frame Linearity

There are a host of possible causes of this symptom, but if it is accompanied by a general fall-off in efficiency of the receiver as a whole, and it is found that the receiver takes longer than normal to warm up, attention should be directed towards the Brimistor in the heater chain.

This component is shunted by a 400-ohm resistor (R29), and should normally decrease in resistance with increase in temperature. Sometimes, however, a fault develops in the component and it remains at a relatively high resistance even when hot. When this happens the current in the series-connected heater chain is reduced accordingly and a smaller than normal voltage occurs across the heaters of the tube and valves. As the ECL80 valves are most sensitive to under-running of their heaters, circuits in which such valves are employed give the first sign of trouble, such as the frame timebase circuits.

When this trouble exists it is often noticed that the valves do not light up as bright as usual, and a voltage test across the tube heater confirms that the voltage is, in fact, low. If the Brimistor goes almost completely open-circuit, the tube heater voltage may drop as low as 4 volts and R29 may exhibit signs of overheating.

It is interesting to note that frame non-linearity, which has no apparent cause, is often aggravated by the mains selector being adjusted a step above the applied mains voltage. This, again, causes under-running of the heaters, and if ECL80s are featured in the frame timebase circuits an effect similar to that above, though possibly less severe, is produced.

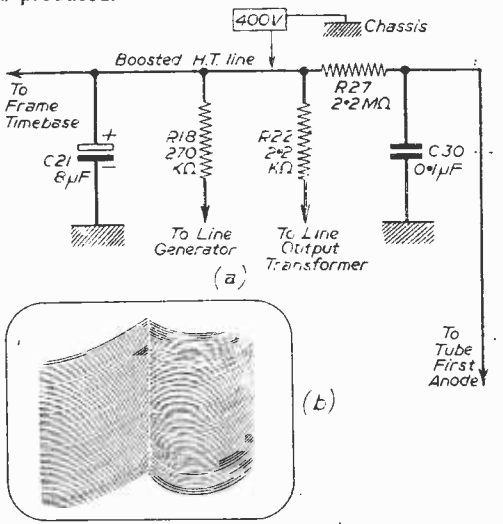


Fig. 1.—The boosted H.T. line circuit of the Bush TUG36 series at (a), and the distorted raster symptom produced owing to failure of the boost smoothing capacitor C21 at (b).

Bush TV36C and TV45: Intermittent Line Tearing

This symptom is often caused by loose electrodes in the EF80 line oscillator valve. The valve is situated on the main chassis next to the PL81, pretty well in line with the "interlace" pre-set control on the back of the chassis. If the symptom is promoted by tapping the valve with the erasure end of a pencil, then the valve should be replaced. There are times when a valve which is unstable as line oscillator serves without trouble in another section of the receiver, in which case the trouble can be cleared simply by interchanging the two EF80s.

Intermittent Picture Height

If the height drops intermittently to about 1¼in. and the resulting compressed picture has a ripple effect across it, the trouble is invariably caused

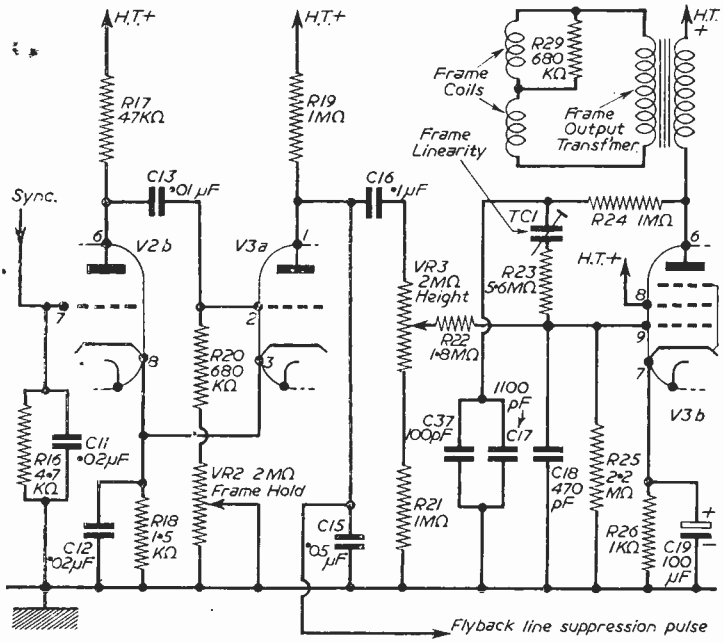


Fig. 2.—Circuit diagram of the frame timebase section of the Bush TV53 and TV56 series.

by open-circuit of the frame scanning coil. One section usually suffers, the circuit being completed through one of the 3.3 k resistors which shunt the coils. Before the scanning coils are eventually replaced, it sometimes pays to check the soldered connection on the coil unit relating to the frame section.

Fluctuating Width

If this symptom is accompanied by a disturbing alteration in focus, the trouble is almost certainly caused by an intermittent open-circuit in the 2 mF electrolytic capacitor across the cathode bias resistor of the PL81 valve. This component is designated C18 in the makers' circuit, but is not used in Model TV36C.

Bush TV53 and TV56: Insufficient Height

When the resulting raster cannot be synchronised in the frame and a spark occasionally jumps between pins 5 and 6 (heater and anode) of the PCL83 frame timebase valve, the rate of change of current in the primary of the frame output transformer is increased well above normal as the result of a timebase fault.

In Fig. 2 is given the frame timebase circuit, in which triodes V2b and V3a form a multivibrator stage and the pentode V3b serves as the output valve. V3 is the PCL83, while V2 is an ECC83, and the section not shown in the diagram (section V2a) is associated with the sync separator circuit.

Open-circuit of C15, the 0.05 mF capacitor connected between pin 1 of V3 and chassis, is usually responsible for the trouble. When this component fails normal operation of the frame timebase is upset in terms of both frequency and waveform, and the distorted drive signal applied to V3b causes abnormally high current changes in the transformer primary winding. Since considerable inductance is reflected across this winding from the scanning coils, the rapidly changing current incites large values of back EMF which are released in the form of sparks between the two points mentioned.

If the flashover is permitted to continue for any length of time, the insulation between the sockets of the valveholder eventually breaks down and the holder has to be replaced. Indeed, when the symptom is first encountered by the engineer it is often considered that bad insulation is the actual cause of the trouble, but this is disproved, of course, when it is later discovered that the symptoms still occur when a new holder is installed.

Foldover at Top of Picture

There is also progressive cramping towards the top of the picture and a display of flyback lines which are broken along their length. The trouble is invariably caused by open-circuit of C17, the 1,100 pF. capacitor in the frame linearity correcting network. When this fault exists it may be found that the frame linearity control has little effect in the correcting of the symptom.

(Continued on page 177)

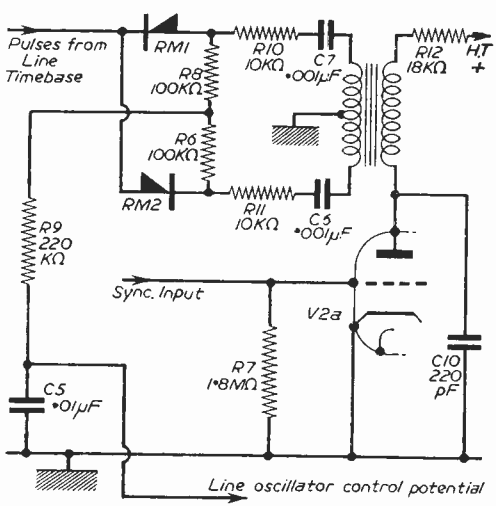
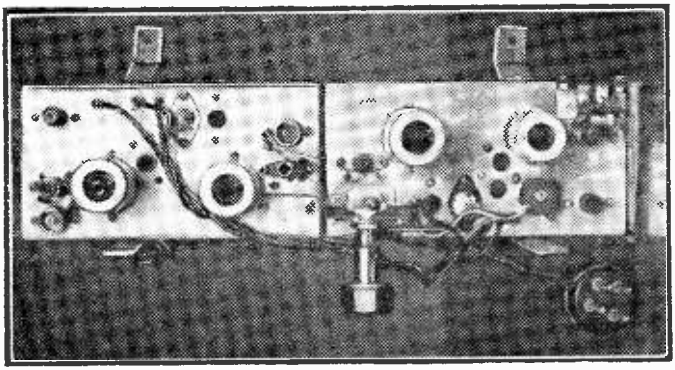


Fig. 3.—The flywheel sync control circuit used in the Bush TV53 and TV56 series.

A Home Constructed TV Receiver



Plan view of the converters used in the receiver.

No. 2—THIS ARTICLE DEALS WITH THE CONVERTERS AND TUBE MOUNTING

(Continued from page 139 of the October issue)

By P. Green

THE BBC converter mentioned last month is shown in Fig. 11. A 6F12 valve was used in the first stage. As there was not sufficient gain a further coil was added as previously stated.

The two converters were bolted together (see plan view) and a 2-pole 3-way switch fitted in the middle. This switch isolates the valve filaments and output coil of the converter not in use. As little as twelve seconds is required to switch to either programme.

When the 1K ohms gain controls have been adjusted, a similar picture is obtained with little alteration to the brilliance control. The heater supply for the converters is taken from the 22 v. 3 amp. winding (see Fig. 12), and as the total voltage required for the PCF80 and PCC84 valves is only 16 volts, a suitable resistance of 20 ohms was made from an old iron element. The terminal strips were carefully removed and reassembled on a length of mica strip wound with resistance wire. As this wire cannot be soldered, it must be pressed under the terminal strips, which are then soldered in the chassis to stiff wires. To obtain 180 volts for the H.T., a 4,500 ohm resistance in series with a .1 mfd condenser was put in the supply (see Fig. 12). A further 2 ohm resistance is mounted on the BBC converter chassis.

Cooling

To ensure adequate cooling, the converters are mounted well above the bottom of the cabinet, and little tuning drift has been experienced. Large holes are drilled under the other two chassis, and these holes are clearly shown in the photograph of the rear view of the cabinet. It will also be seen that a jack plug is mounted near the speaker. This can be used for recording, or for a deaf aid.

Mounting the Tube

The photograph of the cabinet with its easily removable sides and top shows the mounting of

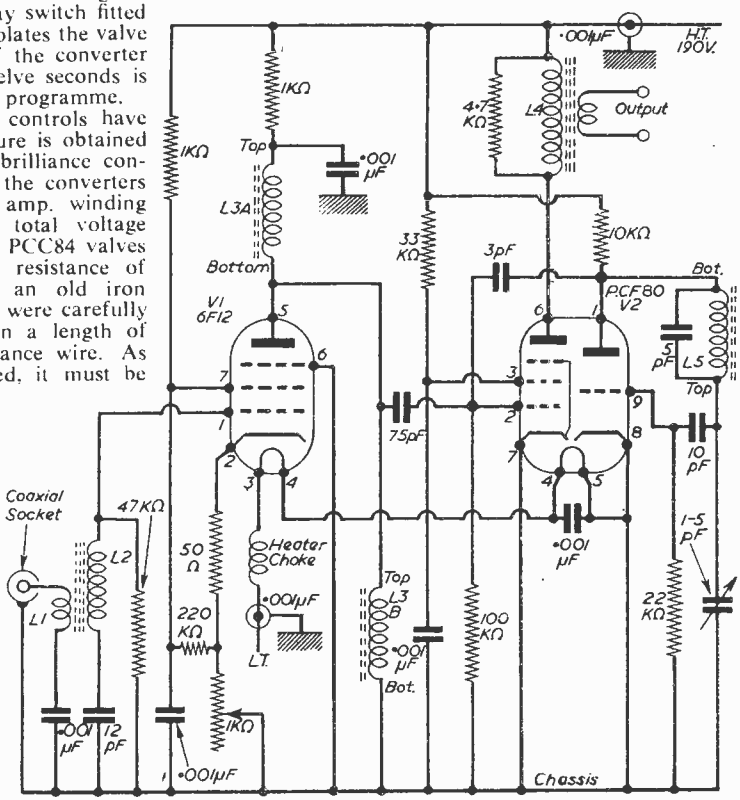


Fig. 11.—BBC converter. All .001 mfd. ceramic condensers. L3A and L3B are inductively coupled.

COIL WINDING DATA *(See page 137, October issue)*

Coil	A	B	C	D	E	F	G	H	I	J	K
Birmingham Holme Moss	7½ 9½	11½ 14½	4½ 7½	13½ 13½	6½ 6½	10½ 12½	12 15	8 8	12½ 14½	13½ 16½	Sound Rejector Coil 14
33-38 Mc/s.	15½	15½	13½	15½	13½ C.T.	15½	21	9½	16½	18½	

the tube. This method enables one to change the tube easily, and tubes of 9in. to 17in. can be fitted in the same mounting by using suitable packers. With all the recondi-

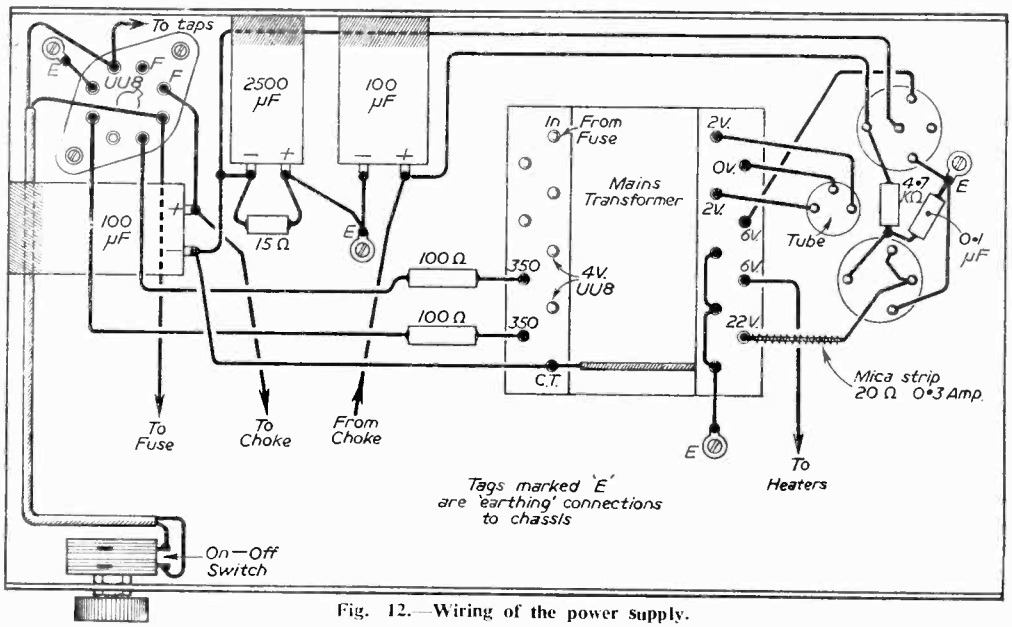
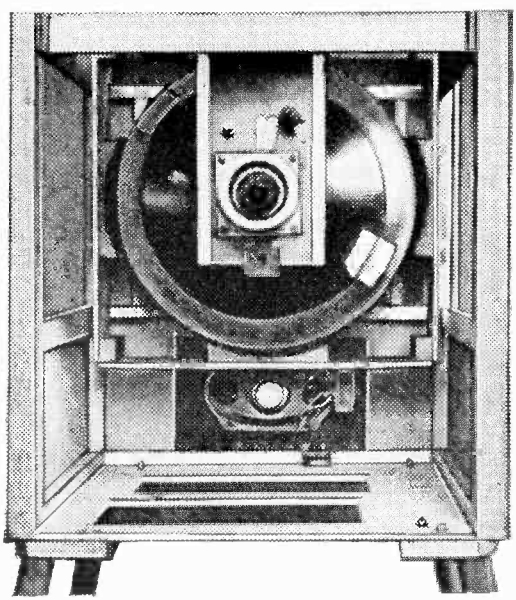


Fig. 12.—Wiring of the power supply.



Showing the large holes drilled under the chassis, the jack plug which is mounted near the speaker, and the mounting of the tube.

tioned tubes available, one has a large and cheap choice. The line transformer, the frame transformer and scan coils are the standard "View Master," and the focus magnet is an Elac.

(To be continued)

TELEVISION TROUBLES

(Continued from page 175)

Fluctuating Height

Sometimes caused by intermittency in the 0.1 mF. coupling capacitor, C16 in the circuit. The symptom may also be promoted by trouble in C19, the 100 mF. bias electrolytic of V3b.

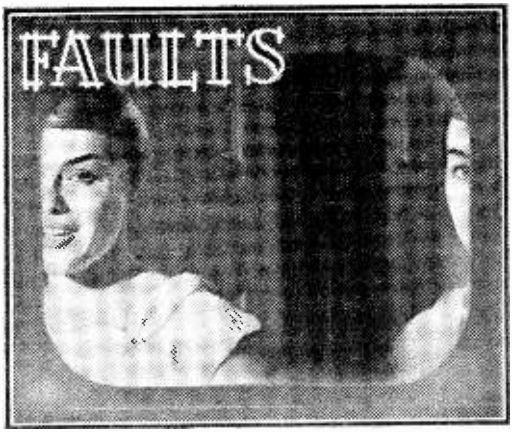
Flyback Lines at Top of Pictures

Check the value of R17 and R19, and replace if high. The symptom may also be caused by trouble in V2 or V3, the effect, of course, is that of a slow frame flyback.

Intermittent Line Hold

This range of Bush models use a form of flywheel line synchronising, in which two small rectifiers (MR1 and MR2) are used in a phase discriminator circuit, as shown in Fig. 3. If line stability is impaired and it is found necessary to make frequent adjustments to the line hold control, the trouble is invariably caused by unbalance of the rectifiers, which may occur as their temperature rises.

LINE TIMEBASE FAULTS



THIS ARTICLE TELLS YOU HOW TO LOCATE AND CURE THEM

By J. Brown

THE line timebase and its associated components are among the most fascinating, and tricky, circuits. By arranging an oscillator to feed an output stage having a specially designed output transformer, we can scan the tube and use the flyback to obtain EHT. There have been many suggested ways of testing these transformers: instruments have been developed, but of the latter the writer has had little experience, and he has adopted a method which has never yet failed. If a line transformer is suspected to be faulty, the test is to replace it. This is impossible in the case of the amateur, because of the cost, and the writer has compiled this article in the hope that a reader will have some new ideas or think of another way to go about this problem.

Line Transformer

The line transformer (Fig. 1) is an auto transformer, with an extra winding "overwound" to obtain EHT. This overwind used once to be wound with special wire, and can be easily recognised as it has the largest diameter. The resistance is usually very high, about 10 kilohms. The resistance shows there is continuity from the anode of the line output valve to the EHT rectifier anode. However, one shorted turn will ruin the performance. (In defence of the line transformer, and the manufacturers of these components, many are suspected and scrapped whilst not at all faulty.) There are various types of windings: some are tapped for use as a width control, the windings being switched or capable of adjustment. Winding or rewinding are for the specialist alone, because of the need for high insulation.

If the screen is blank and the sound section is working perfectly, it is wise, before suspecting the line timebase circuit, to see whether all the heaters, including that of the tube, are alight. Next, check the continuity of the fuses because some makers wire a fuse in the H.T. supply of the line timebase.

Look for any undue heating in components and valves. Place a screwdriver near the anode of the EHT rectifier; if a good spark can be drawn from it, it may be faulty. Remember that this heater does not light if the line timebase is not working, because the heater supply comes from a couple of well insulated turns on the line transformer. Some receivers have a resistor in series with the heater of the EHT rectifier and this should be checked. If there is a spark at the anode, and the heater is alight, with a well insulated screwdriver see if there is any spark from the lead that goes from the rectifier to the cap on the side of the cathode ray tube. If there is a spark, with a good cracking sound, the ion-trap is faulty or out of adjustment. Some sets have a resistor in series with the tube lead and this may go high in value and need replacing. If there is no spark from the tube lead, the EHT rectifier is faulty. Where the rectifier shows a blue or pink glow, it should be replaced. U25 valves develop this fault and may sometimes prevent the line timebase from working, when the line output valve becomes very hot. Sometimes a U25 heater burns out and falls near the anode. Then, a spark is obtained from the anode of the U25 and the tube

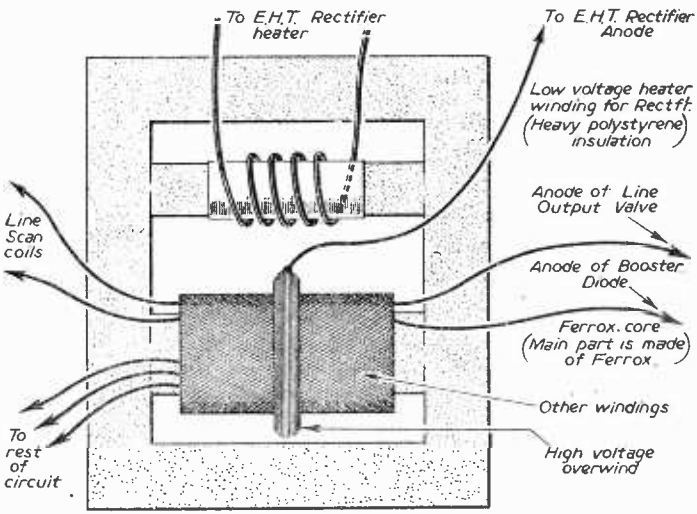


Fig. 1.—The line transformer.

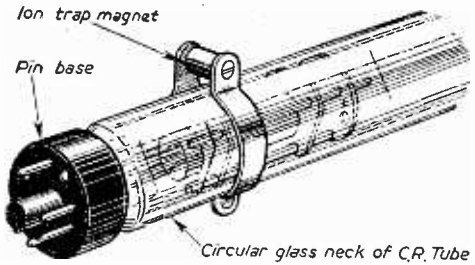


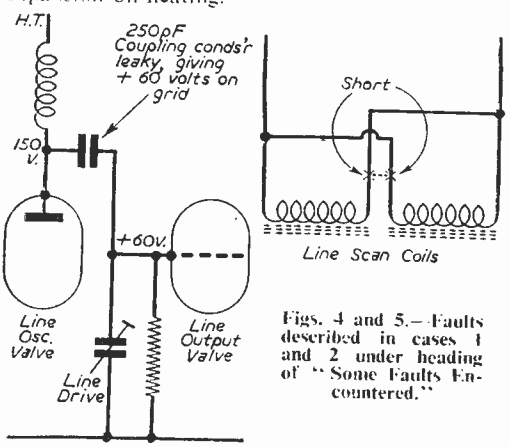
Fig. 2.—The ion-trap magnet fitted to the neck of the tube.

lead. If this happens, the sound of the spark is different from that obtained when the rectifier is working and is easily recognised. If the line timebase is working, the familiar 10 kc/s whistle will be heard; weak if only the oscillator is working, stronger if the line output stage is also in action.

Ion-trap Magnets

Many suggestions have been given for the correct setting of ion-trap magnets. The method the writer adopts is to switch on the set; allow it to warm up for a period of two minutes, with the arrow on the magnet facing the screen; to turn the brilliance fully up, and slowly to rotate it back and forth and move it along the neck of the tube towards the screen until there is light there. If a small area of defocused brilliance is seen, the magnet is turned through 180 degrees. At one position, the screen will light up brilliantly. The brilliance is reduced and the magnet adjusted for maximum brightness at the lowest setting of the brilliance control. Positioning and focusing of the raster are carried out by the picture shift and focus controls, not by adjustment of the ion-trap magnet's position. Should corners of the picture or raster be cut off, this is usually due to maladjustment of the magnet. Many cases of a blank screen are due to a broken or moved magnet.

After the optimum position has been found, seal the magnet with some "Durofix" or other adhesive. Do not overtighten the screws on the magnet, for the fibre band may break owing to expansion on heating.



Figs. 4 and 5.—Faults described in cases 1 and 2 under heading of "Some Faults Encountered."

Fig. 2 shows the ion-trap magnet fitted to the neck of the tube. Normally the arrow points to the screen. Mullard Ltd. will supply instructions for fitting ion-trap magnets. Their method is different from that of the writer.

Fault Finding

Suppose there is no spark at the anode of the EHT rectifier and its heater is not alight. First, listen for the 10 kc/s whistle. If this cannot be heard, the oscillator section is not working. This is usually due to faulty valves, or to components open-circuited or short-circuited. Some circuits use self-oscillation in the line-output stage and all components must then be checked. If the faintest 10 kc/s whistle is heard, the oscillator is working. This whistle can be varied by the line or horizontal hold control. Tracing the fault here can be very tedious. Resistors, condensers, line transformer, and linearity and width components must be checked; valves tested or replaced. Voltage readings must be taken, especially on the screen of the line output valve. Voltage tests must not be made at the anode of the line output valve, as very high R.F. voltages are present. The writer uses a neon on a polystyrene handle (see Fig. 3). This will light about 1 to 2in. from any part of the line circuit. If the neon lights, the EHT rectifier is tested as explained.

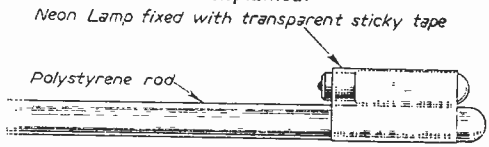


Fig. 3.—The neon tester attached to a polystyrene rod.

If it does not, measure voltages and compare with the maker's figures. Check the cathode voltage of the line output valves. Test the valves, or replace them, and if there is no spark at the anode of the EHT rectifier, first see if the line drive is too high. The compression trimmer may be too tight or the potentiometer may be advanced too far. If these are in order, disconnect the line scan coils. If there is a spark from the anode of the rectifier, the coils or an associated component is faulty. Some coils are fitted with a high voltage capacitor of about 500 pf, across them, and this should be tested. Test the coils for short-circuiting. This may not show up on a normal test meter, for when the energy from the line timebase is applied, this is enough to break down the insulation of the coils. Perhaps they have shorted turns, when sparks from the coils may be seen, or they become hot. If no spark can be obtained after the valves and components have been tested the line output transformer is faulty.

Lack of Width

If lack of width is experienced, again this may be due to a faulty line transformer, or condenser across the line scan coils, or to the width coil, which usually becomes very hot if it is faulty. If there is loss of width and height, this is usually due to a low H.T. supply voltage. Suspected metal rectifiers should be replaced. Valve rectifiers can be replaced after testing the

surge limiting resistors in the anode leads. The U801 valve has four anodes and a wire-wound resistor in each anode circuit. If one of these is open-circuited, H.T. voltage will be low. These resistors are usually of 50 ohms. If the screen is blank and a spark can be drawn from the anode of the EHT rectifier and from the tube connection, and movement of the ion-trap magnet has no effect, the voltages of the various tube electrodes must be measured.

Three readings are taken if the tube is a pentode or tetrode. First, the modulation, secondly the brilliance, thirdly the first anode. These readings depend on the type of modulation used. Cathode modulation is mostly used nowadays: the cathode of the tube is connected to the anode of the video amplifier valve. The reading should be from 100 to 150 volts. The grid of the tube is connected to the brilliance control. The reading here is from 0 to about 150 volts, dependent on the setting of the control. The first anode is from 300-600 volts positive. All measurements are taken negative to the chassis, positive to the electrode. Low readings may be due to burning out of the video amplifier anode resistor or choke, or other burnt-out resistors, controls, a faulty video amplifier valve, or its associated components. Before condemning the cathode-ray tube, test it in a friend's set, or have it tested at a reliable dealer's.

Some Faults Encountered

1. The screen was blank and the sound perfect. A weak 10 kc/s whistle could be heard. No sparks could be drawn from the line output valve or from the anode of the EHT rectifier. A 250 pf. coupling capacitor connected from the anode of the oscillator to the grid of the output valve was found to have a low resistance. The grid of the output valve was about 60 volts positive.

2. The line oscillator was working and the anode of the output valve was red-hot. The valve was replaced, but results were as before. When the line scan coils were disconnected, a spark could be drawn from the anodes of the EHT rectifier and tube. The line scan coils had a short and when these were replaced the set operated normally.

3. The screen was blank and the heater of the EHT rectifier was not alight. The rectifier had a blue glow and when replaced the fault was cured.

4. There was a lack of width. No faulty components were found and the line transformer was returned to the makers who found that it had shorted turns. Its replacement effected a cure.

Figs. 5 and 6 show the faults described in cases 1 and 2.

Latest E.M.I. Transmitters

THE BBC has placed an order with E.M.I. Electronics Ltd. for six frequency modulated transmitters of a new type for the V.H.F. sound station now being built at Llanddona (N. Wales). The station, which will provide a full service of Home, Light and Third programmes, will serve some 180,000 people living in Anglesey and North Wales. The BBC has also ordered six similar transmitters for the new station to be built at Nether Button, Orkney. The new method of frequency modulation used provides an improved signal-to-noise ratio with reduced harmonic distortion.

The transmitter has been designed to operate on Band II frequencies (87.5 to 100 Mc/s) at 1 or 2 kilowatts output. Duplication of the complete transmitter and operation of two units in parallel ensure greater reliability of service as transmission will be maintained should a fault develop in one unit.

Modern Colour Television

THE International Radio Hobbies Exhibition will again be held on 26th to 29th November, 1958, at the Royal Horticultural Old Hall, Vincent Square, London, S.W.1.

For the first time modern colour television will be shown to the public and the latest outstanding world-famous Racal communication receiver worth £400 will be given away to the lucky card winner obtainable free at exhibition entrance.

Displays will be staged by the Royal Navy, Royal Air Force and the Army Territorials radio sections, British Amateur Television Club also Live Amateur GB3RS Radio Station working the world. Radio and IGY will also be featured. Many radio manufacturers will be showing components for "Do-it-Yourself" construction together with kits of parts for transmitters, receivers, hi-fi, and aerials.

Two multiband and transportable aerials and towers will be exhibited for the first time in this country also a new low-priced communication receiver. Transistors for amplifiers and mobile working will be featured together with many technical leaflets on home construction.

The show opens at 11 a.m. until 9 p.m. Admission 2s.

Interference With TV Reception

By G. J. Gordon

WHEN a television picture is disturbed in some way it is often difficult for the viewer and, indeed, the service engineer to establish immediately whether the trouble is caused by a receiver fault or by external interference. External interference can produce a host of curious effects across the picture depending on its type, but the problem is that certain set faults can give almost identical symptoms. It is the purpose of this article to investigate the various kinds of interference effects and to suggest ways of checking whether or not the receiver is to blame.

White Spots on Picture

Although the spots may be grey if the receiver features an interference inverter circuit, the effect is well known and is caused mostly by car ignition systems. The car responsible can usually be seen by looking out of the window, but if such definite proof is not available the disturbance is rarely persistent unless, of course, one happens to live on a main road or close to a garage or ignition-type engine which is constantly in operation; but in this case the cause of the interference would have long been established. The cure is simple, and usually requires the inclusion of a resistive suppressor in the H.T. lead between the distributor and ignition coil of the offending engine.

White spots are also caused by electric motors such as used in most domestic appliances. Here, however, the interference spots are invariably concentrated in narrow horizontal bands across the picture and the bands drift up and down the picture depending on the speed of the motor in relation to the 50 c/s frame timebase frequency.

Flashes and spots are caused by pretty well any electrical circuit which is switched on and off and the cure is somewhat influenced by the offending equipment. In most cases of television interference small television suppressor chokes and 470 pF capacitors located as near as possible to the motor clear the trouble fairly successfully (see Fig. 1).

Sparking in the receiver itself caused by poor insulation of a component or EHT corona will produce similar trouble but in this case it is fairly easy to prove by removing the aerial from the set and adjusting the brightness control to get a raster; it is also as well to turn the contrast control fully up. If the screen is clear of spots, then the interference is possibly external and getting in through the aerial; if the trouble is equally as bad as with the aerial inserted, the set is in trouble and crackles will probably be heard emitting from the loudspeaker. However, if most of the interference disappears, the trouble may be in the set or the external interference may be so strong that it is getting into the set without an aerial, some of it probably coming in through the mains lead, though mains borne interference is not very common at television frequencies.

Similarly, interference generated as the result of a set fault may require connection of the aerial to reintroduce it to the signal circuits so that it is carried through the receiver and produces the symptom in the ordinary way.

Strong external interference is readily established since it more or less disappears when the aerial is disconnected, is rarely persistent and affects other viewers in the vicinity. It also has the character of either ignition or electric motor interference as described above.

Receiver Generated Interference

The line amplifier and EHT circuits are particularly vulnerable to discharge effects and the production of interference. If a discharge occurs at the D.C. side of the EHT rectifier a blanket of very small spots covers the whole

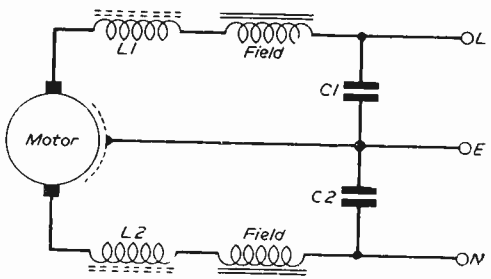


Fig. 1.—Television interference suppression circuit in which L1 and L2 are dust-iron television chokes and C1 and C2 are 470 pF capacitors suitable for mains operation.

screen area. This can be demonstrated by promoting an EHT discharge with the blade of a screwdriver at the final anode connector of the picture tube.

Such discharge may occur while the receiver is working due to humidity or dampness in the room, as the result of a heavy layer of dust on the EHT components or due to bad soldering of connections in the EHT circuit. To avoid this trouble, all connections on the EHT rectifier valve, smoothing capacitors and EHT connecting cables should be formed with a perfectly smooth blob of solder. The wires and tags should first be well tinned with solder, and then a hot iron should be used to drop a symmetrical blob of solder over the connections. Resin-cored solder should be used, of course, and the temperature of the connecting junction should be maintained while the join is made. Sharp points of solder and protruding strands of wire must be eliminated as these are conducive of corona discharge.

If a discharge takes place at the anode side of the EHT rectifier or line amplifier valve, in the circuit of the line scanning coils or width and linearity inductors or controls, the interference on

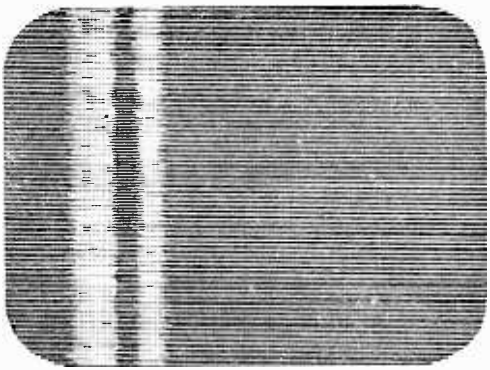


Fig. 2.—The symptom of corona in the line output transformer or component associated with line amplifier pulse voltage.

the picture will have a definite pattern. Because the discharge is promoted by the line flyback, spots or dashes of interference occur at the same point on each line scan and vertical columns of irregular horizontal lines appear somewhere across the picture, usually towards the left-hand side as shown in Fig. 2

Again, this effect can be demonstrated by promoting a discharge at the anode of the line amplifier valve while the screen is observed. It is a good idea to try this to get some idea of the appearance of the symptom.

The usual cause of the trouble is poor insulation in the line output transformer, but a substitution test is often necessary if the trouble cannot be located in any other part. In severe cases a hiss can be heard from the loudspeaker and if the chassis is viewed in a darkened room the discharge may well be visible in the region of the line output transformer.

This trouble can be reflected into neighbours' receivers, and if they happen to be working on a channel different from that to which the offending set is tuned, the columns of interference may sweep across the screen and produce so-called windscreen-wiper interference, which has already been dealt with in these pages.

A horizontal band of interference spots, as shown in Fig. 3, rather like electric motor interference, often results from insulation collapse of a mains transformer or component in the set which carries mains current. The interference band is generally stationary since the interference is synchronous with the frame timebase, the frequency being the same in both cases.

Sparking in a component carrying direct current will cause random interference spots on the screen, but an associated symptom may also result by the disturbance in the circuit of the defective part. Severe crackles are usually heard from the loudspeaker when the component responsible for the picture interference has anything to do with the sound channel. Random interference spots also develop if the heater winding of the E.H.T. rectifier valve loses its insulation between the transformer core or adjacent windings. This frequently happens in receivers where the EHT is obtained from a mains transformer.

Pattern Effects

Interference producing patterns on the picture can also be troublesome and may originate either from external sources or from the receiver itself. The trouble is caused by radio-frequency signals getting into the receiver along with the wanted television signals. When this happens the interfering signal beats with the vision carrier and the difference frequency so produced is detected by the receiver in the normal manner and shows up on the picture as patterns. If the frequency of the interfering signal drifts slightly, then the difference frequency changes and the patterns change their character accordingly, but if the two signals are of constant frequency the patterns remain locked on the picture.

If the interfering signal is lightly modulated at mains frequency the patterns may be "S"-shaped, but if it is heavily modulated at mains frequency the patterns may be confined to a horizontal band across the picture. Pattern interference is really the visual representation of beat whistles which are produced in a sound receiver when an interfering R.F. signal beats or heterodynes with the sound carrier or intermediate-frequency. With sound, however, whistles are produced only when the difference frequency falls within the receiver's A.F. passband, which is usually limited to about 8-10 kc/s. With vision, patterns are produced right up to a difference frequency of 2.0-2.5 Mc/s, depending upon the resolution efficiency of the receiver.

The interference may be either of a frequency which is acceptable by the receiver's main vision channel or I.F. channel. For example, an interfering signal at 42 Mc/s would cause a 500 kc/s pattern on the picture of a receiver tuned to Channel 1 (vision 41.5 Mc/s), as also would a 34.5 Mc/s signal getting into a receiver whose I.F. is 34 Mc/s. In the case of superhet receivers a strong interfering signal may cause a beat in the I.F. channel even though the frequency of the interference is removed from the main or I.F. acceptance.

The interference may get through by way of the receiver's second channel or other spurious acceptance channel, or it may be so strong that it overloads the first valves and produces

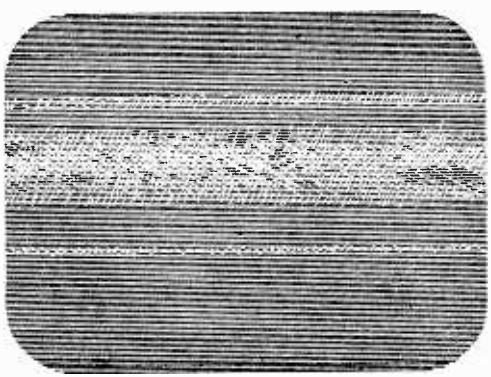


Fig. 3.—Electric motor interference. The symptom may also be produced by insulation breakdown of a receiver component carrying mains current.

harmonics or sub-harmonics which themselves are acceptable by the receiver.

Interfering R.F. signals may also be produced by the set itself. Patterns are sometimes produced if the contrast control is turned right up in a strong signal area in an endeavour to obtain a brighter picture on a worn tube. This causes the production of harmonics in the I.F. channel and vision detector which find their way back to the signal circuits as interference. Poor screening or filtering of the vision detector stage may also aggravate this trouble.

Instability in the I.F. stages, possibly due to impaired decoupling or a faulty valve, gives rise to a spurious signal which beats with the vision carrier and results in a pattern which invariably changes its form as the contrast control is adjusted, and possibly disappears when the control is turned below the critical feedback point. In a receiver which is prone to instability, a mismatch at the aerial socket may start the trouble, and in this case it may be found that the trouble can be cleared by altering the position of the aerial feeder at the back of the set.

Very heavy feedback in the receiver will promote uncontrollable brightness and there will be no trace of picture at maximum contrast setting, but as the control is retarded the feedback intensity may reduce and a picture affected with patterns may be obtained; reducing the contrast still further may clear the patterns, but then the picture may be below optimum contrast.

External Interference

There are very many external sources of interference, and it is impossible in an article of this nature to go into detail, but it will help to mention one or two of the chief causes.

Patterning is often very bad on the ITV programmes when a simple add-on type Band III converter is employed, especially in areas close to a powerful Band I transmitter. With this kind of converter the receiver is still acceptable to Band I signals on the local channel even when the combination is set up for the reception of the ITV signals. The receiver may, therefore, pick up the Band I signals when it is receiving the converted ITV signals. The two signals heterodyne and cause patterning, exactly the same as described above.

The cure is to use a filter or stub in the converter-receiver connecting link or to increase the Band II signal pick-up so that the receiver's contrast control may be turned down, thereby rendering the set less sensitive to the Band I signal. It may also help to remove the Band I aerial from the converter while receiving the ITV signals.

Such a combination may also cause patterning on a neighbour's receiver tuned to the BBC. This is the result of the converted ITV signals being radiated in Band I and being picked up by the affected set. In really severe cases, the ITV picture may actually appear on the affected receivers, superimposed on the BBC picture—experimenters in range of the Isle of Wight ITV transmitter beware!

Local oscillator signals or their harmonics may radiate and cause patterns on sets tuned to a different channel. This trouble is present in the Oxford area at the present time, and a wired television service is being contemplated to give the viewers interference-free pictures. Oxford is in the range of both Birmingham (Channel 4) and London (Channel 1) transmitters. Viewers on Channel 4 are being cut out with patterns due to oscillator radiation from sets tuned to Channel 1. This is because the oscillator frequency of sets with 16 Mc/s vision I.F.s falls within the vision passband of Channel 4.

This trouble may occur with other channel combinations. For example, the second-harmonic of the oscillator of sets with 34.65 Mc/s vision I.F.s tuned to Channel 4 causes patterns on nearby sets tuned to Channel 9.

Patterns may also result from R.F. heating and medical appliances, from mobile transmitters and even from other television stations on the Continent when the ionospheric conditions favour long-distance television reception. Interference getting into the I.F. channel through the aerial system can be eliminated by the inclusion of a high-pass filter, while a low-pass filter serves to block interfering signals at frequencies above the frequency of the required television signal.

Vacuum type electric lamps, particularly those used in electric fire displays, can oscillate at frequencies in the range 30 to 130 Mc/s.

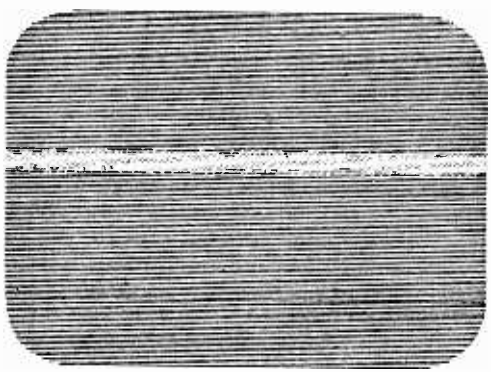
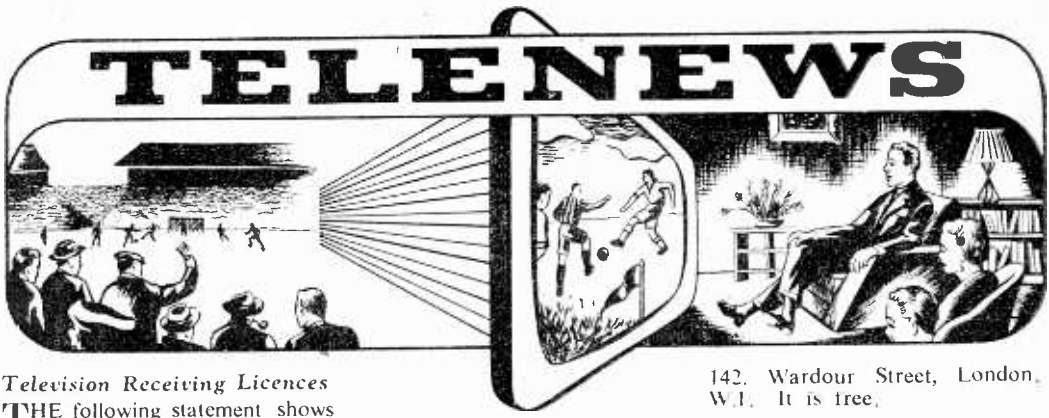


Fig. 4.—A rough idea of the effect on the screen caused by an oscillating vacuum lamp.

Television interference due to this cause is easily distinguishable by the very narrow horizontal band of pattern which occurs across the picture. In some cases it is rather like the knitting together of one or two scanning lines, but in other cases the band may be a little wider containing pattern information of a definite character. A rough idea of the symptom is given in Fig. 4.

As the resulting interference is not very widespread, the guilty lamp can usually be discovered by switching off suspect lamps in turn while having a helper observing the screen. It may be necessary to have the neighbours do likewise if the trouble does not appear to be in the house of the affected viewer. Unfortunately, lamps suffering from this trouble may well be in normal working order from the aspect of illumination.



Television Receiving Licences

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

Region	*Total*
London Postal	1,603,018
Home Counties...	1,037,310
Midland	1,333,920
North Eastern	1,341,943
North Western	1,164,728
South Western	655,502
Wales and Border Counties ...	483,656
Total England and Wales ...	7,620,077
Scotland	634,332
Northern Ireland	90,240
Grand Total	8,344,649

TV Effect on Films

TV has undoubtedly had an effect on public taste in films, and may account for the decline in film attendances. There is almost national criticism of the very poor film. The public requires something different from Westerns, gangster films and sickly love stories. The film show has become a weekly event.

Coin-in-the-slot TV

A FURTHER development in visual entertainment will compete with the films—namely coin-in-the-slot television, which may become the home cinema. To provide this service, existing receivers will have attached to them a coin box through which the public will be able to pay for special programmes which will only be shown once or twice a day. By this system the programme is televised through a scrambler, and the insertion of the coin unscrambles the picture. Alternatively, the programme may be transmitted by lines.

East Anglia

THE BBC has announced its plan for East Anglia and the East region. A permanent TV link is to connect Birmingham with the Norwich TV station and a new station is to be built at Peterborough. There will be a two-way link enabling programmes from East Anglia to be fed into the national programme. Next year the BBC intends to install cameras in its Norwich studios so that a daily news service of interest mainly to East Anglians may be transmitted.

"The Church and Television"

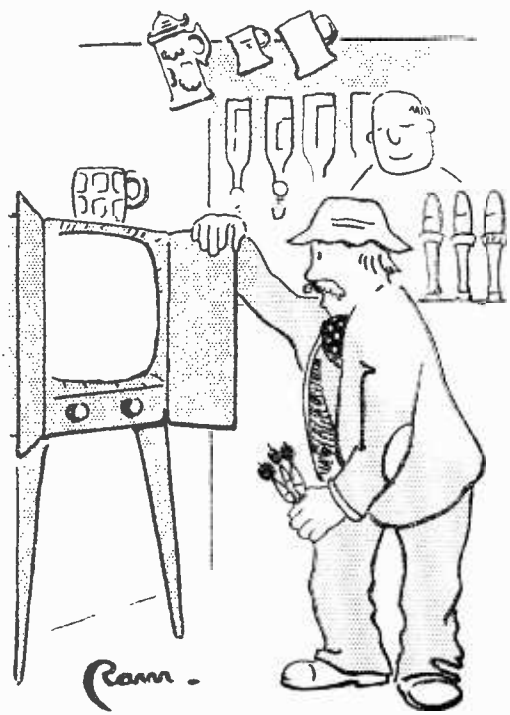
A BROCHURE entitled "The Church and Television" endeavours to answer the question as to whether television is a competitor with the Church or an opportunity. It is a transcript of the ABC Television programme "Living Your Life," which was originally transmitted on June 8th this year. It is published by ABC Television Ltd., 142, Wardour Street, London, W.1. It is free.

Chillerton Down

MORE than 80 per cent. of the population may now view commercial TV as a result of the opening of the Southern TV station at Chillerton Down.

Glass Plastic TV Tubes

A CERAMIC - IN - GLASS electron tube, capable of withstanding extreme conditions of vibration, shock and fatigue, has been produced and is expected to permit improved



"Why, this be a queer sort of dart board!"

performance in electronic equipment.

Within its glass envelope, the device employs a "planar," or sandwich-type mount structure. In the assembly process, various elements of the mount are stacked one on top of the other, instead of being built around a common axis as in conventional tubes. Ceramic spacers are used to separate components of the stacked mount.

TV Sales in 1958

TELEVISION receiver manufacturers expect their sales of sets in 1958 to total between 1,600,000 and 1,700,000, although production has been running at a higher annual rate than this.

Sight and Sound on Tape

SPOOLS of tape containing sight and sound tracks may shortly be available to home televiewers. We understand that two British radio firms are perfecting recorders which will plug into the aerial sockets of ordinary TV sets. There is bound to be a big demand for them.

Television Colour Standards

BRIGHTNESS standards for colour television tubes have been made available by the U.S. National Bureau of Standards. Each set consists of three standards, red, green and blue, closely matching in spectral energy the three phosphors which in the tube act together to produce various colours in the image. The standards are used to calibrate instruments for measuring the colour and brightness of the phosphors. They thus provide a simple means for achieving uniform colour reproduction in television tubes.

ITV Programmes in N.E. England

THE I.T.A. announce that Independent Television programmes will begin in north-east England on January 15 next year. About 2,660,000 people live in the area to be served by the new station at Burnhope, six miles north-west of Durham. It will operate on Channel 8 and it will transmit horizontally-polarised signals. The receiving aerial will thus have to be mounted in a horizontal plane and low powered test transmissions are now being broadcast to assist dealers in orientating Channel 8 aerials.

I.T.A. Service for Northern Ireland

THE Independent Television Authority has invited applications for the provision of programmes from a station in Northern Ireland which is to be built on the Black Mountain, near Belfast, and which the Authority hopes to bring into operation at the end of next year. The station will serve over one million people and its coverage area will include practically the whole of Northern Ireland, with the exception of Fermanagh, the western parts of the counties of Tyrone and Londonderry, a small part of County Down in the Warrenpoint and Kilkeel areas, and the Antrim coast from Larne to Portrush.

The station will have a 750ft. mast and will transmit on Channel 9, horizontally polarised. It will have a directional aerial system designed to transmit a maximum radiated power of 100 kW. to ensure as wide a coverage as possible in the hilly terrain of Northern Ireland.

20 Million ITV Viewers

MORE than 20 million people in some 5,800,00 homes throughout the country can now watch ITV programmes, reports Television Audience Measurement Ltd. This compares with an audience of only 670,000 viewers when Independent Television first began operations in the London area less than three years ago.

Other landmarks in ITV's progress were: May, 1956—5 million viewers. February, 1957—10 million. November, 1957—15 million viewers.

Watching ITV

DURING August, 72 per cent. of the total time spent viewing television in homes with a choice of BBC and ITV programmes, was devoted to watching ITV—two per cent more than in July. This is revealed in the latest of a monthly series of statements by Television Audience Measurement Ltd. (TAM) giving details of the ITV share of time spent viewing television in BBC/TV homes in ITV areas.

ITV's share in BBC/ITV homes was as follows: London 71 per cent.; Midlands 72 per cent.; Northern 73 per cent.; Scotland 71 per cent.; South Wales and the west of England 68 per cent.

Equipment Hire Service

PYE LTD. have instituted a hire service which will include technical and production facilities and enable customers to call upon any form of TV apparatus ranging from complete outside broadcasting bands or underwater television cameras to a single miniature industrial TV camera and monitor. The service will probably be used extensively by firms and organisations requiring only occasional TV facilities, as might occur when conferences are held simultaneously in different parts of the country or in different rooms within the same building.

ITV/BBC in Southern ITV Area

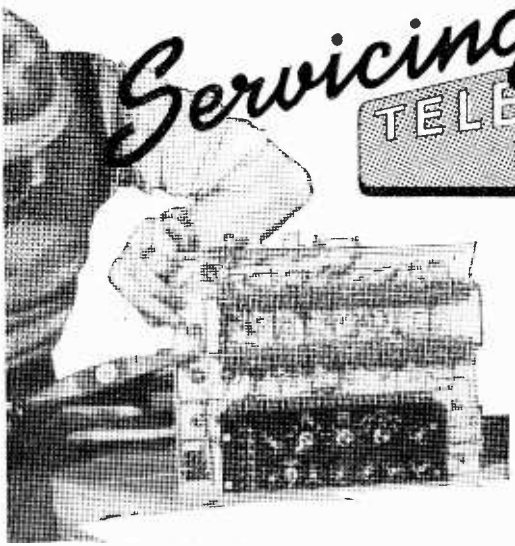
A BASIC survey of the Southern Television ITV area carried out in June/July by Television Audience Measurement Ltd. (TAM) shows that 312,000 homes—36 per cent. of all homes in the area—possessed sets built to receive ITV programmes. This figure represents the highest incidence of ITV/BBC sets yet experienced in any ITV area during the basic survey period.

Of the Band III sets in the area, 45 per cent. were of recent manufacture and were installed in 1957 or 1958. Forty-two per cent. of all Band III sets had ITV aerials and the majority of the remaining 58 per cent. of Band III sets without aerials were within the primary zone of the transmission area, where reception may be possible without special aerials.

25 Next Year

THE first issue of PRACTICAL TELEVISION was published in September 1934. It suspended publication, however, just before the war when it was carried on as a supplement in our companion journal, *Practical Wireless*. It was reissued April, 1950. It will thus celebrate its 25th anniversary in September next year.

Servicing TELEVISION RECEIVERS



No. 42.—THE BUSH TV53 SERIES (Continued)

By L. Lawry-Johns

THE fine tuning control on this receiver moves the entire channel selector assembly, thus providing a small variation on each channel position. Band I change over to Band III is achieved by an auxiliary cam on the channel selector mechanism.

A common sound and vision I.F. amplifier V3 follows the tuner unit and the output of this is split and fed to a two-stage, V4 and V5, vision I.F. strip and a similar, V8 and V9, sound strip. The vision detector and noise limiter is V6 and the video signals are amplified by V7 PCF80. This is a triode-pentode. The pentode section is the video amplifier, the output of which is directly coupled to the control grid of the triode section which functions as a cathode follower. The video signals appearing at the cathode are coupled to the C.R.T. cathode and the sync separator. The latter is one half of the V12 ECC83 and the A.G.C. is derived from this sync input. The A.G.C. system is probably the simplest in use and merely consists of applying part of the heavy negative voltage appearing at the sync separator grid to the I.F. stages after smoothing. The amount of negative voltage applied is determined by the contrast control and, of course, the signal strength. This negative voltage is also applied to the V1 (PCC84) stage when the selector plug is inserted in the *local* socket. It is not applied when the plug is inserted into *distant* and when it is so placed the V1 stage works at maximum efficiency. The second half of the ECC83 (V12) functions as part of the frame timebase oscillator being cross-connected with the PCL83 triode section to form a multivibrator. The pentode section of the PCL83 (V13) functions as the frame amplifier.

The Line Timebase

An ECC82 (V14) double triode operates as the line multivibrator, the output of which feeds a saw-toothed waveform to the PL81 (V15) control grid. The amplitude of this waveform is determined by the line drive control (TC2). The PY81 functions as a conventional efficiency diode whilst the overwind on the line output transformer supplies the EHT rectifier V16. This is a wired-in EY51 on the "50" series, and a plug in EY86 on the "60" series.

After being amplified by V8 and V9 the sound signals are detected by V10 EB91 which functions also as a series noise limiter. After passing through the noise limiter the signals are passed to the volume control and thence to V11 on the main deck (PCL83). This valve is a triode-pentode, the triode working as an A.F. amplifier, the pentode as the sound output.

Power Supplies

Two PY82 half-wave rectifiers, V18 and V19, are connected in parallel to provide an H.T. voltage of some 185 volts. Large capacity electrolytics provide smoothing in conjunction with a tapped resistor.

All valve heaters are in a single series chain fed from the mains dropper via the thermistor (Mullard VA1015). Pin 1 of the C.R.T. base completes the chain to chassis.

Faults to be Expected

Almost certainly at some period of its life the receiver will exhibit the symptoms of *no vision—sound O.K.* No raster will be displayed when the brilliance is advanced. With the rear cover removed, release the two small P.K. screws which secure the screening cover of the right side line timebase section. Pull the screen to the rear. In all probability the EHT rectifier EY51, situated on the top of the line output transformer, will be "out." The line timebase whistle should be audible and a spark can usually be drawn from the single wire end. The obvious conclusion that the EY51 is defective is probably correct. However, "just in case," remove the anode clip from the side of the C.R.T. If the EY51 now lights up the C.R.T. itself may be at fault. To check upon this, replace the clip on the C.R.T., clip a shorting lead between pins 1 and 12 of the tube base socket and remove the socket from the C.R.T. The valve heaters will continue to glow as the heater continuity is maintained by the short across the heater pins 1 and 12. If the EY51 is still out, replace it as it almost certainly has an internal short thereby causing A.C. to be applied to the C.R.T. inner and outer coatings which function as a capacitor to smooth the normal

(Continued on page 189)

D.C. but which short (virtually) an applied A.C. voltage. Many readers have been mystified by what appears to be an internal short in the C.R.T. eventually turning out to be an EY51 defect. The short explanation given above should enable the reason for this to be grasped. However, should the EY51 light up with the base removed but fail when the socket is replaced and the short removed (giving the C.R.T. cathode time to warm up) the reason may justly be attributed to a *grid-cathode* short in tube. Such a short can sometimes be cleared by applying a high-frequency high voltage between the grid and cathode electrodes, by lowering the first anode (tag 10) voltage to that of the H.T. line or the short may be accepted and the base rewired for triode working.

Should the EY51 be out but the spark at the anode be weak and the line timebase whistle almost inaudible, check the PL81 and the ECC82, V15 and V14. It should be borne in mind that a low emisson ECC82 will cause the PL81 to be under-driven. Thus it is possible for the PL81 to be replaced on several occasions when the actual cause of the failure of this valve is the ECC82. If the width is only "on the edge" and PL81 appears to overheat, replace the ECC82.

Another Common Fault

If upon switching on a loud hum is heard and inspection shows that the right side valves are lighting up brightly but the left side valves are not lighting at all, switch off before more damage is done and suspect a heater/cathode short in V11 the PCL83 sound output valve (front right side). A less serious leak of the same type in this valve may cause hum and distortion on the sound although the receiver may otherwise function well. Complete loss of sound may also be due to this PCL83 valve. V13 is another PCL83 valve and may also develop defects as described above, but producing symptoms applicable to the frame timebase. If only a horizontal white line is displayed on the tube face, suspect this valve.

Loss of line hold (picture running into lines) which may be intermittent, can often be traced to a defective V14 ECC82.

Sound on vision is often due to excessive signal input and if the sensitivity plug is in the *distant* positon, this should be replaced into the *local*. If the sound on vision is stubborn, L22 and L24 are the sound rejectors.

Receiving a Weak Signal

Grainy picture, perhaps only on Band III. Where the picture has been of good quality, check the tuner valves, firstly the PCC84 (V1) and then the PCF80 (V2).

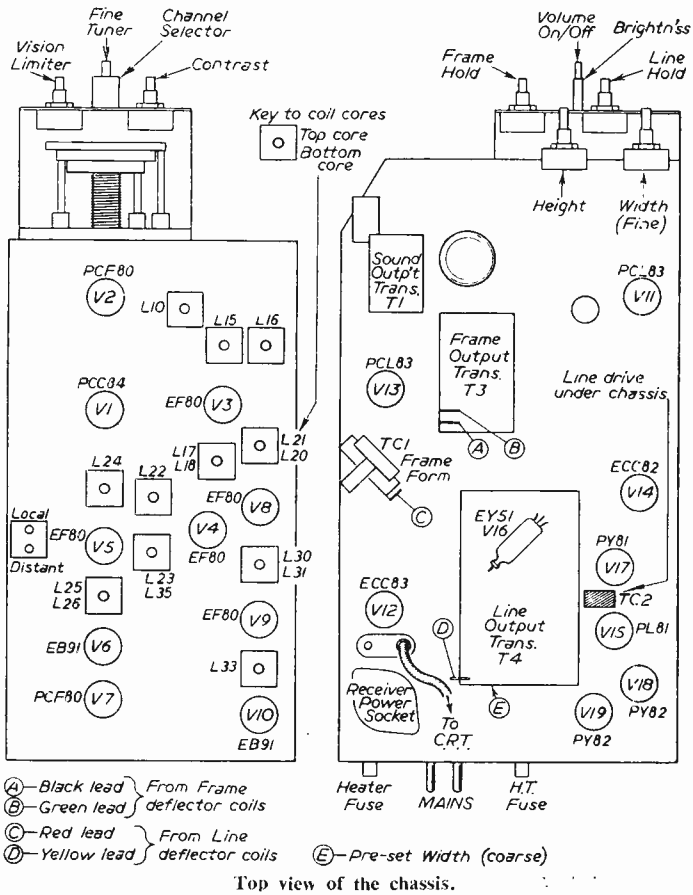
If Band III has not hitherto been received, the above valves may be checked after having seen that the local/distant plug is in the distant position. Thereafter, efforts should be directed to improving the input signal by erecting the most efficient aerial possible and seeing that this is correctly sited. Usually this will be in the highest available position, but not necessarily so. We know of superior results obtained with the aerial just clear of the ground in situations where a chimney position was hopeless.

Removing the R.F. Chassis

Disconnect the picture and sync output leads from their terminals on both chassis; remove tuning and channel selector knobs and unplug 5-pin power supply plug connecting receiver to main deck.

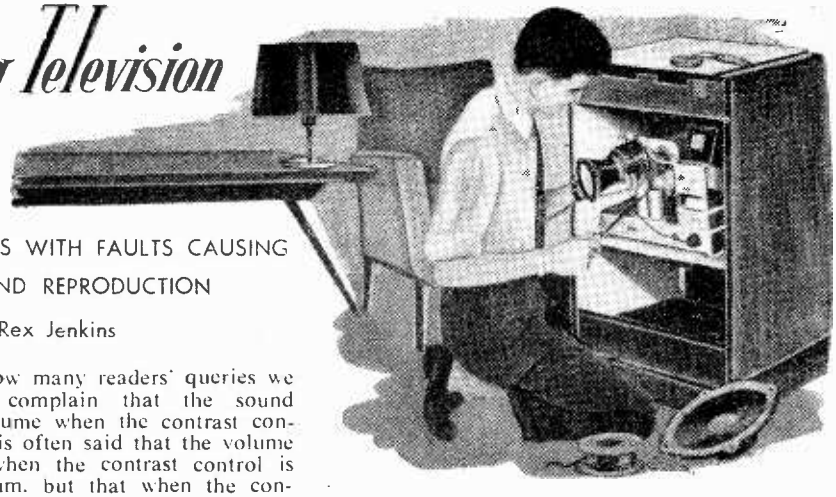
Remove aerial socket panel frnm rear of cabinet, the bonding strap between the two chassis and the flex lead connecting to the cabinet foil. Unscrew the two 2B.A. bolts securing the receiver unit to the cabinet.

(*Continued on page 198*)



Top view of the chassis.

Improving Television Sound



THIS ARTICLE DEALS WITH FAULTS CAUSING POOR SOUND REPRODUCTION

By Rex Jenkins

IT is surprising how many readers' queries we receive which complain that the sound decreases in volume when the contrast control is retarded. It is often said that the volume is quite adequate when the contrast control is approaching maximum, but that when the contrast is backed off to secure a reasonable picture the sound falls to too low a level and cannot be raised sufficiently by means of the volume control, which needs to be set at maximum.

First, let us establish that it is perfectly normal for the sound level to be affected when the contrast control is adjusted. The reason for this is that the contrast control serves really as an R.F./I.F. gain control and is associated with the valves that are common to both sound and vision as well as with one or two of the vision channel

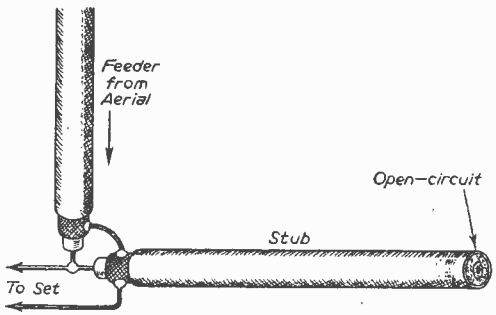


Fig. 1.—A simple stub which can serve to counter standing waves in the feeder due to mismatch. The feeders can be joined neatly together by using the Belling and Lee type L615 twin right-angle coaxial plug.

I.F. valves. Thus when the control is retarded, the gain of the common stages is reduced and this reduces the sound as well as the vision signal.

With recent model receivers, however, an efficient sound A.G.C. system is usually incorporated, so that the net volume from the loudspeaker is maintained reasonably constant even though the R.F./I.F. gain may be decreased. This may not be true if the set is working on a weak signal, for then a gain decrease may push back the I.F. signal to a level which is insufficient to produce a sound A.G.C. bias.

With sets which feature A.G.C. of the vision channel the same general principles still hold, but here the contrast control is associated with the A.G.C. amplifier, and as it is adjusted so the vision A.G.C. bias, which is produced by the vision signal, alters about a mean level, and this bias is applied to the common vision and sound valves as well as to the vision-only I.F. amplifiers.

With older receivers, as well as a contrast control there may also be a sensitivity control. Since this is arranged to control the gain of the first R.F. amplifier, which is carrying both the vision and sound signals, its adjustment will also affect the sound as well as the vision.

Poor Sound and Vision Balance

In cases where the sound volume is insufficient when the contrast is adjusted for optimum picture quality the trouble may lie in the aerial system and not in the receiver itself. As is well known, the aerial has to be fairly flatly tuned so that it will embrace with even response the 5 Mc/s spectrum of the required channel. There are various aerial designs, which account for the slightly different lengths of the elements between aerials of different makes. Some are tuned to give a slightly greater gain at the vision frequency, some are tuned to the geometrical centre of the band, while others may be tuned in favour of the sound frequency.

The trouble is aggravated considerably by using an aerial which is not designed for the channel to which the receiver is tuned. This not only gives a sloping response which is considerably below what is would be at the correct frequency, but it also promotes an impedance mismatch between the aerial and feeder. Standing waves thus occur on the feeder, and severe attenuation of the signal at a certain frequency within the band spectrum may result if the feeder happens to be of a critical length—and this, of course, may occur at the sound frequency.

If this trouble is suspected, a better balance can often be secured by reducing the length of the feeder at the receiver end by cutting off about 1in. at a time while testing the effect between cuts. If the sound is affected in this way, the volume will gradually increase to a maximum as the feeder length is reduced.

Another idea is to use a stub consisting of a

length of feeder in parallel with the main feeder (see Fig. 1). The stub should be about 70in. long on Band I and about 21in. on Band III, and should be cut, about 1in. at a time until the required balance is achieved. At a certain length the picture may deteriorate badly, as also the sound, but a compromise can often be found which gives the desired effect. Care should be taken to ensure that the stub remains open-circuit at the far end after each cut. The principle is that the reflections in the main cable due to the mismatch are cancelled out by the further reflections in the stub when it is properly balanced in terms of length. To avoid having to join the cables as shown in Fig. 1, the Belling & Lee type L.615 twin right-angle coaxial plug can be utilised.

Metal conductors and other aerials in proximity can also affect the tuning and impedance of an aerial and cause it to favour either the vision or sound signal at the expense of the other. Attic and indoor aerials are especially vulnerable in this respect, as also are aerials which are mounted with a host of others on a shared chimney stack.

Misalignment

As with the aerial, the tuning of the stages common to both sound and vision may emphasise the vision at the expense of the sound. It is often quite a simple matter, after attending to possible aerial troubles, to restore a good balance by adjusting the cores in the aerial and R.F. coils so that slightly greater amplification is given to the sound signals. This will, of course, reduce the picture, but then this can be brought back by advancing the contrast control and at the same time the sound will also be increased. Excellent balancing is possible by this means, as will be appreciated.

With sets featuring a turret or multi-channel tuner it is not always easy to get to the aerial and R.F. cores while the set is working. Here it is usually necessary to unclip the aerial coil and turn the appropriate core a turn or so and then try the set again after re-inserting the coil. This is purely a matter of trial and error to find which way the core needs to be adjusted to give the required effect.

One must never be tempted to adjust the trimmers associated with the R.F. and oscillator circuits which are present on the top of the tuner chassis, as this will throw the multi-channel alignment right out of balance. It is permissible, however, to adjust the I.F. coil or transformer on the unit, and this represents another effective method of obtaining sound and vision balance. It will be found that as the core is rotated in one direction the vision will increase, and that as it is rotated in the other direction the sound will increase. A compromise setting can easily be established.

If the sound is well below normal the trouble may be caused by misalignment of the sound I.F. channel. This can be checked quite simply by first ensuring that the local oscillator is adjusted for optimum vision quality and minimum sound-on-vision and then adjusting the cores in the sound I.F. transformers for maximum sound. Care should be taken not to disturb the sound rejector cores or the core associated with the sound pick-up coil as their correct adjustment is critical and calls for the use of a signal generator and video output meter.

Fig. 2 shows the skeleton circuit of a common stage and the sound I.F. stages. The sound signal is extracted from the anode circuit of the common stage and fed to the first sound I.F. amplifier valve through the coupling capacitor C1. The cores which would need to be adjusted in this case are L1, L2, L3 and L4. At this stage it is worth noting that value alteration or failure of C1 would reduce the sound signal applied to the sound I.F.s and also possibly detune L5.

There is also another angle to this problem of unbalance, and that is, if one of the damping resistors happens to go open-circuit, such as R1 and R2 in the diagram, the sensitivity of the vision

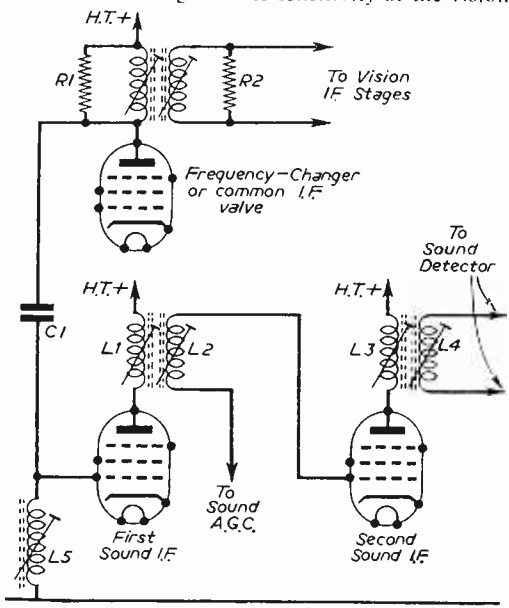
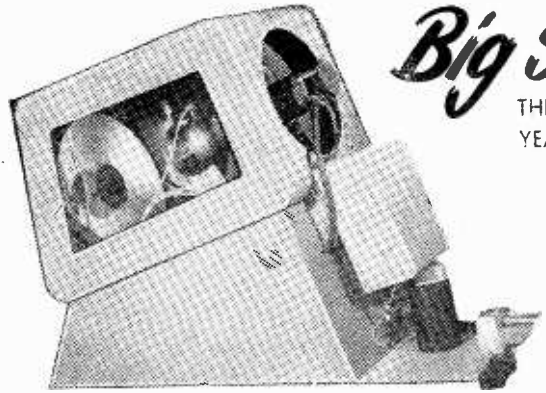


Fig. 2.—Skeleton circuit of a common stage and the sound I.F. stages.

channel would increase, and this would call for a decrease in contrast setting to avoid the picture being too black and white. This, then, would also mean that the sound signal would be attenuated and the sound volume may fall well below normal. With this trouble, however, the definition of the picture may be impaired due to the resistor failure narrowing the vision passband.

There are, of course, a host of other causes of poor sound which cannot adequately be dealt with in this article, but if the unbalance does not appear to be between the actual vision and sound R.F. or I.F. signals, attention should be directed to the sound detector and A.F. stages. Germanium crystal diodes serving as the sound detector and noise limiter should be investigated, as also should the A.F. and sound output valves.

The best way of proving whether or not the aerial is responsible is to check the set on a neighbour's aerial. This may save considerable time and avoid unnecessary work in the receiver.



The Cintel projector with side removed to show the cathode ray tube and mirror and correcting plate for projecting pictures on to a screen 40ft. away.

Big Screen T.V.: Will it C

THE AUTHOR TRACES BACK OVER THE PAST 30 YEARS THE VARIOUS TRENDS IN THE DEVELOPMENT OF LARGE SCREEN VIEWING

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

WHEN a bountiful science saw fit to accelerate the progress of TV developments so that it could dovetail its many benefits into the sphere of everyday life, it gave birth to countless arguments on what constituted a satisfactory-sized television picture for both public and domestic viewing. The advent of television took place in the prosperous cinema era, when, at a relatively low cost, the whole family could be entertained in comfort at the local picture theatre, and the yardstick for public television viewing became the large dimensioned cinema screen. This served as a challenge to those engaged in television's development apart from the domestic viewing, and the pace at which the required goal was achieved did credit to those who kept to this side of the industry's development.

Low Definition 30-line Period

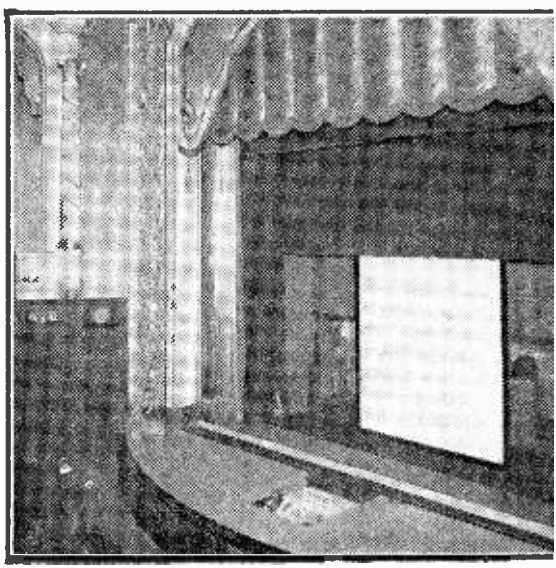
In the low definition 30-line period there were two companies who devoted considerable effort to this work—Scophony and Baird. The latter achieved a small measure of success with simple Kerr cells and neon tubes, but the first screen of any size to be seen by a large audience was the lamp screen shown in 1930 on the roof of the Baird laboratories in Long Acre, London. This was made up from 2,100 small metal-filament lamps, each housed in a cubicle, the whole having the appearance of an out-size honeycomb. The lamps were connected individually to a bar of a stationary circular commutator and this was swept with a contact arm which revolved at 750 r.p.m. thus giving 26,250 contacts every second. The incoming television signal was fed to the revolving contact after amplification, with the result that the degree of incandescence of each bulb was dependent on the degree of television signal modulation at that instant. The resultant mosaic of bright and dim lamps when viewed in this manner gave a picture of somewhat surprising brilliance within the limits of the low definition system then existing.

Prior to this, the American Telephone and Telegraph Company had, in 1927, shown a small screen built up from a continuous neon tube, the fluorescent areas of which were activated in sequence with the aid of a commutator. This was followed by the General Electric Company of America and Telefunken of Germany showing a spot-light projector. Since the metal-filament lamps had luminous inertia, however, the overall brightness of the picture was an improvement on these other methods, for persistence of illumination supplemented persistence of vision.

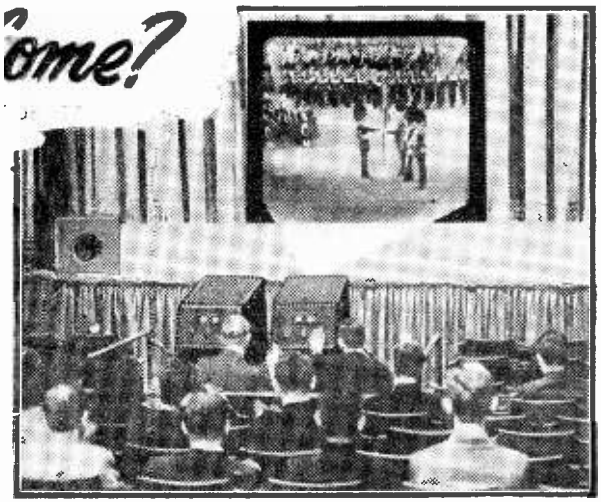
Then early in 1931 an arc lamp was adapted to permit of direct modulation by television signals and the resulting picture was built up with the aid of a large mirror drum scanner. Because an arc lamp formed the basis of this device, there was naturally an increase in the intrinsic brilliance of the resulting picture, but although *Nature* in its subsequent write-up of the demonstrations voiced an opinion that "the television arc would appear to have a useful future" this was not to be and its development was shelved in the light of subsequent research.

Three-zone Television

The summer of 1932 was, in its way, historic in the annals of big-screen television, for it saw the advent of three-zone television linked to that world-famous horse race—the Derby. For this ambitious experiment a caravan was used to

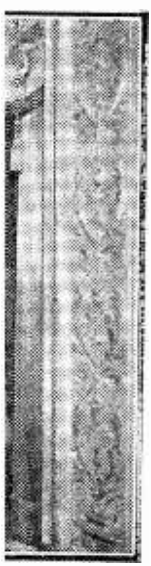


The television screen with the three-zone equipment seer



The early cathode ray tube projection equipment at the Tatler Cinema.

house the transmitting equipment on the Epsom Downs opposite the Grand Stand. It included a large mirror drum which, when revolved, reflected images of the scene on to a lens and thence to three separate photo-electric cells. The electrical signal output of each cell, after amplification, was fed into 25 miles of telephone cable linking up to the Metropole Cinema, London. The signals terminated at three separate grid cells which, in effect, were modifications of Kerr cells. The cells were built up from Nichol prisms and a glass container filled with nitrobenzine.* Changes in the refractive index of the fluid under the influence of electric potential stresses together with the prisms, alters the proportion of light passing through the combination. These cells, when placed in the beams from three arc lamps, modulated them and in conjunction with a mirror drum synchronised to that at the transmitting end, the television picture was back projected in three adjacent zones on a screen 10ft. wide × 8ft. high. This was the first time a television screen so large had been seen by a cinema audience, and in spite of the extreme difficulties of matching the three zones so that they phased side by side the finish of the Derby was seen clearly on the screen and two days later the experiment was repeated for the Oaks.

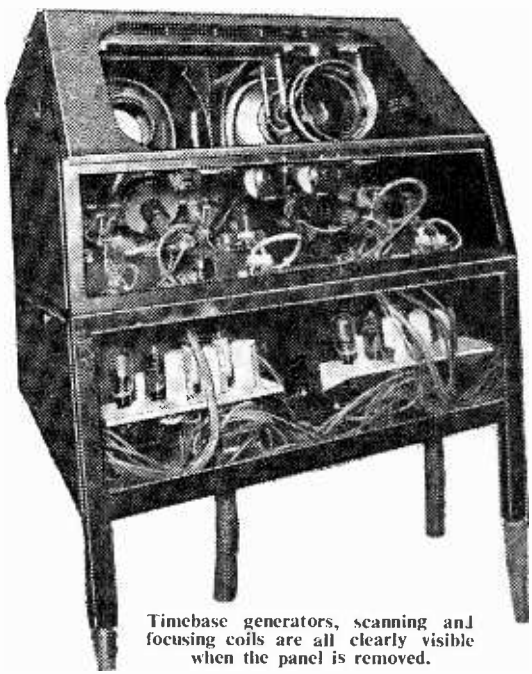


t the right.

Although multizone television was a big step forward, since with the three matched zones in juxtaposition it gave a 90-line definition picture from the 30-line standard vertically scanned, it still fell far short of the larger, good quality film pictures seen in the cinema. The novelty appeal would soon wear off and it was not until the advent of high definition television (the Marconi-E.M.I. standard of 405 lines was accepted for BBC use early in 1937) that interest was once more stimulated in this big-screen field.

Projection Tubes

With the concentration of effort on cathode ray tubes as the most suitable medium for reproducing the high quality television pictures then available, work was undertaken on projection types which had to be of a special character to provide pictures for screens approaching cinema size. One of the main deficiencies of projection tubes relates to the use of the beam of electrons as the source of energy to produce the light for the projected picture, while the efficiency of the phosphors used in the fluorescent screen has to be studied. High accelerating voltages are necessary and this in turn has its corollary in large line and frame deflecting voltages. In spite of this drawback, however, the Baird Company in 1938 installed dual projection units in the Tatler Cinema, London. These were quite compact as will be seen from the exploded line drawing, while the EHT units were accommodated in a remote position and suitably protected to meet the L.C.C. by-laws relating to fire risks. The projectors, side by side (one in use and one spare), were located in the front row of the stalls. Many successful demonstrations were given using the standard BBC television transmissions, the picture screen being 8ft. wide × 6ft. deep.



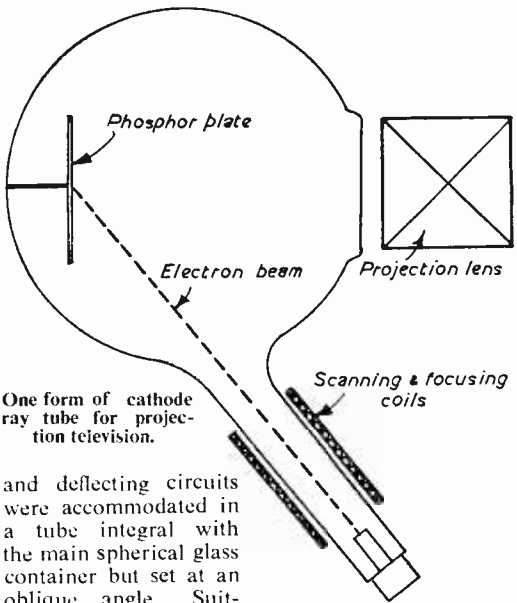
Timebase generators, scanning and focusing coils are all clearly visible when the panel is removed.

Phosphor Coating

At that time a good deal of research was being devoted to ways and means of improving

the efficiency of projection cathode ray tubes and one scheme which showed promise used a luminescent screen made up from an aluminium membrane having a suitable phosphor coating on one side. The uncoated side faced the beam of electrons, for it had been found that although thin aluminium was transparent to a beam of electrons it did not allow the ions to pass through. Thus the destructive effect of the ions on the luminescent screen was avoided, the membrane acted as a conductor of heat and improved the tube's performance, while by connecting the final anode of the tube to the membrane the space charge was dissipated. Tubes made up in this form were used quite successfully before the second world war, particularly on the Continent, and even over long periods diminution in the brilliance of the cinema-sized screen was hardly noticeable.

Yet another successful scheme took cognisance of the fact that the picture built up on the back of the phosphors used in a conventional form of projection tube lost a considerable amount of light from the absorption of the phosphors before the picture entered the optical system for ultimate projection on to the screen. A tube was therefore constructed whose shape resembled somewhat the glass envelope of the original iconoscope. A screen with its phosphor deposit was mounted inside this tube vertically opposite an optically flat glass window in front of which was the projection lens. The source of electrons, focusing and deflecting circuits were accommodated in a tube integral with the main spherical glass container but set at an oblique angle. Suitable electrical correction was made to counteract the effects of the angle at which the scanning of the fluorescent screen was undertaken and the result was a picture twice as bright as that produced when the phosphor screen was scanned from the rear.



One form of cathode ray tube for projection television.

The first projection unit using these cathode ray tubes was installed in a London cinema by the Baird Company and made its début on the occasion of the Boon-Danahar boxing match early in 1939. The rectangular shaped metal container was positioned in a small area towards the front of the stalls. Two tubes with their associated scanner circuits were mounted side by side so as to constitute two entirely separate projectors, capable of being faded in or out as required, to serve as one live and one standby. The EHT units were positioned in a remote screened room. All the controls (duplicated, of course) were mounted in a panel within easy reach of the operator, who sat in a low, partially screened enclosure. Specially designed projection lenses enabled the intensely brilliant pictures built up on the phosphor plate to be thrown on to a large screen on the cinema stage, the surface of the screen having been designed to give maximum light reflection to the whole of the seated audience. This equipment proved most effective and other London cinemas were similarly fitted out, but the advent of war called a premature halt to what promised to be an interesting addition to a cinema's overall programme.

Mechanical Projectors

Coincident with this original demonstration at the beginning of 1939, the Scophony Company, which had devoted considerable effort to developing big-screen pictures, installed its mechanical projectors in a London cinema a few doors away. This equipment produced excellent pictures, using as a light valve a cell whose liquid was subjected to the action of supersonic waves. The cell, with its light output controlled by the television voltage input in conjunction with the supersonic waves and a very high speed, mirror segmented line scanner, was capable of reproducing on a screen not a single picture element at a time, as in most other systems, but one complete picture line. This, together with a low-speed frame scanner, built up a complete television picture of considerable brilliance on a remote cinema-size screen. Similar equipment was installed in one or two other London cinemas and successful demonstrations given of BBC television pictures, but the war halted progress.

After the war, the Cintel Company designed apparatus using cathode ray tubes in conjunction with a Schmidt optical projection system for cinema-size television pictures.

It is well known that even very expensive lens systems are relatively inefficient from the point of view of the overall light intensity provided on the remote viewing screen when used in conjunction with the small light output from luminescent cathode ray tube screen phosphors. Because of this, recourse was made to a Schmidt lens which comprises a spherical reflecting mirror and a plate for correcting the spherical aberrations resulting from the use of a spherical mirror. This combination has several advantages over normal lenses, the foremost being simplicity and the absence of numerous free surfaces with the consequent elimination of reflection losses. The lens has a fixed unalterable focal length, however, but its overall efficiency is very much higher and since the lenses are costly, work has been undertaken on plastic lenses with a large aperture ratio.

Cintel Equipment

During 1940 the Radio Corporation of America showed, in that country, a picture 20ft. × 15ft. with a high-light peak brightness of 5ft./Lamberts using this method. The Cintel equipment using a Schmidt lens was first shown at a small cinema in a London suburb, and a larger version was demonstrated subsequently to a party of international delegates investigating the development of television in various countries in 1950. The screen size then was 20ft. × 16ft. and the pictures seen had a high-light brightness comparable to that of normal cinema film projection.

Technically the results achieved appear satisfactory so that any subsequent use would seem to be bound up in politics or the policy associated with viewing by a public paying audience. No such obstacle exists, however, when it comes to home viewing, but during the last year or two domestic projection sets have not achieved great popularity.

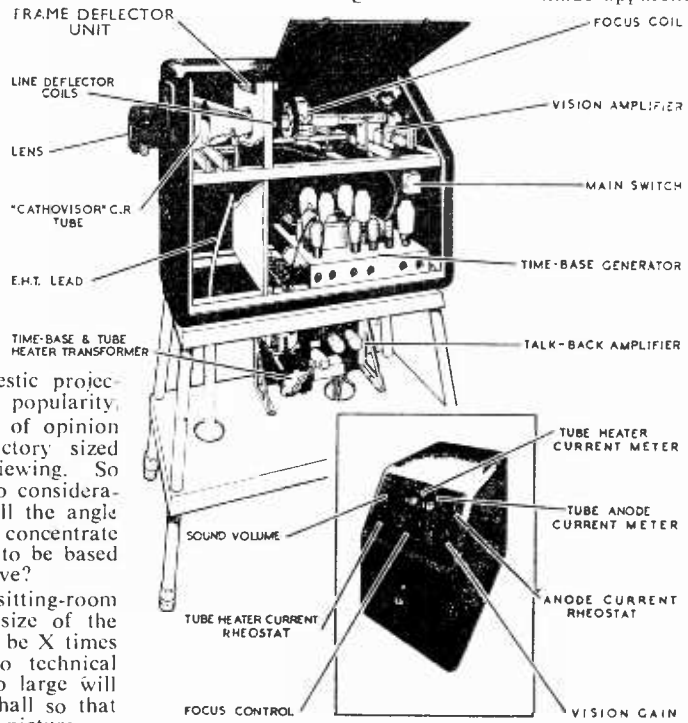
There seems to be a divergence of opinion as to what constitutes a satisfactory sized television picture for domestic viewing. So many factors have to be taken into consideration. Is the picture required to fill the angle of vision within which the eye can concentrate its attention, or is the picture size to be based on the attainment of true perspective?

The dimensions of the average sitting-room are all-important as well as the size of the family. Is the viewing distance to be X times the picture height to conform to technical standards and if the picture is too large will the set have to be located in the hall so that the scanning lines building up the picture are just not visible? Is it better to counteract the line structure by incorporating spot wobble as part of the receiver equipment? To the technically minded all these questions should be studied to achieve optimum results for home viewing, but in practice on many occasions the answer is dictated by how much the family can afford to pay for a set. It will also be found that the family just group themselves in comfortable positions round the fireside at distances from the screen to suit their own tastes and convenience.

Viewing Screen Separate

It was not very long ago that the 9in. and 12in. diameter tubes held sway, but these have now given way to 14in., 17in. and even 21in. with the picture reconstituted on the back of the tube's fluorescent screen and viewed from the front. To many, the idea of having the viewing screen separate and detached from the picture equipment is the correct one and here the projection tube would seem to be the only answer at the moment. A small 2in. to 3in. diameter tube with a Schmidt optical system of appropriate focal length is capable of giving pictures ranging in size from a 15in. to a 5ft. diagonal. If space has to be considered, the screen can be made integral with the receiver cabinet housing the set and in this case recourse is made to what is termed a folded version of the Schmidt optical system.

Fashions change and it is easy to conceive that research can provide some other method for television viewing. This has been made apparent in colour television where triple projection tubes have been used to give satisfactory pictures. No one at the moment can give a wholly satisfactory answer to the question "Whither big-screen television?" for public or domestic viewing, but this brief survey has shown that, over the last twenty years or so, many schemes have indicated their capabilities and shortcomings, and modern science is sure to fit others into this rapidly expanding electronic age.



Internal view of the projection receiver with external view inset.

Vision and Electronic Recording Apparatus

THREE-TRACK SYSTEM OF RECORDING

By J. B. Heavychurch

THE advent of the BBC's Vision and Electronic Recording Apparatus (VERA) has brought into sharp focus the whole question of the recording of high definition television signals which has remained almost dormant since the advent of the American Ampex Video-tape Recorder. The impact of the demonstrations of this latter machine given in 1956 were considerable when it is remembered that the video signals use maximum frequencies in terms of megacycles, whereas magnetic tape normally dealt with the kilocycles of audio for sound recording. Up-to-date details of the Ampex machine were given in the August issue of this journal following a demonstration given by Associated-Rediffusion Limited. Readers will recall that there were four recording heads and a relative writing velocity of tape to head of 1500in./sec., although the tape speed is only 15in./sec.

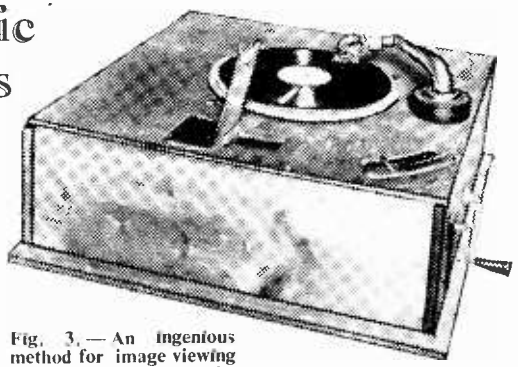


Fig. 3.—An ingenious method for image viewing from Phonovision records.

Sound and Video Signals

With Vera there is a three-track system of recording, one being employed for the sound signal and the other two for the video signal, band split to cover 0 to 100 kc/s and 100 kc/s to 3 Mc/s. This coupled with the recording tape speed of 200in./sec. is the basis of a machine which is hailed as an outstanding engineering achievement, both mechanically and electronically.

The commercial implications of these two television signal recorders emphasised the tremendous strides which have been made since Phonovision, as it was then called, was first

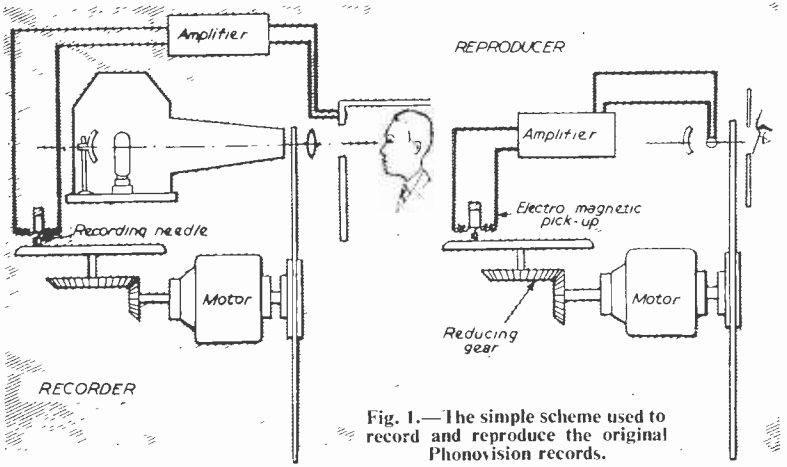


Fig. 1.—The simple scheme used to record and reproduce the original Phonovision records.

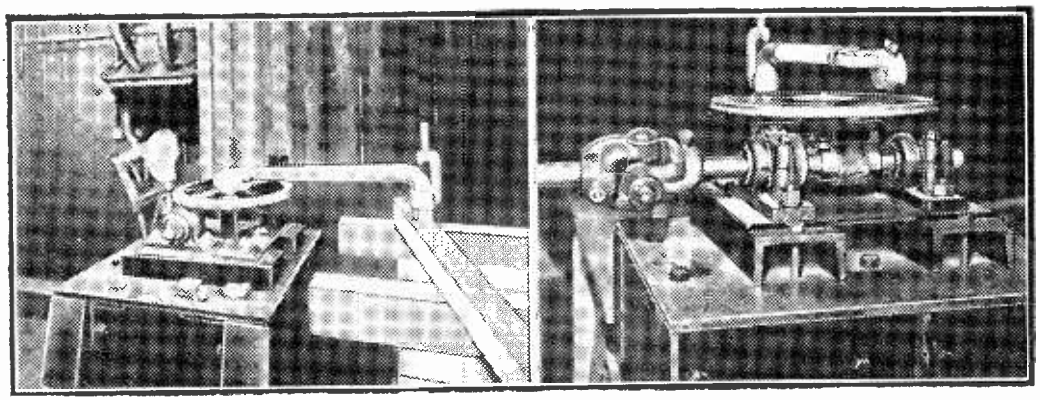
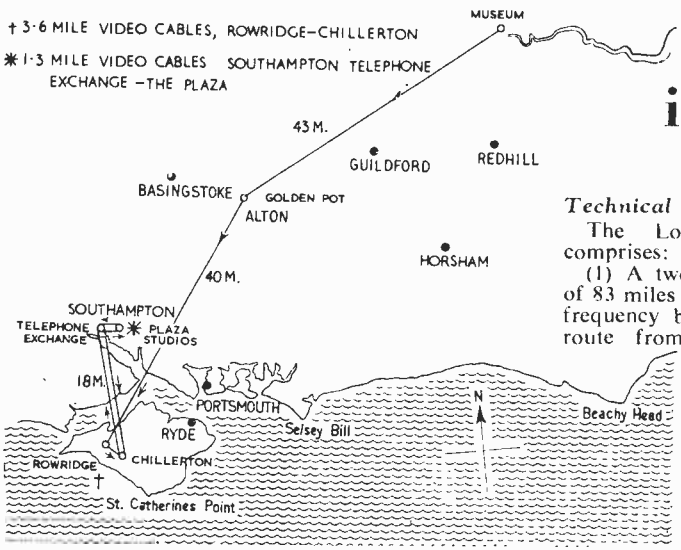


Fig. 2.—Making Phonovision records 30 years ago was almost a "heavy engineering" task, but was successful for low definition pictures.

demonstrated by Baird in the middle of 1928. The low definition system then used had a frequency range within the audio spectrum and it was, therefore, quite natural to record these frequencies on an ordinary gramophone record. The scheme is made clear in the diagram, Fig. 1. On the recording side the record turntable and scanning disc are driven from the same motor with the aid of reduction gearing and the electrical impulses proportional to the photoelectric signals derived from the scanning light pulses were passed to the recording needle. Two of the accompanying illustrations bring to light the "heavy engineering" side of this work for on one is seen the famous dummy's head Stookie, the photoelectric cells above it, the recording table and the large diameter shaft passing through the wooden partition to the main motor driving the scanning disc. The second illustration gives a clear impression of the worm drive and coupling all of which were clamped via metal channelling to a rigid table (see Fig. 2).

Reproducing Mechanism

On the right of the diagram is the reproducing mechanism where the pick-up on the record had its impulses amplified and fed to the neon lamp scanning disc viewing mechanism. One simple form of this was a record player mounted on top of a wooden case with the disc turning horizontally inside, the small picture being viewed in a mirror something like a periscope (see Fig. 3). It is understood that a few of these Phonovision records are still in existence—curios of a pioneering age.



Television in the South

NEW POST OFFICE LINK

WHEN Southern Television opened on August 30th, its programmes were carried to the I.T.A. transmitter at Chillerton Down, I.O.W., over a link provided and operated by the Post Office. This link is in two parts. One carries the I.T.A. national network programme from London to the Southern Television Plaza Studios at Southampton. The other carries the network programme, locally provided programmes and advertising material inserted at the Plaza Studios, to the I.T.A. transmitter at Chillerton Down.

The link is about 125 miles in length, most of which is provided by microwave radio relays. Short connections between Rowridge and Chillerton Down, and between Southampton Telephone Exchange and the Plaza Studios, use co-axial cables. Television signals are transmitted by radio from the Museum Telephone Exchange in London to Rowridge, I.O.W. A new 30ft. aerial has been erected on the roof of the Southampton Telephone Exchange for the radio link to Chillerton Down.

Technical Details

The London to Southampton system comprises:

(1) A two-hop microwave radio-relay link, of 83 miles length, operating in the 4,000 Mc/s frequency band and installed on the existing route from Museum Telephone Exchange, London, via a repeater station at Golden Pot, near Alton, Hants, to the receiving terminal situated in the BBC television broadcasting station at Rowridge, I.O.W.;

(2) A video link of 3½ miles on co-axial cable from Rowridge to the I.T.A. station at Chillerton Down;

(3) A single-hop microwave radio-relay link, of 18 miles length, operating in the 2,000 Mc/s frequency band, from the I.T.A. station at Chillerton Down to the Post Office Telephone Exchange in Southampton;

(4) A video link of 1½ miles length on co-axial cable from the Southampton Telephone Exchange to the Plaza Studio.

The Southampton to Chillerton Down system comprises:—

(1) A video link of 1½ miles length on co-axial cable from the Plaza Studio to Southampton Telephone Exchange;

(2) A single-hop 2,000 Mc/s microwave radio-relay link, of 18 miles length, from Southampton Exchange to Chillerton Down.

To guard against interruption of television signals by equipment failures during programme time, the equipment, with the exception of aerials, is duplicated throughout to provide two independent signal paths.

Radio Equipment

The 4.000 Mc/s radio equipment serving the Museum-Golden Pot-Rowridge link was designed, manufactured and installed by the Radio Experimental Branch of the Post Office Engineering Department. At each transmitter the video signal is arranged to frequency-modulate an intermediate frequency carrier of 60 Mc/s which in turn phase-modulates a travelling-wave valve driven by a 4.000 Mc/s carrier. A second travelling-wave valve further amplifies the microwave signal to produce an output power of about 1 watt. At each terminal receiver the microwave signal is translated to the 60 Mc/s intermediate frequency range by means of a crystal mixer. Amplification at this frequency is followed by demodulation to recover the video signal. At each repeater similar techniques are used except that the intermediate frequency signal, instead of being demodulated, is amplified and caused to remodulate the travelling-wave valve.

Microwave Carrier Frequency

The frequency of microwave carrier driving this valve differs by 72 Mc/s from that incoming to the repeater. Waveguide branching filters are used for combining the outputs of the transmitters and repeaters with those of the radio link provided on this route for the BBC. The inputs of the receivers and repeaters are combined in similar fashion. This enables the use of common aerials and aerial feeders for the I.T.A. and BBC links. The aerials are paraboloid dishes each of 10ft. diameter and with waveguide feeders. The aerial at Museum Exchange is 70ft. above roof level, at Golden Pot 200ft. to 300ft. above ground, at Rowridge 70ft. up the BBC mast.

The 2.000 Mc/s radio equipment serving the links between Chillerton Down and Southampton was provided and installed by the General Electric Company, Coventry, under Post Office contract. At each transmitter the video signal is arranged to frequency-modulate a 70 Mc/s intermediate frequency carrier which is amplified and then translated to 2,000 Mc/s by means of a triode valve mixer. Amplification at this frequency is by use of triode valves in two stages to produce an output power of about 2 watts. At each receiver the signal is translated to the 70 Mc/s intermediate frequency range by means of a crystal mixer; and, after amplification, is demodulated to obtain the video signal. Co-axial-type branching filters are used for combining the transmitter outputs at each station. The receiver inputs are combined in similar fashion. At each station two co-axial aerial feeders are used; the one serving the transmitters and the other the receivers. The 12ft. diameter paraboloid dish acts as a common aerial for transmitting and receiving. The feeders enter the launching units which illuminate the paraboloids so that the radio signals being sent and received at a station have orthogonal polarisation, thus avoiding interference between transmitters and receivers. The aerial at Southampton Exchange is 30ft. above roof level and that at Chillerton Down is 160ft. up the I.T.A. mast.

SERVICING TELEVISION RECEIVERS

(*Continued from page 189*)

Removal of Main Chassis

Disconnect scan coil leads from main deck, C.R.T. base socket and EHT lead. Remove volume and brightness knobs and unplug speaker leads from socket on side of cabinet. Remove lead from cabinet foil and disconnect bonding strip between chassis if this has not already been removed from R.F. unit. Remove the two 2 B.A. bolts securing chassis flange to cabinet.

Removal of C.R.T.

Remove chassis as above, place cabinet face downwards on soft surface and remove the *ion trap magnet* from the tube neck. Unscrew the two P.K. screws securing cross member to cabinet and remove complete with focus assembly. Slacken deflector coil assembly clamp (immediately above line form control TC3) and withdraw scan coil assembly. Unscrew all nuts securing front C.R.T. supporting strap to inside of cabinet and withdraw C.R.T. from cabinet complete with mask.

Useful Details

Valves.—Five ECL80, two EB91, two PCF80, two PCL83, two PY82, one ECC82, one ECC83, one EY51, one PCC84, one PL81, one PY81, two 39K1 (small metal rectifiers) used in discriminator—line sync circuit, two OA71 crystal diodes, one as a pulse limiter, the other as an interlace diode.

Fuses.—Two 500 mA. I.F. sound 38.15 Mc/s, vision 34.65 Mc/s.

Electrolytic Capacitors.—Two 2 mfd. 350v, 50 mfd. 25v, 100 mfd. 25v, 100 + 100 mfd. 275v, 200 mfd. 275v.

EHT Voltage.—13.5 kV approx.

Mains.—A.C. or D.C. 200-250v.

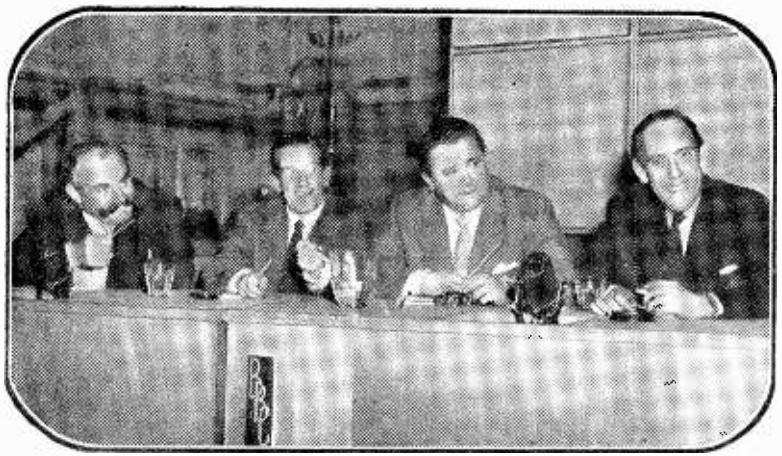
Controls.—Vis limiter, 100 KΩ; contrast, 1 MΩ; volume, 1 MΩ—brightness, 200 KΩ (combined); frame hold, 2 MΩ; height, 2MΩ; line hold, 1MΩ; width, 2KΩ.

(*To be continued*)

Widescan Television

A BBC EXPERIMENT IN ASPECT RATIO

By F. J. Camm



A comparison between the present aspect ratio of 4:3 and widescan 7:4.

THE BBC has recently undertaken experiments using a picture aspect ratio of 7:4 instead of the present 4:3, and the illustrations on this page show a comparison between the present and the proposed ratios. It must be stressed, however, that there is no possibility of any immediate change as far as the viewer is concerned; it is only a possibility of the distant future. *Do not therefore defer purchasing a new TV receiver in the mistaken belief that this change is imminent. It is not.*

More Detail

The experiments, however, demonstrate clearly that such a change is necessary when the industry is prepared for it, and that will not be for several years. You will see from the wider picture that much more detail can be incorporated. The movement and action in a television picture or cinematograph picture takes place more in a horizontal direction than in a vertical direction, and the increase in width proposed shows that much more detail can be given. Our present aspect ratio of 4:3 is based to some extent on the shape of the cinematograph picture, and of course on the shape of the TV tube. Mr. Richard Levin, the BBC head of design, who is responsible for the experiments believes that the aspect ratio of the TV picture should be related to the scene depicted and not to the shape of the tube.

More Pleasing Picture

There is very little upward movement in a television stage set. No doubt the idea germinated after wide-screen cinema pictures were introduced to the cinema. It is a logical development for TV. There can be no doubt that a more pleasing picture results from the new aspect ratio. It cuts out unwanted top detail and increases horizontal detail. In fact, it enlarges the area of the picture upon which the viewer concentrates. It also means less crowding of the actors, and for outside broadcasts it would be a vast improvement. It is also much easier on the eye to watch.

Making the Change

Sir Ian Jacob is entirely in favour of the change, but the first move must obviously come first from the industry and next from the public. It would mean a long-term policy so that the change could be made without disturbing the production lines, and I suggest that in order to spread the change over a period sufficient to enable the new system to be adopted without disturbing production the BBC should put out two programmes, one on the old system and one on the new, gradually fading out on the old.

No Technical Snags

There are few technical problems involved. Some system of masking existing receivers could be a temporary measure until the change over is complete. It is well known that the industry is in need of some new development to revive public interest.

However, design cannot be allowed to remain static and there have been no major improvements in design in TV since the introduction of EHT from the flyback, and the introduction of wide-angle tubes. Another point arises: is direct viewing to remain? Will projection TV be the eventual answer? The TV tube at present is cumbersome and looks wrong, and it is a fundamental of design that a thing which looks wrong is wrong. There can be no doubt, however, that once the public has viewed on the widescan idea they will not wish to return to the old.

BBC Television Translator

THIS EQUIPMENT CAN BE USED FOR AUTOMATIC OPERATION

THE BBC began transmitting programmes on July 14th. 1958. from a new type of low power television transmitter. known as a "translator," which is undergoing extended service trials at Folkestone. This town is typical of small populated areas which are within or adjacent to the service areas of the main BBC stations. but are prevented by surrounding hills from obtaining satisfactory reception.

Converts Sound and Vision Transmission Frequencies

A translator converts the sound and vision transmission frequencies from one channel to another without demodulation to audio and video frequencies. which occurs when a normal receiver and transmitter relay installation is employed. This simplification increases the reliability of the equipment which can therefore be arranged for automatic operation without attendant staff. Because the equipment is small it can conveniently be housed in weatherproof and insect-proof cabinets. thus dispensing with the need for a station building. The BBC utilises cabinets of existing design and special precautions have been taken to provide sufficient cooling. The power supply is included in the steel cabinets. so that the translator can work direct from the mains.

Location

The translator must be on high ground where good reception is possible from an existing station in the BBC network and from where its transmissions can be radiated over line-of-sight paths to the area to be served. In this way only a very low-power output is required. which therefore does not add to the already serious co-channel interference problem.

The receiving aerial system consists of a double 3-element array and the transmitting aerial has four tiers of single, folded dipoles.

Difficulties

If the sound and vision signals of a television system are amplitude modulated. difficulties are introduced if they share a common amplifier in the translator because of the greater possibility of intermodulation. These difficulties are eased in the systems such as those used on the Continent in which the sound signal is frequently modulated. It is hoped that these and other difficulties have now been overcome with the system developed by the BBC. Separate channels have been provided for the amplification of the sound and vision signals using common frequency-changing oscillators. The separate channel arrangement reduces the risk of intermodulation and enables separate automatic gain control to be employed to combat the effect of differential fading between the sound and vision signals. which could occur if a translator were dependent upon reception from a really remote BBC station. The automatic gain control voltages are also used to initiate an automatic changeover to reserve translator equipment should the normal unit become faulty.

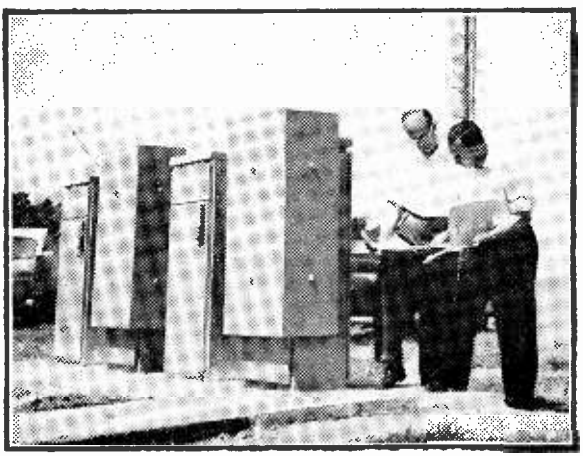
Spurious Signals

The double frequency-changing process facilitates the rejection of spurious signals and provides additional protection against "in band" feedback. The first frequency-changing process resembles that in a normal television receiver, producing vision and sound intermediate frequencies of 34.65 Mc/s and 38.15 Mc/s respectively. and the second frequency-changing stage produces vision and sound signal frequencies in the required channel.

Power Output

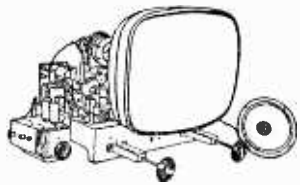
The Folkestone translator peak white vision power output is 1.5 watts and in conjunction with the type of transmitting aerial used gives an effective radiated power of 7 watts in the direction of maximum radiation. It is hoped that the installation of similar low-power translators which have been developed by the BBC's Designs Department will enable at least some of the small populated areas. in which satisfactory reception is difficult, to be given an improved television service. The illustration below shows the television translator equipment being installed at Folkestone in special weatherproof cabinets.

The BBC also intends to develop translators to extend the BBC's V.H.F. Sound Broadcasting Service to small areas which are prevented by intervening high ground from obtaining direct reception from the main stations.

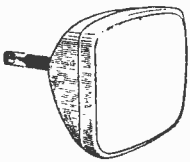


Showing engineers installing the equipment.

17in. T.V. CHASSIS, TUBE & SPEAKER, £19.19.6.



17in. Rectangular Tube on modified chassis. Supplied as single channel chassis covering B.B.C. channels 1-5, or incorporating Turret Tuner which can be added as an extra, at our special price to chassis purchasers 50/-, giving choice of any 2 channels (B.B.C. and I.T.A.). Extra channels can be supplied at 7/6 each. Chassis size 12in. x 14½in. x 11in. less valves. Similar chassis were used by well-known companies because of their stability and reliability. With tube and speaker, **£19.19.6.** With all valves, **£25.19.6.** Complete and working with Turret Tuner, **£28.9.6.** 12 months' guarantee on the tube, 3 months' guarantee on the valves and chassis. Ins. Carr. (incl. tube) 25/-.



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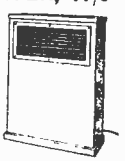
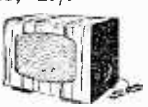


Start to prepare for Winter now. Draughty corners no longer necessary. Electric Convector Heaters will give you a steady comfortable heat. They can be used in any part of the house where there is a plug. Don't forget—luxurious warmth at an economical price. A.C./D.C. Switched for 1 or 2 kW. Illuminated grille. Size 26in. x 18in. x 7½in. deep. Ins. Carr. 10/6.

EXTENSION SPEAKERS, 29/9



Fitted with an 8in. P.M. Speaker W.B. or Goodmans of the highest quality. Standard matching to any receiver (2-5 ohms.). Switch and flex included. Unrepeatable at this price. Money back if not completely satisfied. Ins. Carr. 3/6.

8in. P.M. SPEAKERS, 8/9

Don't miss the football results just because you want to wipe up for the wife. Why not fit a speaker in the kitchen. She'll be pleased, too. 8in. P.M. Speakers, **8/9.** With O.P. Transformer fitted, **10/-.** 6½in. P.M. Speaker, **12/6.** Postage 2/9.

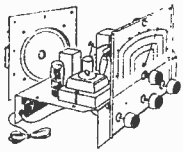
PLESSEY SOUND AND VISION STRIP, 25/6

Superhet. Tested. I.F.s 10.5 Mc/s sound. 15 Mc/s vision. 8 valve bases (6-6F1s and 2-6D2s not included). Size 8½in. x 5in. x 4½in. high. Post and packing 2/6. The Turret Tuner plugs directly into this chassis.

SOUND AND VISION STRIP. 10/6. Superhet. Complete vision strip. Less valves. Not tested. Drawings free. Postage 2/6.

CHASSIS, 1/- each, 6 or 8 valve. Latest type midget valve design for A.M. or F.M. Brand new cadmium plated. Size 12½in. x 7½in. x 2⅝in. Post 1/9, 4 for 4/-, Post 3/-. 12 for 10/-, Carr. 5/-.

SUPER CHASSIS, 99/6



5 valve superhet chassis including 8 in. P.M. speaker and valves. Four control knobs (tone, volume, tuning, w/change switch). Four w/bands with position for gram. P.U. and extension speaker, A.C. Ins. Carr. 5/6.

SOLO SOLDERING TOOL, 12/6

110 v. or 6 v. (special adaptor for 200/240 v., 10/- extra). Automatic solder feed, including a 20 ft. reel of Ersin 60/40 solder and spare parts. It is a tool for electronic soldering or car wiring. Revolutionary in design. Instantly ready for use and cannot burn. In light metal case with full instructions for use. Post 2/9.

AND NOW WE PROUDLY PRESENT SOME NEW LINES

RECORD CABINETS, £3.15.0

No more piles of records—bad for them and an eyesore to you. We are delighted to be able to offer this attractive record cabinet at such a remarkably low price. It is reed fronted and wood partitioned for easy classification and filing. It will take 200-300 records in an upright position. The overall size is 24in. x 24in. x 15in. and the legs are detachable if you so wish. The design is modern and it is space saving because it will serve a dual purpose being ideal also as a T.V., Radio or Record Player stand. Complete, sand papered finish, ready for staining, French polishing, painting, etc. Postage, packing and Ins., 5/-.

RECORD PLAYER CABINET, 39/6

Amazing offer. Latest contemporary style, rexine covered cabinet in two-tone colour scheme. Hinged, clipped lid, carrying handle. Space available for all modern amplifiers and auto changers, etc. Store soiled. Carr. and Ins. 4/6.

COLLARO 4-SPEED AUTO CHANGERS, £7.19.6. Type R.C.457 incorporating auto and manual control, complete with studio crystal p.u. and sapphire stylus. Post, packing and Ins. 5/6.

PORTABLE AMPLIFIER MARK D.I, 59/6. Brand new. Latest design with printed circuit. Dimensions 7in. x 2½in. x 5in. A.C. only. Mains isolated. 2-3 watts output. Incorporating EL84 high gain output valves. Volume and tone controls. Post and packing 3/6.

PORTABLE AMPLIFIER MARK D.4, 69/6. Brand new. By famous manufacturer. Especially built for portable record players. Dimensions 4½in. x 3½in. x 4in. A.C. only. 2 valves EL84 as high gain output valve. EZ80 as rectifier. Volume and tone controls. Post and packing 3/6.

STEREOPHONIC AMPLIFIER, £7.19.6. (12 months' guarantee). Beautifully made for portable stereophonic record players. Latest design with printed circuit. Dimensions 3in. x 5½in. x 9⅞in. A.C. only. Mains isolated. Each amplifier gives 3-4 watt output. Incorporating ECL82 triode pentode valves. Tone volume and balance controls. Complete and ready to fit. Knobs 3/6 per set extra. Post, packing and Ins. 4/6.

MAINS TRANSFORMERS, 15/9. 350-0-350 v. 250 mA., 6 v. at 5 amp., 4 v. at 4 amp., 22 v. at 6 amp., extra winding for 2 v. or 4 v. tubes. Primary 200-250 v. 50 cycles. Post and packing 3/9.

MAINS POWER TRANS., 12/9. 350-0-350 v. 250 mA., 6 v. heater at 5 amp. 4 v. at 5 amp., 4 v. centre tapped. Drop through type. Prim. 200-250 v. (4½in. x 5in. x 5in.). Post 3/9.

MAINS TRANS., 3/9. 350-0-350 v. 80 mA., 4 v., 4 v. heaters. 250-250 v. prim. Post 2/3.

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The Silver Jubilee Radio/TV Show

THE MARQUIS OF DONEGALL REVIEWS SOME OF THIS YEAR'S MODELS

"STEREO-CRAZY, just like back home!" That was the verdict of the American visitor I took to the 25th Radio and Television Show at Earls Court.

A slight exaggeration, one feels. True, audio equipment, for the first time, had a hall of its own on the first floor (second floor to my American!) and it was exhibited and demonstrated on many of the ground floor stands and in the demonstration rooms. This reflected the public's interest in the possibilities of 3D sound.

New Trends

As we go round the exhibits, certain trends in TV become apparent. For instance, there is a marked decrease in size, partly due to the increasing use of the 90 deg. wide-angle tube, replacing the 70 deg. tube. There is talk of a 110 deg. tube in the near future.

Further reduction in length from front-to-back is made possible in some cases by pushing the tube-face through the encircling mask. This also increases picture area and even more space is saved, in sets using printed wiring, by doing away with the conventional chassis and assembling "printed boards" round the neck of the tube. We see examples of these trends with Cossor, Philco and G.E.C.

In some cases, notably Marconiphone, H.M.V. and McMichael, the screen has been stuck right through the cabinet, to be contained in a projecting frame.

Reduction in the depth of the set sometimes means that the speaker is moved from the side to the front, an innovation permitted by a new speaker shape—only 2in. deep for a width of as much as 8in. Again, the bentwood cabinet remains popular owing to its bulk reducing qualities.

Another trend that strikes us is that the consolette (the spindly-leg type) is growing vertical speakers alongside the screen and shelves in the hitherto useless space between its legs (Philco, R.G.D.). Rolling doors are featured by Decca and H.M.V.

Portables

Last year there were many portable TV sets with 12in. and 14in. tubes. The drive towards smaller sets has produced a number of transportable sets with 17in. tubes. Clever chassis design, combined with very light fibre cases, has resulted in many of these transportable sets working on telescopic rod aerials (Sobell, McMichael, Ekco, Ferranti, Murphy, Ferguson, H.M.V., etc.).

At present, the 17in. tube remains the most popular size against the 21in. tube models offered by most manufacturers.

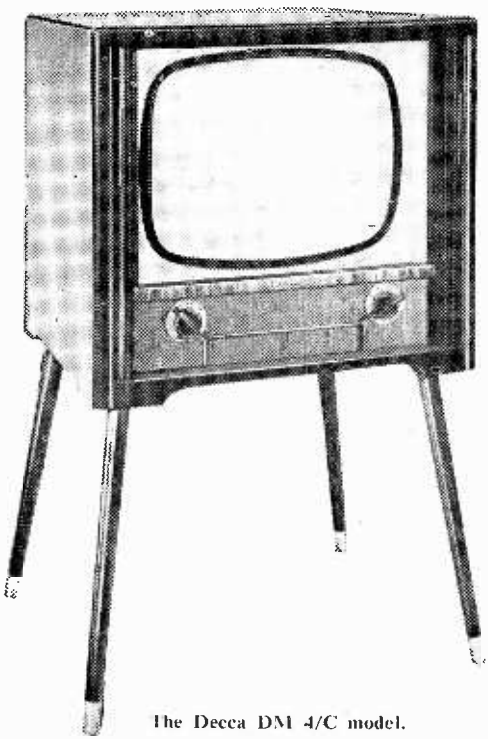
At the K.B. and Masteradio stands we see 24in. tubes, and the Valradio is the only projection set we can find in the show. (Incidentally, my old Decca projection set with 4ft. × 3ft. screen is still inducing: "Say, is that home movies?" from American visitors who have never heard of projection TV.)

TV Plus V.H.F.

The increasing incorporation of V.H.F. radio into TV sets strikes us all the way round the exhibition. To take one example, we see the new Bush 77 at 80 guineas. This is a 17in. set incorporating a separate V.H.F. set. At 84 to 89 guineas the Decca DM 4/C 17in. provides V.H.F./F.M., in five wood finishes and black and white. Somewhat cheaper 17in. sets with V.H.F. are the Ultra at 72 guineas and the R.G.D. "Deep Seventeen" at 67 guineas plus 2 guineas extra for its legs. Its brother, with 21in. tube, V.H.F./F.M., front-facing speaker, costs, with legs, 101 guineas or 103 guineas with a table.

Push-button TV is introduced to us by Bush. By way of demonstration, this 14in. transportable switched from BBC to I.T.A. 20,000 times during the show. (Let's hope that is more times than it will take for little Johnny to get tired of jumping it from one channel to the other!)

The mechanism caters for all 13 channels with only 4 push-buttons.



The Decca DM 4/C model.

We pause to admire the 185 guineas Pam. This is a late arrival. Pam's previous most expensive set being the 521 CF at 116 guineas which is a 21in. set. The newcomer is a console contain-

ing 21in. TV, a 10-valve, four waveband A.M./V.H.F. radiogram with provision for stereo records.

Automatic Assembly

We have already noted that printed wiring has the effect of reducing bulk. The next visible step has been fully automatic assembly and soldering of printed panels (Ferguson).

Some firms are using special "plated" panels on hinges, to make parts readily accessible (McMichael, Sobell). Philco uses handy screw fixings for the panels.

As we know, a large proportion of faults occurs in the main panels. Alba have had the excellent idea of developing these into plug-in units. No testing; all you do is plug in a replacement and return the faulty panel to the factory.

Considerable improvement in picture quality results from research in circuitry. Ultra certainly achieve unusual vertical precision with the new Model 17, already mentioned. Direct synchronising is coming in again.

Reduced Prices

New constructional methods are having the effect of reducing prices. We noticed this everywhere at the show. Last year, the average price of a 17in. table model was about 69 guineas. This year, several are priced at 65-66 guineas, and the Cossor is even more competitive at 63 guineas.

A 14in. table model seems to average 56 guineas, as opposed to 59 guineas a year ago.

A word about the BBC and I.T.A. activities at the show. Our old friend Cecil Madden, the BBC television pioneer who produced the first high-definition TV programme, "Here's Looking at You!" at Alexandra Palace in August, 1936, was once again in charge of the BBC's celebrity dais.

Altogether invitations were sent out to 400 stars to appear, which means a different star made a personal appearance every ten minutes.

At Independent Television's Wonderland seven halls were devoted to different aspects of Independent Television. For instance, in the Quiz Hall we saw exhibits from the Panel Games. Then there was the Display Hall with a studio set of "Emergency Ward 10," from which we emerge into the Hall of Music. The Wild West Hall was a small boy's paradise and the Hall of Personalities even included seeing ourselves on a monitoring screen.

Stereo Record Players

It would not be right for us to leave the Radio Show without a mention of stereo, although at present the subject has little to do with television as such. Stereo models are to be seen on the stands of nearly every firm.

Complete stereo radiograms are to be seen with speakers on left and right of a broad console and either built-in or arranged so that one or both can be moved away.

The slide-out form of speaker-housing is sometimes combined with a full width sideboard top (Hobday, Hobart). In others the style of speaker-housing can be selected by the customer (Ferguson).

Most stereo radiograms are of the two-unit type (Decca, E.M.I., and R.G.D.). The medium priced models usually have a fairly compact extension speaker (Decca, Ferguson, H.M.V., Invicta, Pam and Regentone).

Of the rest, the majority are "wired for stereo"; —a plug-in stereo head and additional amplifier/loudspeaker unit can be bought at some future time (Alba, Bush, Dynatron, Ekco, Ferranti, H.M.V., Masteradio and Philips).

In stereo gramophones, as distinct from radiograms, there are many models of both portable and "cabinet" types and the two types merge in some models. Between the portable player in plastic covering, with detachable extension speaker (or speakers) and the polished wood model in consolette or coffee-table style with matching extension speaker or speakers, there are consolette models in fabric finishes (Margolin, Pilot). One, having fold-away legs, is both portable and "permanent"! (Fidelity).

Stereo models are to be seen on the stands of nearly every set maker and, certainly, among every display by firms specialising in hi-fi and/or electric gramophones. As an indication of the enthusiasm with which firms are taking up the new system, one specialist in record producers (E.A.R.) is introducing stereo versions of practically every model in its range—no fewer than seven players and three amplifiers. The price range is typical of competitive levels throughout the show—stereo players at from 20 guineas for a single non-auto portable to 65 guineas for a compact console model; amplifiers at from 10 to 30 guineas.

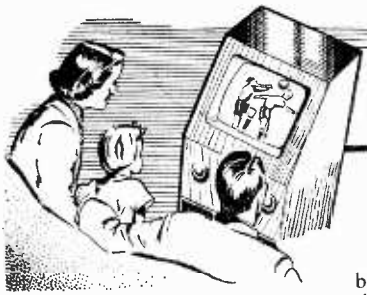
It seems that stereo discs have increased interest in, rather than competed with, stereo tape records. Most of the stereo pre-amplifier units introduced for linking stereo pickups to their two amplifiers also allow for the connection of the twin magnetic heads of stereo tape players (Beam-Echo, S.T.D.). Many tape decks available for fitting into hi-fi installations make provision for the fitting of stereo heads (Brenell, Truvox).

Tape Recorders

In general, the tape recorders at the show offer improved value and also greater economy by giving acceptable quality at low tape speeds, even down to $1\frac{7}{8}$in./sec. (R.G.D.). The machines in the 45-55 guineas bracket provide several facilities hitherto reserved for *de luxe* models, facilities that go to make the recorder a very comprehensive and versatile instrument for those seriously interested in music and sound (Magnafon).

Not the least of developments in tape recorders is the coming of very neat little models at prices hitherto considered impossible. The least expensive is 26 guineas and another is 29 guineas (Walter, Tape Recorders (Electronic)).

We may well conclude our visit to the Silver Jubilee Radio and Television Exhibition with the last sentence of Lord Brabazon's opening speech: "We have developed Eurovision, and it is interesting to note that 98 per cent. of our population is covered by television—a remarkable feat. Then, in the future, there must come coloured and stereoscopic television."



UNDERNEATH THE DIPOLE

A MONTHLY COMMENTARY

By Iconos

Picture and Sound Variations

WHAT a wide variety of picture and sound qualities we see and hear during the course of an evening's viewing! In spite of all the checking and testing on closed circuits that goes on prior to transmission, these variations in quality persist and cannot be entirely ascribed to the individual tastes of the studio lighting and sound technicians. Such variations are naturally greater on the I.T.A. transmissions, especially when successive programmes originate from different programme contractors' studios. But they are also noticeable to some extent on the BBC transmissions.

"Cutting Through"

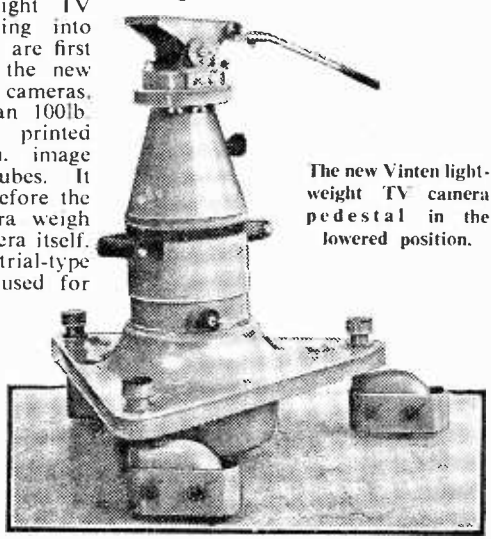
IT is a fact the the top technical policies of the many television organisations in this country are not identical. The main objective of most of the I.T.A. programme companies' chief engineers is to secure a reasonable reproduction on the largest possible number of receivers, including those viewed in clubs, pubs and homes with fully lighted rooms, and on sets which are badly out of adjustment. In order to carry out this aim, their first consideration is for a picture which is extremely sharp and hard, and which, in my opinion, often has a "soot and whitewash" effect when viewed in total darkness or in a dim room light. On the other hand, I admit that a carefully graded picture possessing all the delicate gradations essential for good portraiture, good skin texture in close-ups and good modelling, fails to "cut through" under bad viewing conditions. Some of the best quality pictures come from the BBC, particularly in the plays from Lime Grove. But these pictures are seen at their best only when the lights are lowered. I tried a few experiments at home with room lighting during the transmission of *Green Pastures*, a fine BBC play from Studios D and H at Lime Grove, which was especially notable for its magnificent photographic quality. However, with the room lights fully up, the picture looked rather woolly and soft. With the set thrown slightly out of adjustment, it looked worse. But with all the room lights out (excepting one), the picture was absolutely superb. *Green Pastures* was followed by the International Ballet from Riverside Studios, also a fine technical job, but rather harsher in tonal values. But the pictures of the ballet fared better when subjected to the poorer viewing conditions.

Lightweight TV Cameras

AT long last the much talked about lightweight TV cameras are coming into service. The BBC are first in the field with the new Marconi Mark IV cameras, which are less than 100lb in weight, with printed circuits and 4½in. image orthicon camera tubes. It will not be long before the lenses on a camera weigh more than the camera itself. Already the industrial-type Vidicon cameras, used for captions and clocks, are being used in announcers' and "presentation" studios. For such very lightweight cameras, costing about £450 each—compared with the £3,500 for an image orthicon camera—new lightweight camera pedestals will be required. It somehow does not seem to make sense to spend £2,000 or more on a heavy mounting to carry a camera about a quarter its value and about one-tenth its weight. The firm of Vinten, which specialises in all kinds of motion picture and television camera mountings, is well aware of this point of view and will be supplying the BBC and other TV programme organisations all over the world with a new type of lightweight pedestal of highly ingenious and revolutionary design.

Minority Opinion

THIS is a problem similar to that which film studio technicians have had for years. With lighting, photography, developing and printing adjusted to give the best effect at cinemas fitted with the latest projection equipment, the results at older cinemas are often disappointing, both for sight and sound. What is the



The new Vinten lightweight TV camera pedestal in the lowered position.

answer to this problem, so far as TV is concerned? My own inclination is to obtain the best possible results on reasonably modern TV receivers under good viewing conditions, and not to bother too much about the bad sets. But in writing this opinion, I am well aware that I am stating a minority choice.

Old TV Sets Persist

THE increasingly slow rate at which BBC-only sets in the London and Midlands ITV areas are converted or adapted to receive ITV programmes, is explained by the results of a March survey conducted in these areas by Television Audience Measurement Limited. Of the 595,000 BBC-only sets in the London area at the time of the survey, no fewer than 371,000 (62 per cent.) were unsuitable for modification to receive ITV programmes. In the Midlands a further 114,000 BBC-only sets—29 per cent. of all BBC-only sets in the area—were found to be unsuitable.

Southern Television

SOUTHERN TELEVISION has tackled in a big way the stiff task of attracting the attention of about 25 million potential viewers in its area. This compares with about 13 millions served jointly by Associated Rediffusion and A-TV through the Croydon transmitter, whose service area Southern overlaps in several "fringe" places. As with T.W.W. and Scottish Television, it is compensated to some extent by having a full seven-day operation. To ensure a good send-off and a large viewing public from the very start, an impressive publicity campaign was launched, costing about £50,000. This money was spent upon exhibitions, posters, press advertising and tie-ups with radio dealers in all parts of the area. Judging by the large number of bright new Channel 11 aerials in the district, I would guess that this investment paid off handsomely. Not many months before the opening of the station, Roy Rich decided not only to put out his full 15 per cent. or more quota of locally originated programmes of a high standard, but to send back to the I.T.A. network a weekly serial, *Mary Britten, M.D.* and a large number of outside broadcasts of sporting events. It is not easy for the smaller I.T.A. companies to break into the network. In any case, the G.P.O. return-network lines or microwave links hired on an annual basis are a very large additional expense. No doubt the Tyne-Tees and the East Anglia companies, who start operating in a few months' time, will watch Southern's bold policy with considerable interest. The opening show, *Southern Rhapsody*, a spectacular, was an ambitious start, which nearly came to grief in the first few minutes when one of the camera pedestals ran over the cable of another camera. That accounted for a poor picture on one of the cameras for a short time. These openings are a stiff trial for artistes, producers and technicians alike, who are naturally somewhat far from relaxed. But on the whole, I think it was one of the most successful station openings, which certainly put the Southampton studio well on the I.T.A. map.

Regional Progress

I DOUBT whether any of the I.T.A. areas remaining unallocated will produce large enough revenues to support such a large staff and extensive studio and equipment facilities as at Southern Television. It was considered to be extremely good in I.T.A. programme company board-rooms if there was an annual return of £1 per head of population served, by way of gross revenue from advertising "slots" and magazines. Some of the I.T.A. companies have managed to exceed this amount during the past year, which accounts for the prosperous atmosphere which surrounds those companies which operate in London and Manchester areas. Scotland and Wales have lagged behind a little, but are fast catching up, and in any case were not faced with the huge financial losses that were sustained in the first year or so by AR-TV and A-TV. The BBC, too, have benefited by the tremendous increase in television licences, and have put on strong competitive programmes. Some of the best of these are missed by viewers who won't be bothered to switch over or retune to the opposition programme. A great many sets have not been installed by the retailer in a manner which can give equally good reception from more than one station. Recently, I heard a dealer in a shop near Aldershot discourage a customer from tuning to Southern. "It's pretty well the same as from London, anyway," he said. That customer was on high ground and received a very strong signal from Croydon I.T.A. on an elaborate aerial. He could have received Croydon equally well on a new, simpler aerial and twisted his existing Channel 9 aerial towards the Isle of Wight transmitter, leaving his BBC aerial in its present position.

CORRESPONDENCE

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

SERVICE DATA

SIR.—I was pleasantly surprised to read in your September issue correspondence that a reader had been assisted with technical queries by Messrs. Marconi, as my similar request to their sister organisation produced only a mimeographed refusal, indicating in addition that I should take the set to a dealer.

On reflection, I cannot understand why any manufacturer should refuse information. The amount of servicing work lost to the trade thereby is surely but a drop in the ocean, as only a very limited number of interested amateurs possess the costly sets of spare valves and components necessary for substitution tests on sets; such tests being, I imagine, the backbone of most television servicing.—F. TURNER (Manchester).

FAULT WITH THE T141

SIR.—Many thanks for your assistance re my Ekco T141. I fitted a new sync separator screen decoupling condenser as you suggested, and it has cured my trouble.

Some time ago I wrote E. K. Cole Ltd. asking for service information and I received the same childish reply as your reader C. B. C. (August issue).

Surely when one has an article—whether it is TV, motor car, or anything, in fact—one is entitled to seek information from the makers. Usually it is freely given.—W. CONNER (Altrincham).

BAIRD P167 RECEIVER

SIR.—Many thanks for your assistance in identifying the receiver and guidance in using an alternative C.R.T.

The results obtained being extremely satisfying the following may assist others who may desire to improve this receiver.

CRM123 was replaced by Mullard MW31-74 and an ion trap magnet and 6.3v. transformer was obtained to begin the changeover. However, A1 of C.R.T. supply was obtained from H.T. line at junction of choke and reservoir condenser but result was a coarse badly focused picture. The correct type of focus assembly was obtained which improved matters slightly—it was then observed that slight movement of the tube caused the focus to appear sharper and subsequently a firmer contact between C.R.T. envelope and chassis by means of a spring clip, was made. Further experiment showed that complete focus and improved picture could be obtained by connecting a 120 KΩ resistor from pin 12 C.R.T. (heater) to chassis.

One caution appears to be necessary—the scan coils can easily be disturbed by handling, these being rather loosely wound and trapezium distortion becomes apparent. The turns are easily bent whilst being fitted and considerable trouble can be experienced due to careless handling which, however, can be rectified with a little care and the addition of adhesive tape.—G. SHAW (Chiswick).

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.

ITV IN DIFFICULT AREAS

SIR.—Mr. B. L. Morley in his numerous articles in PRACTICAL TELEVISION has been of great help and interest to me. I wish to point out, however, that in my opinion the leads to a pair of phones connected to the speech coil of the loudspeaker may be at mains voltage if one is connected to the chassis and the chassis is connected to the line side of the mains (see paragraph 5 on page 13, PRACTICAL TELEVISION, August, 1958).

I suggest using isolating condensers about 0.005 mfd. on the leads and those of good insulation test also, as a precaution when working on a roof. The insulation between speech coil and chassis is very small sometimes.—J. L. BENT (Dublin).

[*Author's comments.—This is a point which is worth bearing in mind, particularly with the prevalent use of "D.C." method of working.*

It is considered that 0.005 *mfd. condensers are a bit on the low side. A more suitable value would be between* 0.01 *and* 0.05. *The condensers, should, of course, be fitted at the televisor end.*]

INVICTA 126

SIR.—As a radio and television dealer, I have at many times gained information from "Your Problems Solved" and I would like to give you a tip for the Invicta 126.

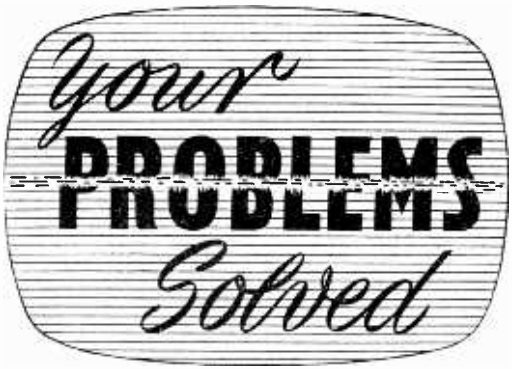
Mr. Kingham (Peterborough) has enquired, in the October issue, about picture break up after the set has become hot. This is not line trouble but a fault in the video stage. The faulty components are between V5 and V13: the Q of coil L6 decreases and the capacity of C24 and C23 becomes low. If the coil is rewound on a bakelite former, and the two waxed condensers are replaced by ceramic condensers (having a negative temperature co-efficient), the fault will be cured.—W. D. (Essex).

"YOUR PROBLEMS SOLVED"

SIR.—I would like to support your correspondents who suggest that "Your Problems Solved" should be published in book form.

Perhaps S. T. (Ipswich, will tell me how to cut these out and paste them in a book as my problem is what to do with the answers on the reverse side of the page.—K. MUIR (Anerley).

[*The reader merely pastes the margins, so that the pages can be turned.*—ED.]



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. 215 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

DECCA D17

I receive Channel 5, but would also like Channel 10. Welsh I.T.A.

Could you advise me what type converter to buy as I am given to understand the converters advertised in the "Practical Television" might not suit—W. J. Morse (Swansea).

We would advise you to obtain and fit a Brayhead 10s (5/10) tuner unit with B9a R.F. plug and 10BA1 adaptor. Full fitting instructions are supplied.

REGENTONE 143/T

Will you give me the correct details of tube-changing for my set as above?—W. Smith (Mon.).

To remove the C.R.T., remove the base socket, ion trap magnet and EHT connection. Release the front fixing band and withdraw the C.R.T. forwards through the focus magnet and scanning coils, taking care not to damage the latter, easing them off the tube neck. Take care to replace rings and rubber bands in the order in which they were removed. Do not expect to pull the tube neck through. It is to be eased a little at a time. When replacing, observe the same precautions. Adjust the ion trap to obtain maximum brilliance.

PHILIPS 17480

I have purchased a Brayhead Turret Tuner, to convert my set to I.T.A.

My problem is that I am unable to get a picture either on BBC or ITV although the sound is very good. I have tried two different aerials, and altering the spacing of the wire on the oscillator coil on the unit.

The vision I.F.s of both sets differ by 2 mc/s. the Philips is 12 mc/s. and Brayhead is 14 mc/s.—E. G. Sullivan (Leeds, 16).

When using a Brayhead turret tuner unit with a Philips 1748u, and where the signal strength is not too good, it is always necessary to tune the oscillator coil of the converter to obtain maximum sound and then tune the I.F. output core (on top of the tuner) to obtain optimum sound and vision. Then tune the adaptor (if used) coil core similarly. We have fitted several of these tuners to Philips receivers in the 1748u range and once the above trimming has been carried out no difficulty has been experienced.

BANNER D436

The width control has little effect and brings the width of the picture up to about two-thirds full size. When the horizontal hold control (which was faulty and has now been replaced) is turned back, the picture increases to full width but completely breaks up, or alternatively it is possible to obtain a picture with several images spaced at approximately 3in. apart.

The following have been tested or replaced: EY51, PY81 and PL8. In addition to the above, sound on vision is apparent with loud notes, and advancing the contrast control increases volume. The ECL80s and EF80s have been changed round in the set with no apparent results.—J. E. Sutcliffe (Leeds).

The Banner receiver referred to is directly equivalent to the Sobell T277. A service sheet for this receiver or the T144, T174, T274, etc., will apply. You should have no difficulty in obtaining one of these from one of our advertisers. Referring to the lack of width, check the ECL80 100 KΩ and 330 KΩ resistors (pin L to H.T.). Then check the PL81 3.3 KΩ screen dropping resistor (pin 8) and cathode capacitor of 50 mfd. pin 3. The trimmer on the scanning coils is the balancing capacitor intended to eliminate any left side strips on the picture. The trimmer under the front of the chassis is the vertical (frame) linearity control.

INVICTA MODEL 137

The picture is good, but thick wavy lines or thin straight lines appear horizontally across the screen frequently. At other times the set works well for an hour. I can cure this by controlling the horizontal hold, but this entails constant adjustment.—D. Goulding (Whitby).

We would advise you to replace the PCF80 valve mounted on the rear centre of the chassis. This is the line timebase oscillator and is often responsible for the fault described.

PHILIPS PROJECTION 1700A

When I turn the contrast control the picture goes very bright and enlarges, then drops back to normal. This only occurs when the contrast control is turned up or increased. I have circuit of the 704 and 1800A; does this apply to the above? What is wrong, and where do I look for the trouble?—A. Reeves (Winchmore Hill, N.21).

The circuit for the 704 and 1800A applies to the 1700A. We do not know which circuit you have to hand and thus cannot quote circuit references with confidence. The negative voltage for the contrast circuit is derived from the H.T. negative return. The final resistor in this chain often changes value. It should be 2.2 KΩ. It is

(Continued on page 215)

the rearmost of a group of four under the rear centre of the chassis. Check this resistor, the contrast control itself and the resistors connected to either end.

FERGUSON MODEL 968T

A black band creeps up the picture from the bottom. It extends for about ¾in. The rest of the picture is perfect. Also, could you please tell me which is the sound output valve?—G. J. Chipp (High Wycombe).

For the frame fault replace the ECL80 (V13), which is situated in the far left-hand corner of the chassis when viewing from the rear of the cabinet. The sound amplifier (output) valve is the ECL80 situated in the near right-hand corner of the chassis.

PETO SCOTT 1712T

The picture is showing a white line about ¼in. wide on the right-hand side of all black objects. The effect on test card C is a similar white line at the right-hand side of the vertical black bar on a white background. I am told that this fault is known as "overshoot" or "ringing" and I should be grateful if you would confirm this and offer any assistance regarding its cure. —H Hewitt (Chester).

This trouble may be promoted by misalignment of the vision I.F. channel or by an aerial mismatch and accompanying low signal. A certain degree of overshoot is purposely introduced to "liven" the picture, but you will probably find that a better balance can be obtained by carefully adjusting the final vision I.F. transformer. There is also a possibility that a component associated with the video amplifier has altered slightly in value.

R.G.D. "DEEP SEVENTEEN"

I have had to replace the EHT rectifier EY51 four times within the 12 months I have had the set.—W. T. H. (Ipswich).

Check that the mains selector is adjusted to suit the mains supply voltage. A tolerance error in the line output transformer may aggravate the trouble, but in this case can be overcome by connecting a 10 ohm resistor in series with the EY51 heater. Take care in connecting and placement to avoid corona.

SOBELL TS17

I have fitted "Channel 10" coils for ITV reception and tried a "double nine" aerial. The sound has been excellent but no vision, even though low loss cable has been fitted. My set has been connected to a neighbour's aerial who receives good vision but again with the same result.—M. Thomas (Neath).

Since BBC reception and the I.T.A. sound are satisfactory, it is unlikely that the set is at fault, though there is a possibility of a fault or misalignment of the Channel 10 coils. If this is suspected the coils should be returned for a replacement set. The signal may, however, be too low for your model, which would account for your neighbour receiving a Channel 10 picture if his is a more sensitive model.

ENGLISH ELECTRIC 16T18F

One evening the picture quite rapidly got smaller and disappeared. The 10 kc/s whistle is still audible. I haven't had the valves checked but all, including the EY51s, have their heaters continuous.—R. J. R. (Aylesbury).

We are unable to supply a circuit diagram or service manual, but one of our advertisers may be able to help here. Check for EHT. If the EY51 is lighting up, EHT is almost certainly available. However, you will probably find that the EHT has failed, in which case a check should be made of (a) the thermal cut-out in the anode circuit of the PY81 valve, (b) the PY81 valve, (c) the PL81 valve.

PHILIPS 1100U

Symptoms: no line hold, no frame hold. I have checked ECL80 valve (sync sep.) and resistance and condenser (.01 μF) feeding it from video output stage. I have checked video output valve (EF80) but not associated circuit. Line synchronising is impossible; frame synchronising almost so. Sound output and voltages appear to be O.K. Raster O.K. (quite bright and full scan). —J. L. (Manchester).

If the sync separator valve and associated components are in order suspect open-circuit of the 100 mF electrolytic capacitor in the cathode circuit of the video amplifier valve.

EKCO T231

A band approximately 1½in. wide down the left-hand side of the picture is brighter than the remainder, and slightly out of focus. In between this band and the remainder of the picture there is a narrow darker line. The fault appears on both Band I and III, and persists despite adjustment of brightness and contrast controls. Apart from this difference in brightness between the sections, the whole of the picture appears normal in other respects. The spot-wobble unit is not in use on the set.—C. F. Lovegrove (Surrey).

We have only met this fault once and it took ages to find due to the "red herrings" provided by the feeding back of line pulses into the video amplifier for A.G.C. gating purposes. In our case it turned out to be the .1 mfd condenser which decouples the brightness network to H.T. This is located under the chassis between the main smoothing block and the metal rectifier. There are many other likely causes of this fault, however, as we discovered to out cost!

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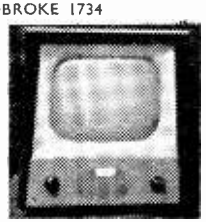

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6H6	10 6	12AH8	10 6
6J5G	10 6	12AT7	9 6
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6K7G	10 6	12AX7	9 6
6L6G	7 6	12BE6	10 6
6P6	7 6	12K7	8 6
6Q6	3 6	12Q7	8 6
6U5	9 6	35Z5	9 6
6X5	7 6	35Z4	9 6
6J7	8 6	80	10 6
6K6	6 6	954	1 6
6K7	5 6	EA50	1 6
		EABC80	8 6
		EAF801	10 6
		EB91	6 6
		EBC33	8 6
		EBC41	10 6
		EBF80	10 6
		ECC84	12 6
		ECF80	11 6
		ECF82	11 6
		ECH42	10 6
		ECL82	12 6
		EF39	7 6
		EF80	7 6
		EF85	8 6
		EF86	10 6
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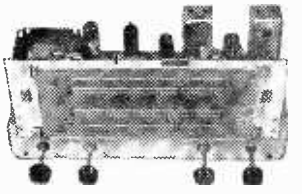

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