TELEVISION AT EARLS COURT

PRACTICAL TELEVISION

AND TELEVISION TIMES

1/-

EDITOR
F. J. CAMM

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PRACTICAL TELEVISION

& "TELEVISION TIMES"

Editor : F. J. CAMM

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Televiews

The Earls Court Show

DESPITE the efforts of the Electrical Trades Union, the Radio Show was little affected by the strike, and by opening day most of the stands were completed. This is the second occasion upon which the Radio Show has been affected by strikes, and as one of the primary objects of an exhibition is to attract overseas buyers and to increase our export trade, any attempt by any section of the community to use such an occasion to advance a demand for increased wages transports the dispute from one between employer and employed to one between a union and the State. There was plenty of time for this dispute to have been considered long before the Radio Show and the Engineering Exhibition which were running contemporaneously. The exhibitions were thus being used to force a decision favourable to the members of a particular trade union. It is not in the national interests that national exhibitions should be held to ransom in this way. It is making a rod of those who are not parties to the dispute with which to whip the employers. No doubt there are remedies at law for those who have suffered damage as a result of the strike, but the R.I.C. should in future seek assurances from all the unions concerned that strikes will not take place during the period of the Show.

The show itself was a model of organisation, and deserved the success it met. Naturally, the main interest was in television, but the radio market is still lively, and manufacturers reported good business. The exhibition was certainly a great improvement on last year.

The Super-Visor

ENORMOUS interest was evinced in our latest design, the Super-Visor, which was shown working on our stand, and also on that of the English Electric Company, who showed the receiver built from our instructions. The Super-Visor is being built all over the country, and this seems to indicate that the modern trend is towards the larger screen.

Reconditioned Tubes

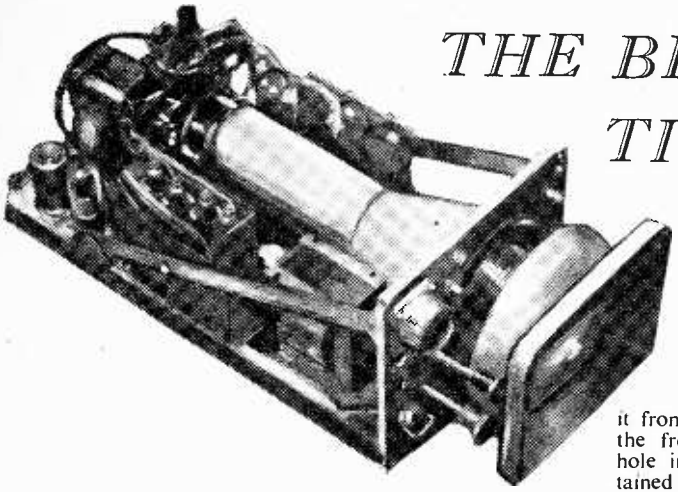
ONE firm has announced a service which will be praised by owners of commercial television receivers. When a tube fails outside its guaranteed period, they will undertake to replace it at half price. The owner merely has to take the old tube, irrespective of its age, to the nearest agent who will immediately hand him a new tube for half the catalogue price. This, of course, only applies to metal tubes made by the firm concerned.

"Practical Wireless" Comes of Age

OUR companion journal, *Practical Wireless*, celebrates its twenty-first birthday with the October issue now on sale. With it is given free a full-size blueprint of the "Coronet," a four-valve A.C. superhet of outstanding performance, but specially designed for low cost of construction. It is a double-sized number, although the price remains at 1s. It is packed with topical features.

What's in a Name ?

AS we go to press we learn that the Government has found a way round the opposition to sponsored TV. It is to be called "commercial" TV, a distinction without any real difference. Of course, sponsored television as known in America was never intended over here. In that country advertisers sponsor their own programmes, and are responsible for their production. In England it has been proposed by the advertising profession in a memorandum presented to the Postmaster-General that commercial stations themselves should be entirely responsible for their production, merely selling programme time to advertisers, as newspapers sell space. When an advertiser, however, buys advertising space in a newspaper or periodical he can, within broad limits, say what he likes in that space. Any attempt merely to sell a particular programme to an advertiser, written and produced outside his control, with the mere announcement that he has sponsored it, is foredoomed to failure. It was tried in this country before with radio and failed for that very reason.—F. J. C.



THE BEGINNER'S TIMEBASE—2

DETAILS OF THE CONSTRUCTION OF AN INEXPENSIVE UNIT FOR ELECTROSTATIC TUBES

(*Continued from page* 151 *Sept. issue*)

By B. L. Morley

TWO cords are used one above and one under the tube, the ends being fixed in the bolts which held the original tube mask. Fishing line of the strong variety is a very suitable material to use.

It is not strictly necessary to purchase a mask as the existing mask can be used if desired.

Once the position of the metal holder for the tube base has been determined the tube should be removed. The metal base can be fitted in the new holes and the next step can be made.

Now fit the E.H.T. transformer in the position shown and change the octal valveholder adjacent to the transformer for a four-pin ceramic-based type for use with the E.H.T. rectifier valve. Those who have previously constructed the R3170A receiver will have a suitably insulated type of holder available as surplus from that unit; although not made of ceramic material the insulating properties are suitable for the VU134.

Those who are using a 2X2 rectifier will, of course, have to fit a valveholder to suit this particular valve.

The smoothing condenser C21 can be fitted and also C20. This latter condenser should be fitted underneath the tube-holder and can be held in position with a clip.

In order to add balance to the chassis the mains transformer for the power supply should now be fitted. The outer edge of this transformer should be within ¼in. of the edge of the chassis, and the front edge should be 2in. from the front panel. These measurements must be adhered to.

On the right-hand side of the chassis (looking at it from the front) and spaced 11in. from the front panel will be found a square hole in the chassis which originally contained the switch. It will be found that the rectifier valveholder can be fitted in this hole by using one of the existing bolt holes and bridging the opposite gap with a spacer.

Mount the rectifier valve in its holder and then fit the potentiometer panel next to it. The potentiometer panel is the one originally fitted on the right of the chassis and fitted with the calibrating potentiometers. The panel must be set in a little from the edge of the chassis so as to allow room for the preset spindles, and the edge nearest the rectifier valve should be set to within ¼in. of this valve. After having found the position, new holes can be drilled (removing the valve during the operation) and the panel bolted in its new position.

In the bottom front end of the panel should be fitted a 20 K Ω potentiometer. The C.R.T. should be temporarily fitted back in the chassis. The smoothing choke can now be located in position, the edge nearest the potentiometer panel being ¼in. from the potentiometer just inserted and the edge nearest the tube being just clear of the tube screen.

It will be found that the choke can just be fitted in this position without overhanging the edge of the chassis; the mounting holes should be marked, the tube removed, and the chassis drilled.

After mounting the choke the smoothing condenser C25 can be fitted in a convenient position between the choke and the front panel.

The next step is to fit the coupling condensers to the deflector plates. There are two types generally available in the surplus market (0.1 μF 2.5 kV. working); one type is encased in an insulated con-

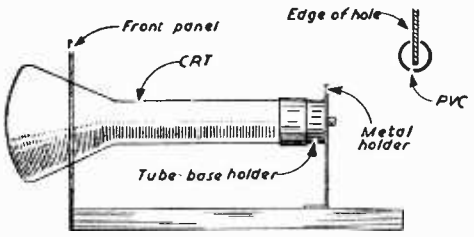


Fig. 2.—Method of mounting the tube as described last month.

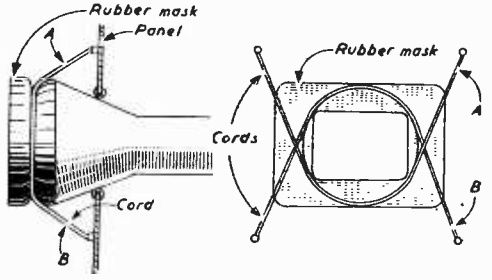


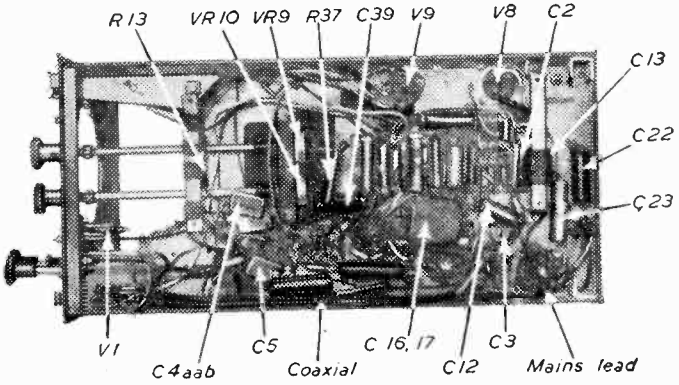
Fig. 3.—Method of mounting the mask.

tainer and the other is encased in metal which forms one pole of the condenser. The condensers are fitted into the metal panel which originally held the coils. If the metal-cased ones are used (Type 10C2565), as were used in the prototype, then steps must be taken to insulate them.

The side of the condenser connected to the deflector plates should be insulated for a 2.5 kV. and for this reason the top insulated connection is used. Wire is then wound round the case of the condenser for four turns and tightly twisted ; the wire should be bare, of course. The whole of the case of the condenser should then be covered with two layers of insulating tape, the wire round the case being brought out through the side of the insulation.

It will be found that with a bit of padding they will fit nicely into the metal panel and will be retained in position by the metal bracing bar fitted to the chassis. The photograph below shows the position.

The various potentiometers should be fitted to the panel, using the layout given in Fig. 4. The horizontal and vertical shift controls should have their spindles insulated from the panel by paxolin bushes recovered previously from the unit.



View of the completed unit. Positions of main components.

The two holes in the front panel made for trimmers should be drilled out to accommodate the line hold and frame hold controls. The layout of this panel should be as shown in Fig. 5.

Now proceed to stage III.

Stage III—Wiring of E.H.T. Circuit

Note : It is very important that all condensers should be tested for leakage before being wired in the circuit. This applies to all condensers used in the unit. Some of the units have been stored for a considerable period and it may be found that some of the paper condensers are leaky.

A simple method of test for those who do not possess other facilities is to connect the condenser between a high voltage source and a voltmeter. Any voltmeter can be used and the high voltage source can be the H.T. rail in a broadcast receiver. When stage IV has been completed the high voltage rail (not the E.H.T.) in the unit can be used.

Fig. 6 shows the testing circuit. No reading beyond a slight initial "kick" should be registered on the voltmeter. The voltmeter should be set to the range of the voltage being used for the test.

Now proceed with the wiring.

Wire R29 between pins 9 and 10 of C.R.T. holder ; wire R30 between pins 8 and 10 of C.R.T. holder.

Turn the tube-holder round so that the locating key comes on the top.

Wire one end of R27 directly on to pin 11 of C.R.T. holder and wire R28 on to pin 12.

Wire the other ends of R27, 28 to their relative shift controls, using stiff wire recovered from the unit and using different colours ; this will be found useful for tracing the circuits at a later stage. The wiring should be run neatly and when all the wiring is completed the wires can be bunched together and bound with string to give a neat appearance (see photographs).

Wire C20 to R31, using well-insulated wire. R31, 32 and 33 are fitted on the small insulated panel mounted above the tube-holder. Run a wire from R31 to outer tags of VR7 and 8. Wire the other outside tags of VR7 and VR8 to R32.

Connect the centre of R31, 32to pin 10 C.R.T.

Connect R35 between focus control and three-point tag strip ; this resistor should be covered throughout its length with P.V.C. insulation. The outer cover of a piece of the recovered coaxial cable can be used. The centre tag of the tag strip should be removed and R34 wired across the outer tags.

Care is needed in the next step. Wire R33 to the end tag of E.H.T. panel fitted above tube-holder ; the other end of the wire should not be wired to a tag but should be soldered to a heavily-insulated length of wire. In the prototype a length of recovered wire, coloured white, and heavily insulated; was used. The wire runs down to and along the deck of the chassis to the three-point tag strip near the focus control.

The next step is to insulate the panel thoroughly. It is possible for the E.H.T. to jump a ¼in. gap with ease. The bolts holding the panel to the metal

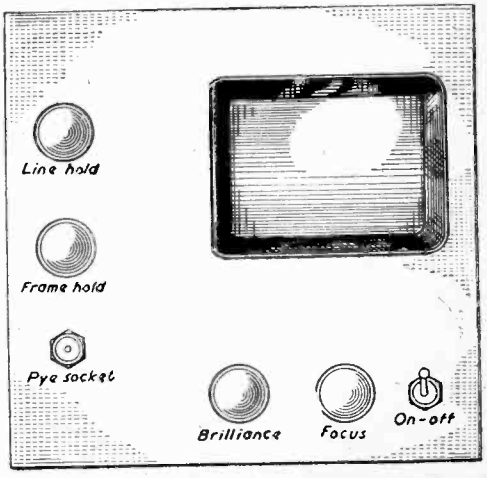


Fig. 4.—Panel layout and control positions.

platform should be unscrewed and the platform removed. A small piece of fibre insulating material, which was originally fitted to the front panel and held the wires of the screen lights, is used as a washer for the bolt, being inserted under the bolt head to prevent the E.H.T. jumping from tag A to the bolt. The paxolin strip is now moved so that the bottom piece is offset from the top piece by one hole and the

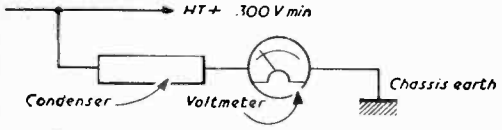


Fig. 6.—Checking a condenser for leakage.

bolt with its fibre insulator is inserted. The panel is bolted back on to the holder, but the other end of the panel is not fastened but rests on top of the small bracket. It will be found that the wiring will hold the panel in position in conjunction with the single fixing bolt.

Wire R36 directly between the tags of the brilliance and focus controls. This resistor should be covered throughout its length with P.V.C. sleeving in a similar manner to R35.

Wire R37 between outside tag of the brilliance control to an earthed tag inserted under the bolt which holds the main resistance panel in position.

C19 is wired to the centre tag of the brilliance potentiometer and earth. Care should be taken to ensure that none of the components under the chassis project below the actual bottom of the chassis or they will come into contact with the metal cover when the unit is enclosed.

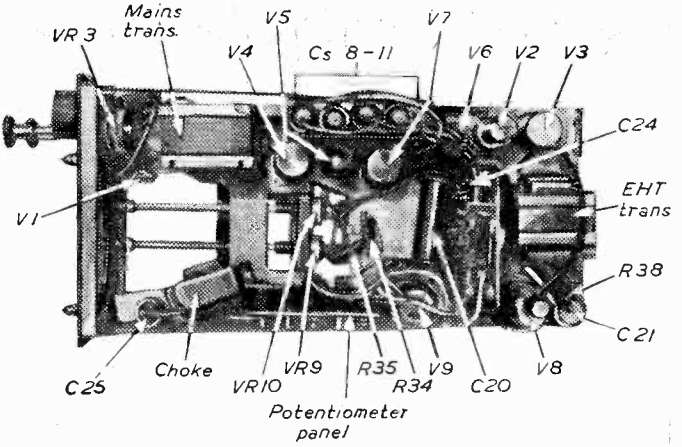
The next step is to connect R3 between pin 8 of V2 and earth and to wire from pin 8 of this valve to pin 1 C.R.T. Leave the wire "floating" slightly above the chassis; it should not be laid directly on the deck of the chassis.

Wire the cathode of the C.R.T. from the cathode resistor R40 to the centre of the brilliance control.

Connect the centre pin of the focus control to pin 6 on the C.R.T.

The primary of the E.H.T. transformer should be wired to the on/off switch connecting the transformer wires to two moving members of the switch. The two inner members will be wired to the mains. The switch then acts as a single-throw double-pole switch, the mains being switched through to the transformer when the knob is pulled out.

A length of screened cable should be used to make the connection between the transformer and the switch, the screening being earthed. The cable will fit comfortably along the edge of the chassis (underneath).



Further component positions are shown here.

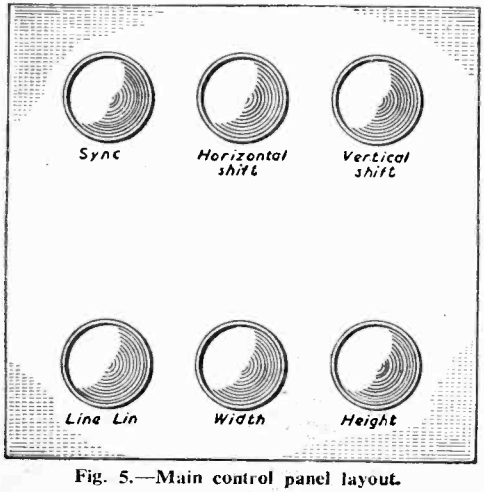


Fig. 5.—Main control panel layout.

The remainder of the E.H.T. transformer wiring can now be completed. Note that R38 is wired directly to the top connection of C21. The leads to the heater of the rectifier valve should be very heavily insulated.

If the valve specified is used, 4 v. will be required for the heater of the rectifier. Most of the transformers designed for the VCR97 have the rectifier winding centre tapped so that the actual output is 2-0-2 v. For a 4 v. rectifier the two outer wires are used, leaving the centre wire clear and free from earth, while with a 2 v. rectifier any outer plus the centre tap are used, the other outer wire being left free and clear from earth.

R41 and 40 are mounted directly on the tube base.

Now make the connections between the deflector plates and the coupling condensers C8, 9, 10 and 11. Use wire recovered from the unit with different coloured coverings, well insulated. The wires will be self-supporting, and when the final work has been completed they can be bunched together and kept tidy by string ties. The photographs should make the method clear.

(To be continued)

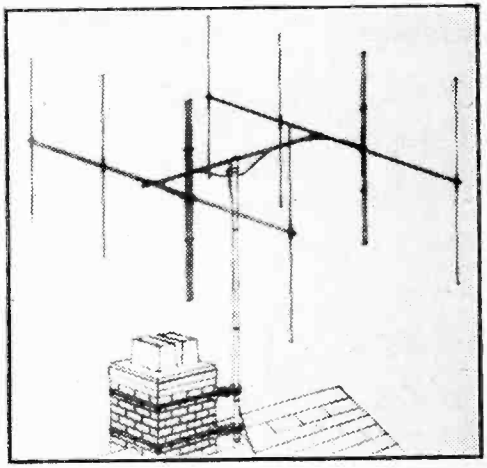
Television Exhibits Reviewed

THE main tendency seen at last year's radio show was an increase in the size of the pictures on the majority of receivers. From the previously popular 9in. screen, the major proportion of receivers had gone over to the 12in., and there was only one make in which the 9in. tube was retained. This year the tendency has been carried on, and the 12in. tube being now found only in the minority of receivers. Approximately one-third of the models had tubes 12in. or below. A general examination of the receivers shows that the most popular tube is the 14in. rectangular, with the 17in. rectangular a close second. The rectangular tube seems to have gained its popularity on account of the smaller cabinets which may be used, and as a result many receivers are to be seen this season no larger than last year's model but with a greatly increased picture area. Again, there is a tendency to refer to the picture size by the length of the diagonal rather than the tube face diameter, and this has, of course, been rendered necessary by the use of the rectangular shaped tube. Sooner or later there will have to be some standardisation in referring to the actual size of the picture, and probably the area covered will prove the most satisfactory, as it does permit of an exact comparison, which is not possible when one refers to a 14in. tube, meaning a 14in. circular face, and a 14in. meaning a rectangular tube with a 14in. diagonal.

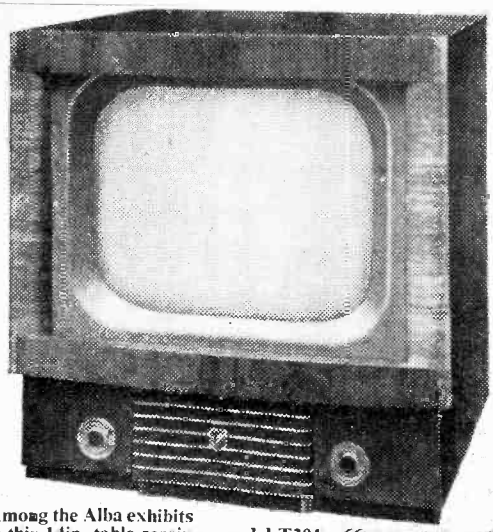
Again, manufacturers vied with one another in their claims of picture quality, and amongst some of the terms used may be mentioned "deep" picture and 2-D plus. There is little doubt that improved techniques have permitted the production of a much more detailed and more brilliant picture than was the standard last year. The use of aluminised tubes with filter screens or faces, plus the improved types of video valve, results in general in a more detailed picture with greater contrast. Other improvements which were noted were the increasing use of automatic gain control and fly-back suppressing circuits, each of which appeared under different names according to the manufacturer.

Projection

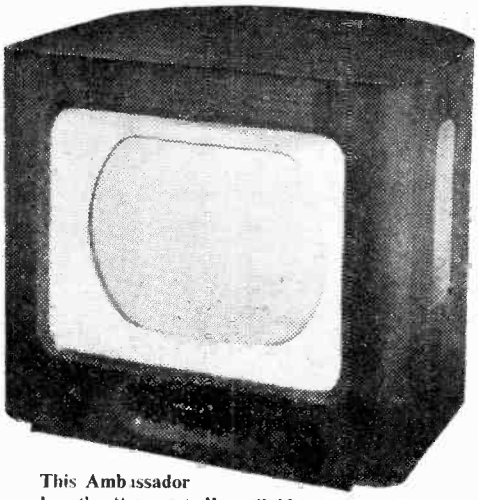
Projection receivers were in greater number than last year, and several firms now supply the "big screen" arrangement in which a separate screen is used to provide a picture of about 4ft. by 3ft. The increased use of large (wide-angle) tubes appeared to have resulted in a falling off in the number of the projection type receivers in which a screen forms part of the cabinet (back projection). The reason is, no doubt, that the direct-viewed tube now provides a picture of similar size and, of course, it is brighter than the projection scheme. A further point is that



A typical fringe-area aerial array. This is an Aerialite product.



Among the Alba exhibits is this 14in. table receiver, model T301—66 gns.



This Ambassador has the " pre-sets " available at the front.

the larger tubes are now provided with flatter faces and thus give a better comparison with the older type of projection model.

Controls

A general impression gained by a rough look round is that the controls have been either removed to the side, of the cabinet or reduced to two—and in many cases these have been made less conspicuous by using the " edge " type of component. We were still surprised, however, to note that the essential pre-set controls are only available at the back in the majority of models.

A mast head amplifier. This is a Belling-Lee product.

This partial inaccessibility does render it difficult for the serviceman to make adjustments without the aid of an assistant or a mirror, and it should not be difficult for the manufacturer to devise some form of panel strip available at the cabinet front which could be satisfactorily covered when not in use.

Appearance

The general appearance of the receivers is about the same, very little change being seen in the types of picture surround or mask. Pye appeared to be the only firm who had dispensed with the mask in its

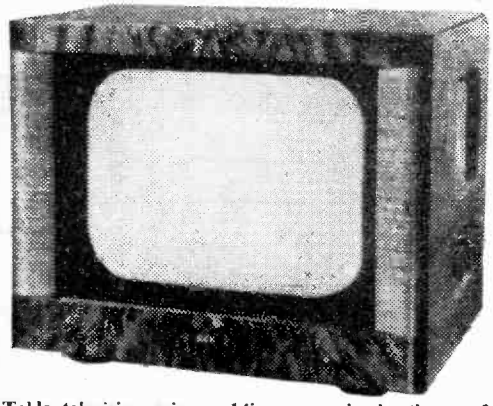
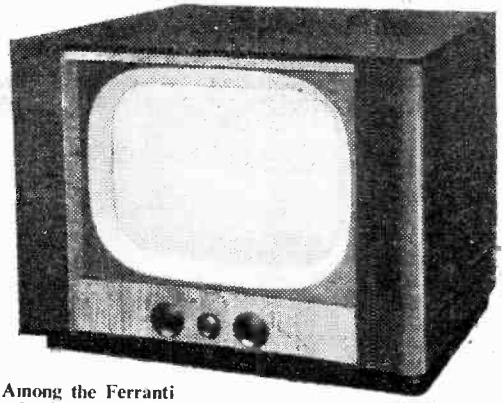
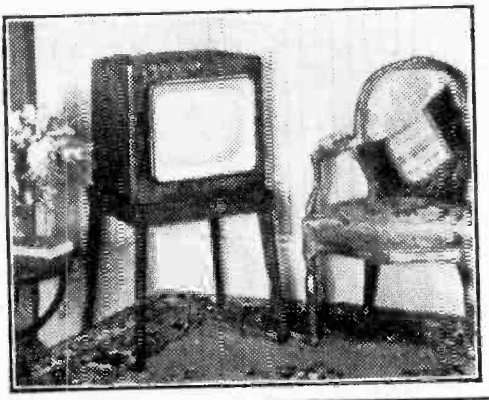


Table television using a 14in. screen is the theme of the G.E.C. range of models. This model, BT5147, is priced at 60 guineas.



Among the Ferranti selection is this table model 14T3, a 5-channel A.C./D.C. receiver with instantaneous channel selector. The tube is a flat-faced 14in.



The H.M.V. Model 1821 in a domestic setting with its own stool.

original form, although Masteradio have a form of cabinet front which gave a similar effect. Some viewers appear to prefer a wide mask as it gives the effect of a larger picture area, and tastes differ concerning the colour of the surround.

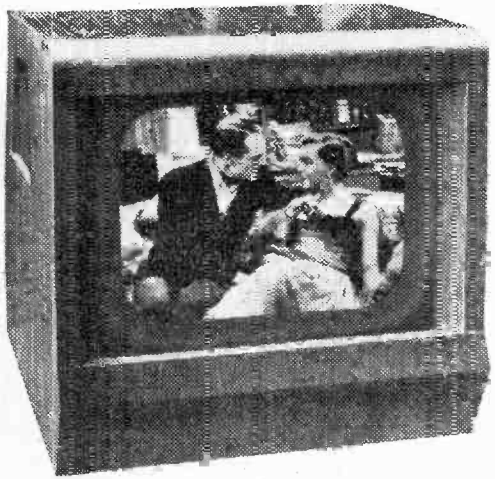
Sound Reproduction

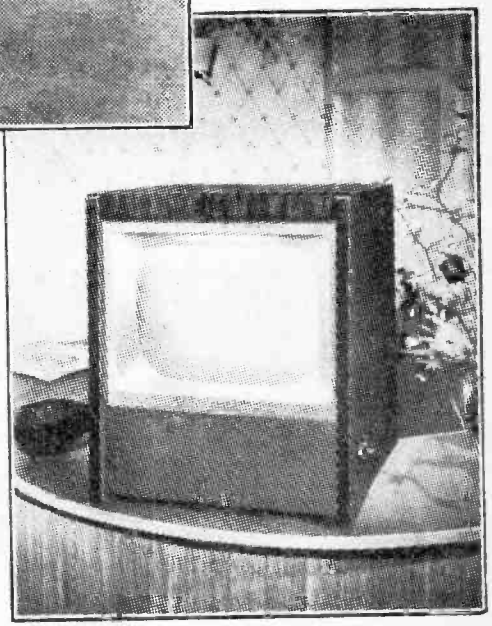
On the sound side improved interference suppression was noticeable on many models and, except in the table models where space limitations apply, better loudspeakers and reproduction seemed to have been produced. It did not appear, however, that any general attempt had been made to push up the volume beyond the 3 or 4 watts which the picture justifies.

Accessories

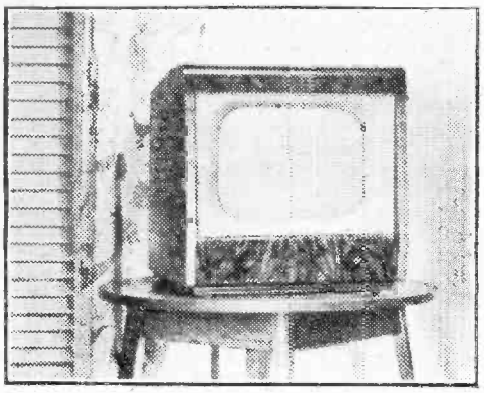
Among the accessories, aerials formed the major exhibit. These are now available in a variety of types, for both the vertical and horizontally polarised transmitters, and for the benefit of the fringe area viewer some elaborate folded arrays with reflectors and directors were to be seen. Many aerials have now been produced for use inside the house—either in the room with the receiver or in a loft, and these take many forms. Some are adjustable so that they can be set for individual conditions to avoid reflections, etc. The "Univex," for instance, supplied by Antiference, is supplied with two rods for room mounting and four rods for loft mounting. It permits a simple angle adjustment of the rods to any position through 90 deg., and the telescopic rods can be extended to suit the five-channel frequency requirements. In the Telerection range are the "Paravex," the "Multimus," the "8DBD" and the "Anti-Ghost." The latter has been specially produced to eliminate reflections in hilly or mountainous districts.

Test instruments for checking receivers, aerials, tubes, etc., were also to be seen and some of these were very ingenious. Unfortunately, we

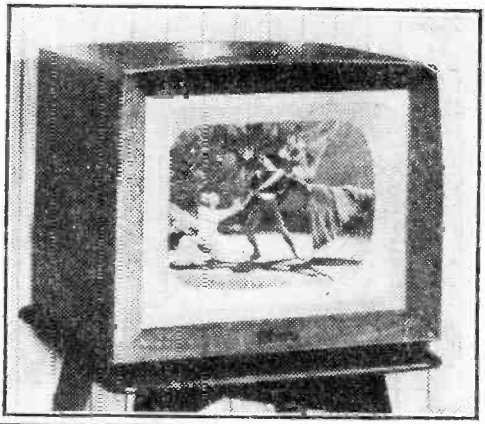




Above, the Decca wall-projection sets give a 4ft. by 3ft. picture and cost £158 10s. 0d. without the screen. Below (left), the Invicta Model 120 and the Ekco Model T207.

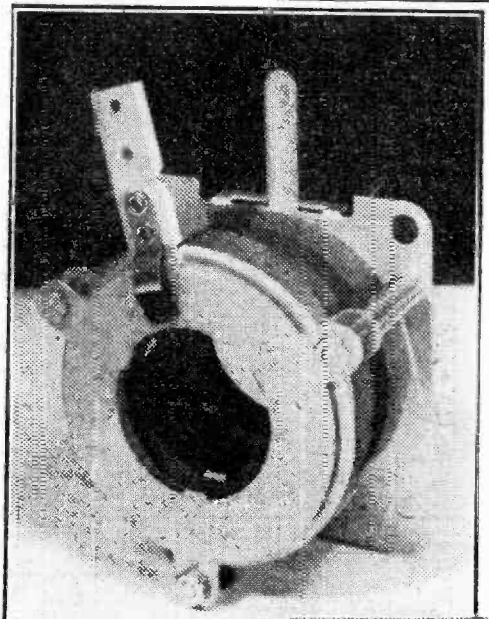


This is the 14in. Pilot Model TV84.



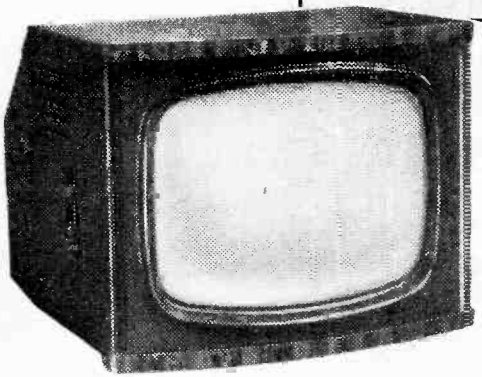
Model VT620A by Marconiphone.

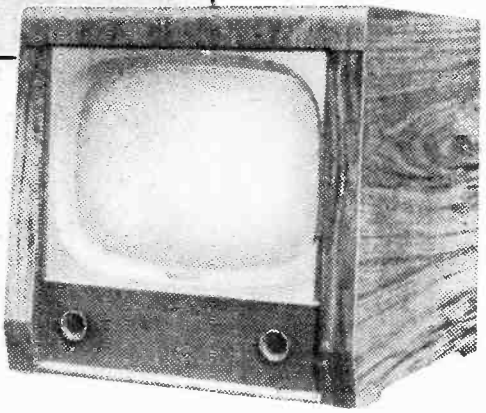
were unable to see an instrument of the type used in some laboratories for checking the response of a receiver. We refer to the combination of a wobbulator and oscillograph whereby it is possible to sweep over the band desired and see the actual curve on the 'scope. Pattern generators are generally used for testing the performances of time-bases, etc., and in use some of these may also be used to judge the performance of the receiver itself. One of these is seen on page 204 and is a Telequipment product, providing sync pulses and having three R.F. levels at the input. Another similar type of instrument was exhibited under the name "Radar" by Waveforms Ltd.



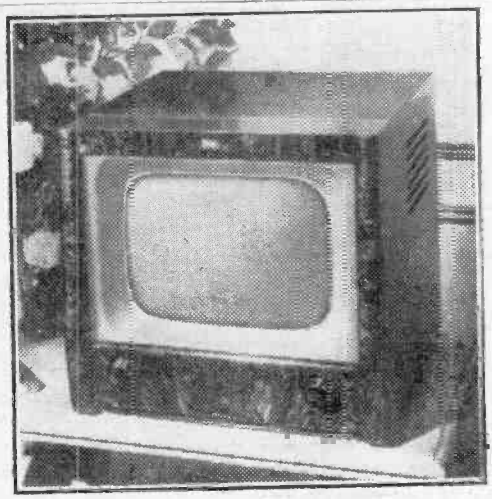
Amongst the items used by the home-constructor there was the vast range of condensers by T.C.C., Dubilier, and Hunts, all of which include special miniaturised ceramic types for decoupling and coupling at the high frequencies met with in television, as well as the more or less standard items used in the audio section and power packs.

For focusing the picture various types of both permanent and electromagnetic units are used, and a newcomer to this field was seen on the Goodman's stand. Although well-known in the loudspeaker field, this was a new item for them, and is seen on the left.





Above, Goodman's Ferroxdure Focusing Unit. Below (left) Masteradio TD7T and right, the Peto Scott 1712.T.



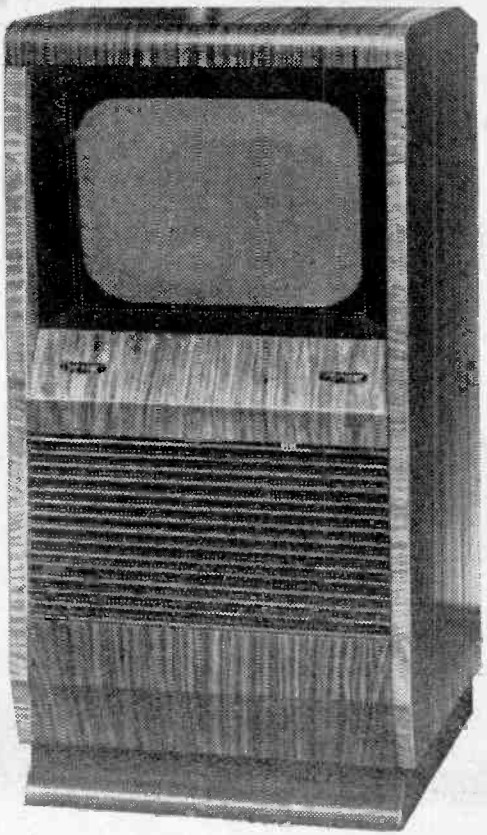
This is the R.G.D. Model 6014T.

Folding doors are the main feature of this Pilot 17in. screen model DDC.87.

This particular unit utilises the new Ferroxdure material which removes one of the great drawbacks to the permanent magnet type of unit, namely the size of the external field. When Ferroxdure is used the field is kept very small and no distortion of the scanning field takes place. Further, separate magnetic rings may be included by means of which the picture may be centred on the tube face and this removes another obstacle of the ordinary type of magnet, namely the elongation of the spot due to unsymmetrical positioning of the coils and magnet round the neck of the tube.

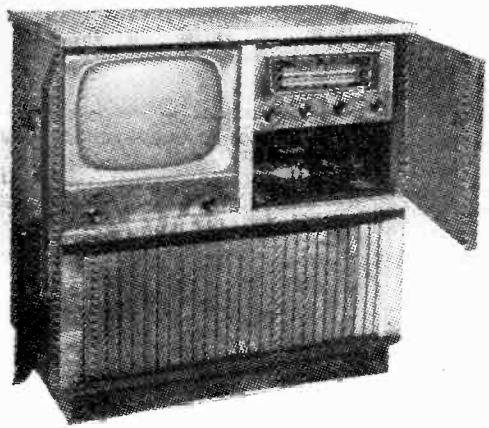
Valves and Tubes

Amongst the valves and tubes there was an endless variety, and an examination of the manufacturers' receivers shows that the miniature type of valve of the B7A or B9A type is being more or less standardised. These are available from all the big valve firms, Mullard, Marconi-Osram, Mazda, Brimar, etc. In the special Mullard series there are some interesting dual components such as triode-pentodes which simplify the layout of the timebases and also permit the overall size of the chassis to be kept down. There is, of course, no necessity to overdo this miniaturisation as the size of the cabinet is generally governed by the tube which is being used, but the wide-angle component is shorter in the neck than the older types of tube and as the front of the chassis is more or less useless for valve mounting due to the proximity of the tube, all the valves have to be accommodated in a smaller space and thus one is forced to use the miniature type of valve if the cabinet is to be kept of small dimensions. Some layouts were interesting to study in this connection and there appears an increasing tendency to use valves horizontally. A number of valves are designed to be used safely in this position but constructors should be careful to make certain, if they adopt this form of construction that suitable valves are used, and that the valve-holder is so mounted that the electrodes are in the position recommended by the valve makers.

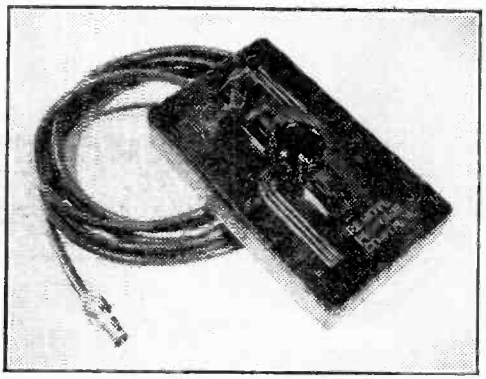


This Pye Console has the edge-type tuning controls.

For the picture tubes there is a general class

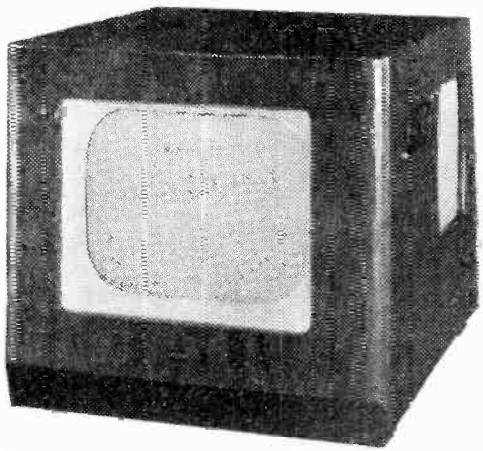


One of the few combined instruments. This is the Regentone 17in. combination model.



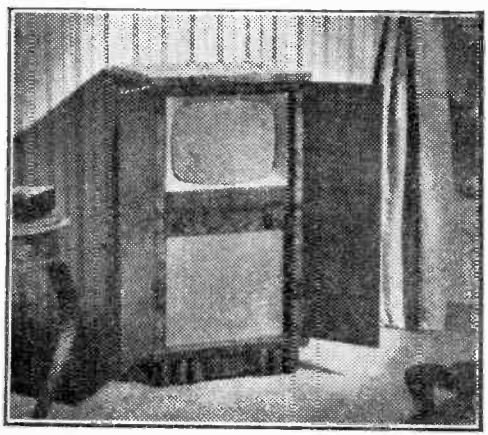
A valuable accessory—the Remote Picture Control by Reproducers, Ltd.

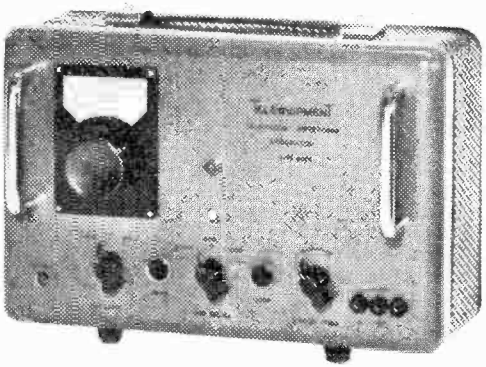
division of aluminised and ion-trap. The avoidance of ion burn may be tackled in either way and whilst the G.E.C., for instance, prefer the aluminised tube, Mullard prefer the ion-trap. Again, viewers have definite opinions as to which type of tube they prefer, and whilst some like the hard contrast of the aluminised tube face, others prefer the softer tones of the ordinary tube, and the home-constructor can, therefore, choose his tube to suit his preference. Similarly, the shape of the tube varies, and whilst one manufacturer appears to prefer the rectangular, others make tubes of both types, but the resultant factor which matters is the picture area which is available. The two largest tubes generally available for the home-constructor are the English Electric T.901 and the Mullard MW41-1, both being metal cone 16in. models of the non-aluminised type for wide-angle components.



An interesting point in connection with picture tubes was emphasised on the English Electric stand. The large metal tubes (which cost approximately £24) may be repaired—a new face and electrode assembly being fitted for about £12. The normal guarantee then applies and thus one can obtain a new 16in. tube for approximately the cost of the older 9in. model.

The difficulties of tube checking are, of course, overcome in a simple manner by the Radar Cathode-ray Tube Tester and Reactivator. This is designed especially for the purpose and is not an adapted test instrument.





Centre, Stella Model ST.8314U. Lower left, a console by Sobell—Model T.1742C (17in.), and right, the Telequipment Waveform Generator.

FAULT SYMPTOMS

THE CAUSES OF COMMON FAULTS, AND METHODS OF CORRECTION

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

(*Continued from page* 172, *September issue*)

SOMETIMES E.H.T. windings are connected in series with half of the H.T. winding (as in Fig. 9), so an open circuit winding or a fuse—f3—in this section may be the cause of no E.H.T. With the mains switch off, of course, we can check continuity of the windings concerned—the E.H.T. winding usually has a resistance value in the region of 6,000 ohms, as compared with about 40 ohms across the H.T. winding.

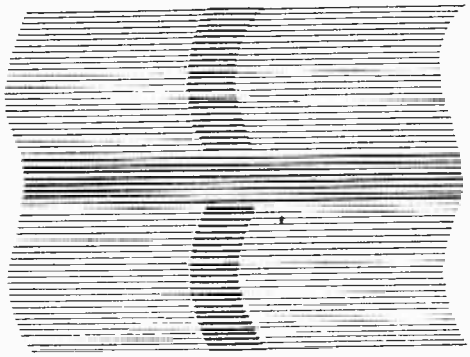


Fig. 11.—The possible effect of an open-circuited E.H.T. reservoir condenser (mains-derived type only).

If the E.H.T. reservoir capacitor had shorted, a blown fuse or flashing in the rectifier would be expected. In the exceptional case where the capacitor had developed an excessive leak and the fuse had failed to isolate the circuit (some receivers have no fuse in the E.H.T. section), the emissive property of the rectifier may have been ruined without causing any undue disturbance. It is advisable, therefore, before replacing a fuse or rectifier, to make sure there is no external cause for their failure.

Poor insulation or complete breakdown at E.H.T. voltages are probably the main cause of 50 c.p.s. derived E.H.T. failures, and are rather a problem to the experimenter with only limited testing facilities at his disposal. Generally, the first indication that a defect is occurring somewhere in the E.H.T. circuit is when hosts of unfocused white blobs (slightly larger than normal interference spots) manifest across the screen; picture brilliance gradually deteriorates until it fades completely; a smell of "cooking" pitch is noticed, and then, before one has time to switch the receiver off, the E.H.T. transformer erupts like a volcano.

A constructor known by the writer was rather puzzled by the sudden occurrence of apparent interference, not only on the screen of his own receiver but also on the screens of neighbouring receivers in the near vicinity. It was not until he was experimenting with another receiver that he discovered the interference ceased when his own receiver was switched off. The trouble was soon traced to poor insulation in the E.H.T. transformer, and transformer replacement presented the only cure.

It is easy to see, therefore, that a leak or short-circuit may be apparent only when something approaching normal working voltage is applied to the suspected component. E.H.T. capacitors often flash over and cause a blown fuse, and normal circuit checking fails to reveal the cause. Replacing the fuse usually renders the receiver workable again, but probably after a month or so (sometimes less) the same symptom occurs—capacitor replacement is demanded on the second offence.

No E.H.T. on the cathode but raw A.C. on the anode of the rectifier, provided there are no shorts, usually indicates that the rectifier has died a natural death. No E.H.T. on the anode of the picture-tube may simply mean that the filter resistor (R1, Fig. 9) has become open-circuited.

An open-circuited reservoir capacitor or one low in value will probably show a hum bar across a picture together with wavy edges (see Fig. 11). This will, of course, apply only to mains-derived E.H.T. systems where the unsmoothed ripple voltage possesses a frequence of 50 c.p.s. (half-wave rectification).

Flyback-derived E.H.T.

When we have established that the line timebase is working properly and the E.H.T. circuit is not, we

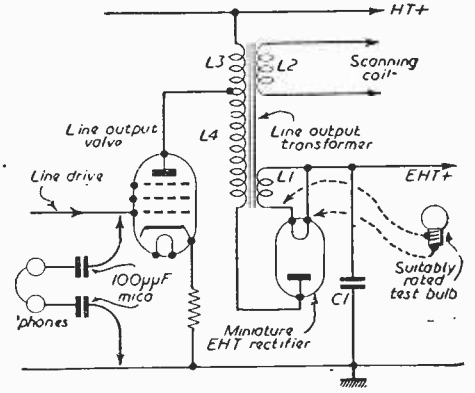


Fig. 12.—A typical line flyback E.H.T. circuit.

must investigate the circuit a little closer, but before we set ourselves this task the screwdriver dodge at the anode of the E.H.T. rectifier will give us some idea as to the proficiency of the rectifier valve itself. In modern receivers quite a large spark—continuous in nature—can be drawn from this electrode, and usually the valve heater can be seen glowing. Should it be possible to draw a spark, and yet the heater remains cold, it is fairly obvious that the rectifier has died, and valve replacement should provide a cure.

A short in the cathode side of the E.H.T. circuit

rarely occurs in this style of circuit, so we are reasonably safe to assume that the valve did not end its days from this cause ; nevertheless, to be on the safe side it is just as well to make sure. On the other hand, an open heater circuit in the line output transformer itself may be the cause of no volts, and although this is also a rare occurrence, it does sometimes happen. Since the line flyback is the energising factor for the rectifier valve heater, an ordinary A.C. voltmeter does not very often provide a true reading of heater volts, and for this reason another indicative method is to be favoured. This can take the form of a normal pilot bulb connected across the rectifier valve heater (see Fig. 12), the choice of bulb is rather important, because various types of miniature E.H.T. rectifiers are now available and are used in different receivers, but each type has a different heater loading. The Brimar R12 (Mullard EY51), for instance, has a 6.3 volt 0.09 amp heater, while the Brimar R16 (Osram U37) has a heater rated at 1.4 volts, 0.14 amp. The Mazda U25 (still of the miniature wire-ended type) has a 2 volt 0.2 amp heater. The correct bulb should produce a bright glow across a normally operating pulse L.T. circuit, even though wired in shunt with the existing rectifier heater. No illumination provided in this way should prompt the constructor to check for continuity across the L.T. winding (L1, Fig. 12) ; unfortunately, an open circuit winding here usually necessitates transformer replacement.

Probably at this point it will be instructive to consider the function of a typical line flyback E.H.T. circuit. The circuit of Fig. 12 shows a system after this style, and as will be seen the line output transformer represents the main feature of design. The primary winding L3/L4 is virtually an auto-transformer in itself ; therefore, L3 can be considered as the primary and L4 the high-voltage secondary winding—just the same as the two windings concerned in Fig. 9. Differences in function between the two systems being, of course, that with the flyback system the frequency of operation is in the region of 10 Kc/s, and that, instead of being sinusoidal (Fig. 10y) the rectifier anode waveform is spiky in nature and takes on the form of Fig. 10z. This is brought about by the fact that during the line flyback a rapid change of current takes place in L3, which induces a back E.M.F. across the winding, and at the same time an E.M.F. is also induced across L4, but of larger magnitude owing to the step-up ratio L4/L3.

The E.H.T. rectifier conducts only on the spiky tips of the induced flyback voltage, when the flyback voltage at the anode exceeds the voltage of the reservoir capacitor C1, which sets the value of the E.H.T. potential. The winding L2 is for the purpose of conveying current to the line-scanning coils, and the actual ratio L3/L2 depends on the type of scanning coils employed ; a perfect impedance match here is an important factor which sometimes the home-constructor tends to ignore.

It is very unlikely that the experimenter will discover a glowing rectifier valve heater, and yet no pulse voltage at the anode of the rectifier : this does not happen or, at least, the writer has never known it.

No spark and no glowing heater is probably due to no line sawtooth drive at the grid of the line output valve, and we can establish this quickly enough by means of a pair of 'phones connected between the control grid and receiver chassis—via isolating capacitors—as shown in Fig. 12. A high-pitched whistle should be heard, which alters in frequency with adjustment to the line hold control. If line drive is apparently lacking at this point, our next move will be to investigate the line generator proper, checking the associated valve and components concerned, but we shall deal with this fully later in this series, and for the time being we shall assume that line drive is indicated and E.H.T. is absent.

It takes little time to discover whether the line output valve is responsible for the fault ; a quick check of electrode voltages (screen and anode) should determine whether the valve is being properly supplied, and a check on the cathode volts is one way of knowing the degree of valve emission ; another way is by testing the temperature of the valve by quickly touching the glass envelope with a finger. Under normal conditions these valves run exceedingly hot, and a comparatively cool valve should lead the

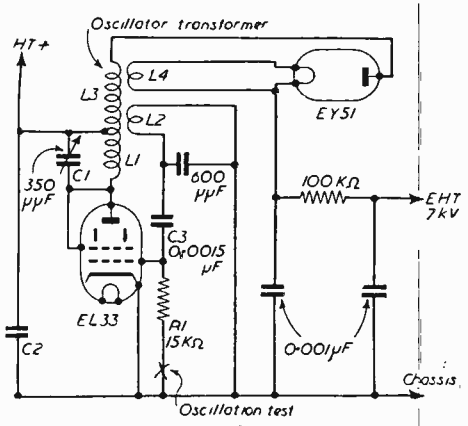


Fig. 13.—A typical R.F. E.H.T. unit by R.G.D. (Model B2 35IT).

constructor to suspect valve emission, or even a "dis" in one of the electrode feed circuits.

A characteristic 10 Kc/s whistle is usually emitted from the line output transformer when the line output stage is working properly, but sometimes this whistle is audible even though pulse voltage is lacking at the anode of the E.H.T. rectifier. This symptom generally indicates that a fault exists in the E.H.T. winding on the line output transformer, and steps should be taken to establish this possibility by checking the winding for continuity, bearing in mind that short-circuit turns may be the prompting factor ; a knowledge of the approximate D.C. resistance of the windings is a great asset when investigating in this direction.

Sometimes short-circuit turns or a defective component in the circuit associated with the line-scanning coils prevent the line output stage from operating satisfactorily. If the line output valve electrode potentials measure approximately normal and drive is being applied to the valve, it may be a good idea, before finally settling on the line output transformer, to isolate the scanning circuit from the appropriate winding on the transformer and then again check for E.H.T. If it is still absent, then it can be fairly safely assumed that transformer replacement is necessary. It should be mentioned, however, that it is extremely detrimental to the line output transformer—and the valve—to leave the scanning coils disconnected

whilst the stage is oscillating, but for a quick test little damage should result.

R.F. Derived E.H.T.

Another source of E.H.T. supply which, like the 50 c.p.s. system, is not dependent on the function of the line timebase takes the form of an R.F. oscillator embodied in a separate unit on the main receiver chassis, and depends on the receiver only to provide it with power (some R.F. E.H.T. units have a self-contained power-pack). Although E.H.T. derived from such a method is wholly satisfactory, it is, in recent years, failing to take favour of modern television receiver designers—probably because of its added expense, as compared with the flyback derived E.H.T. system.

Nevertheless, since various manufacturers have, from time to time, adopted the principle it is bound to be met in some form or other by the experimenter. A representative circuit diagram is given in Fig. 13, which depicts the arrangement used by R.G.D. in their Model B2 351T receivers. The action of the circuit is easy to follow, and in the case cited the beam power tetrode (EL33) is connected as a triode with the anode and screen grid electrodes strapped. H.T. supply to the valve is conveyed via the anode winding L1 on the oscillator transformer, which is inductively coupled to the grid winding L2. The effect of this, of course, prompts the valve to oscillate in the usual way, and the oscillatory voltage developed across the tuned anode circuit is stepped up to a considerably higher value over the separate E.H.T. winding L3, which feeds the rectifier and smoothing circuits. The E.H.T. rectifier cathode is also heated by R.F. drawn from an additional winding L4.

Most circuits of this type employ variable capacitive tuning in the anode circuit—C1 performing this function in the circuit under discussion—so that a means is provided of varying the output voltage. The optimum frequency of oscillation is in the region of the natural resonance of L3 combined with the sum of the various stray capacitances in parallel with the winding, and maximum output voltage occurs when the anode circuit L1/C1 is tuned to this frequency, which, in practice, is usually in the range 50-100 Kc/s.

When one of these devices ceases to supply E.H.T. volts the most likely cause is a low emissive oscillator valve, and a substitution check usually solves the problem without further worry. On the other hand, replacing the valve may leave the generator just as inactive as before, in which case the first test should be to find out whether the valve is actually oscillating. A quick way of doing this is by breaking the grid circuit and inserting a 0-1 m/A meter in series, as indicated in Fig. 13.

If the meter shows a reading, the valve is oscillating and, apart from the rectifier, little can be wrong. Another way of ensuring that R.F. is present at the anode of the rectifier is by the spark test from the blade of an insulated screwdriver to the E.H.T. rectifier anode connection on the transformer. Probably the cause is an open circuited heater in the rectifier itself, and again in this type of generator wire-ended miniature style rectifiers are nearly always used, which means that a glow should be observed from the heater when operating correctly. If there is no glow it may be advisable to check heater continuity, but beware here, for it has been known by the writer for a valve to indicate continuity across its heater, and yet fail to emit electrons—or even glow—when correctly powered. Again—in the writer's opinion—the safest way to check the rectifier is by substitution, but it can be checked for emission on a valve tester, although this will, of course, depend upon the type of valve concerned, and the convenience of the experimenter.

Other Causes

Where the valve heater is energised by R.F. the lamp check, as previously described, can be employed to ascertain that the L.T. winding is working properly, and that the valve is receiving its approximately correct L.T. voltage. Some circuits differ slightly from that of Fig. 13 inasmuch as the E.H.T. rectifier heater is powered by a special winding, with high-voltage insulation, on the mains transformer. It would follow, therefore, that it is probable for a breakdown in the heater winding insulation to occur; such an effect would heavily damp the oscillator coil loading and very likely prevent the oscillator from functioning, but disconnecting the anode of the rectifier from the transformer secondary winding will relieve the loading and allow oscillation to recommence, which can be proved by the grid current, or spark test.

Should poor insulation of the heater winding definitely be proved the cause of no E.H.T., mains transformer replacement can sometimes be avoided by disregarding the defective winding, and installing a new L.T. winding on to one limb of the mains transformer core, using suitably insulated wire. To determine the precise number of turns necessary an old length of insulated wire can be used as a test, and an A.C. voltmeter will tell when the number of turns is correct—the insulated inner conductor of co-axial cable (feeder) represents suitable wire of which the winding can finally consist.

There are, of course, other faults which sometimes occur in this type of circuit to prevent the oscillator from working, and, apart from a defect in the oscillator transformer itself, the most likely are C2, C3 or R1 going open circuit. A substitution check of the component suspected should be made, with a meter in circuit to indicate grid current on each check, until the culprit is located.

Poor insulation, or very slight leakage in the oscillator transformer represents a frequent cause of E.H.T. failure, and after the rest of the circuit has been checked O.K., transformer replacement should be considered, even though it may check as normal from the continuity aspect. The effect is that transformer leakage increases the oscillator loading, and in this type of circuit a slight enlargement in the loading kills oscillation altogether. Leaking smoothing (E.H.T.) capacitors, a leak between cathode and anode in the E.H.T. rectifier valve, or even a leak from the final anode of the picture-tube may be responsible for a lack of oscillation, and each possibility should receive due attention before transformer replacement is finally decided upon.

As a word of warning it will be noticed that grid bias for the oscillator valve is present only when the circuit is in a state of oscillation, therefore, as far as possible, it is advisable to minimise the length of time between tests when the circuit is powered under fault conditions.

(To be continued)

TV for the Beginner—5

A NEW SERIES EXPLAINING THE PRINCIPLES OF RECEPTION FOR THE NEWCOMER TO TELEVISION—THIS MONTH WE DEAL WITH HEATER SUPPLIES AND E.H.T.

By "Alpha"

(*Continued from page* 54 *July issue*)

THE television receiver requires three different types of power supply, (a) a large current at low voltage for the valve heaters, (b) a moderate current at moderate voltage for the anode circuits, (c) a very small current at a very high voltage for the electron beam in the cathode-ray tube.

Apart from (c) the requirements are similar to those of a normal broadcast receiver—only more so ! A broadcast receiver contains, on the average, four valves plus rectifier, while the televisor contains sixteen to twenty valves (four to five times as many). This means that if the supply system as used in a normal receiver is employed for a televisor the equipment becomes bulky and expensive, therefore other methods are usually employed.

Heater Supplies

Two methods can be used for feeding the valve heaters, the first by means of a transformer to step

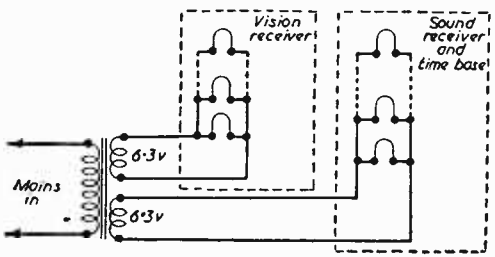


Fig. 22.—A parallel heater wiring arrangement.

down the voltage and the second by employing D.C. principles and wiring all the valve heaters in series.

The first method uses either an additional winding on the normal mains transformer or an entirely separate transformer.

The load is generally split into two windings in order to simplify transformer design and to avoid too heavy a loading. There are various ways of doing this, but the basic principles are the same. Fig. 22 shows a popular scheme.

The main advantage of this form of heater supply is that valves can be substituted without interrupting the whole heater circuit; the main disadvantage is the cost and bulk of the transformer.

In an effort to reduce costs and to simplify chassis layout the heaters are often wired in series as in D.C. receivers.

It is usual to fit a "shock absorber" in the series chain which will prevent heavy currents flowing in the heaters before they are properly warmed up. The "shock absorber" is a special type of resistance which has a negative temperature coefficient—its resistance reduces as it warms up—and is marketed commercially under such names as the "Brimistor" and "Thermistor."

When first switching on the resistance is quite high (in the region of 2,000 to 3,000 ohms), but it drops to 40-50 ohms when fully warmed up.

With this method the C.R.T. heater is usually placed at the end of the chain (the low potential end), though some circuits employ a separate small heater transformer for the tube

A.C./D.C. televisors are invariably series connected. (Fig. 23.)

Anode Supplies

There is quite a difference between televisors using electrostatic timebases and those using electromagnetic timebases. The former requires a fairly high voltage at low current; where about 3 kV is used for the E.H.T. the timebase requires a voltage of about 425 v. at 20-30 mA to enable full scan to be obtained. The electro-magnetic tube does not require such a high voltage in the timebase and an average voltage of 250 v. can be used, though the current requirements range from 150 mA. upwards. This is one reason why it is difficult to change from electrostatic working to electromagnetic without involving the wholesale scrapping of the existing timebase.

As such a comparatively high voltage is required for the electrostatic timebase it is not an easy matter to operate such equipment from D.C. supplies.

Under the best conditions the available voltage after smoothing is not much in excess of 200 v. and this is insufficient to provide full scan, when using average values of E.H.T.

It is possible to step up the output voltage waveform from the respective oscillators by means of a transformer, but the design of a suitable component is both difficult and costly, especially in the case of the line circuit where the rapid flyback generates high peak voltages. There are no such components available for the home-constructor.

Where larger tubes are used then the problem becomes more complex as under average conditions an E.H.T. of 5 kV will require about 1 kV deflecting voltage for frame and line plates.

Those who are on D.C. supplies and who wish to use equipment associated with tubes of the VCR97 class are well advised to use an A.C./D.C. converter. It is possible to use quite a small motor generator to supply the timebase only, the rest of the circuits being fed from the D.C. supply.

Fig. 24 shows a projected scheme.

Even with this type of circuit we are considering

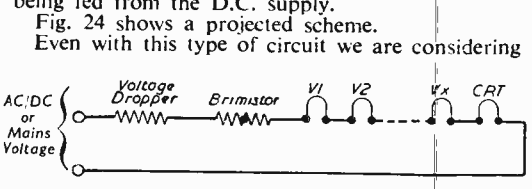


Fig. 23.—This is the series heater arrangement.

the costs and it may be well worth while to employ magnetic tubes and use A.C./D.C. principles.

For the electrostatic tube then, the usual method is to step up the voltage with transformers in the mains supply; the voltage so obtained is rectified usually by a valve rectifier, smoothed by a choke and condenser system and fed to the timebases. This is the point of highest smoothed potential.

From this point dropping resistors are usually inserted to reduce the voltage to suitable figures for supplying the vision and sound receivers. A popular method is to feed sound and vision receivers separately to avoid any possibility of coupling between the two sections.

Fig. 25 shows the scheme with representative voltages. The positions of the various smoothing and reservoir condensers are indicated.

Magnetic Tubes

As we have seen, the electromagnetic or, more briefly, magnetic, tube does not require such a high voltage on the H.T. rail and 350 volts is usually more than sufficient.

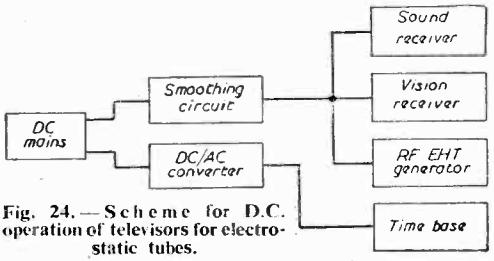


Fig. 24.—Scheme for D.C. operation of televisors for electrostatic tubes.

In order to effect economy it is quite usual to employ the mains directly, rectifying the A.C. voltage by means of metal rectifiers on the A.C./D.C. principles. One disadvantage of the transformerless version is that the resultant voltage is inadequate for the line output valve, which has a strenuous job of work to do. To cater for this condition it is usual to employ a recovery diode (or efficiency diode, as it is sometimes termed) in the line output stage.

The recovery diode recovers the energy present in the line flyback and adds it to the normal anode voltage. The line output valve provides a large amount of power to the scanning coils in order to swing the electron beam across the tube; at the end of the stroke this energy is suddenly released, the spot flies back to the beginning of the line extremely rapidly and the surplus energy is recovered by the diode and stored in a condenser. The potential thus built up in the condenser is applied in series with the H.T. supply to the anode of the line valve and thereby increases the total applied anode voltage. Fig. 26 shows the system.

The "Lynx" televisor uses this method.

Another method employed in purely A.C. televisors is to use a small transformer for supplying the C.R.T. heater, plus (sometimes) the other valve heaters; the primary of the transformer has a small degree of overwind and it therefore behaves as an auto-transformer and steps up the voltage. It is possible to obtain satisfactory operation from 210v. mains by this means. Fig. 27 shows the scheme.

E.H.T. Supplies

The supply of E.H.T. for the production of the electron beam in the C.R.T. differs between electrostatic and magnetic televisors.

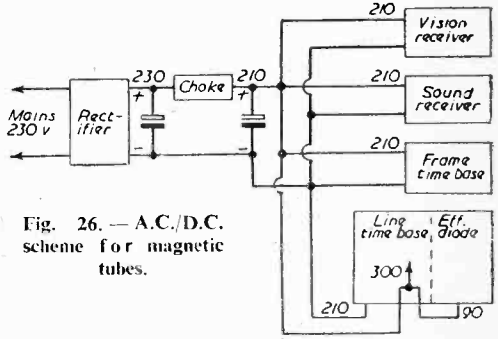


Fig. 26.—A.C./D.C. scheme for magnetic tubes.

Electrostatic circuits generally employ an ex-Government C.R.T. such as the VCR97 or VCR517, and these tubes require an E.H.T. potential in the region of 2.5 kV. The current is quite small (less than 2 mA) and the most convenient method of obtaining this is to use a transformer directly on the mains.

With this system the smoothing condensers must be fairly large because of the low frequency of the mains supply. Large condensers means a large storage capacity, and to avoid shocks from accidental contact when the supply is disconnected, a chain of resistors is connected across the output of the circuit to discharge the condensers.

This chain is commonly called the "bleeder" chain. Fig. 28 shows the scheme.

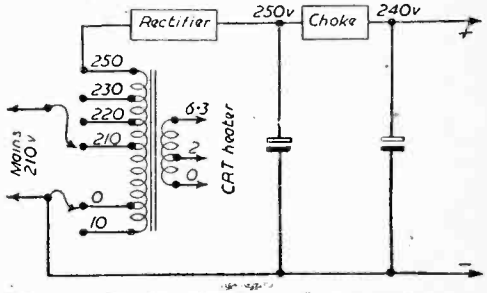


Fig. 27.—The auto-wound transformer arrangement.

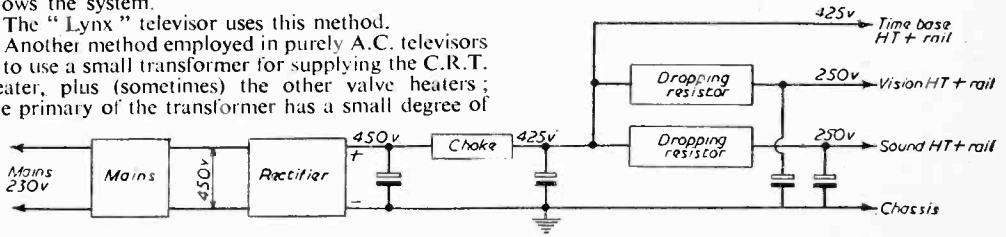


Fig. 25.—General layout of power pack for televisors using electrostatic tubes.

Tappings can be taken from the various points along the bleeder chain to provide potentials for focusing and control of brilliance.

As the current requirements are rather small, a resistance can be used for smoothing instead of the more usual choke in standard power supplies.

It is possible to use a metal rectifier instead of a valve, but valve rectifiers are the more common, due to the availability of suitable valves at reasonable prices in the ex-Government market.

Sometimes the E.H.T. positive is earthed and sometimes the negative ; the point is often confusing to the novice. The polarity of the E.H.T. is determined very simply by the way in which the rectifying valve is connected.

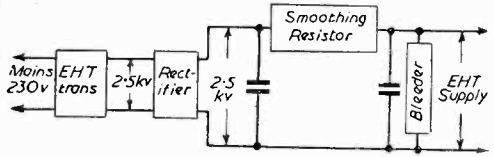


Fig. 28.—A mains type E.H.T. supply.

If the rectifier is connected so that its anode is on the "earthy" side and the E.H.T. rail is taken from the valve heater, then the E.H.T. rail is positive. If the valve is reversed, however, the E.H.T. rail becomes negative (see Fig. 29).

The main advantages of using E.H.T. positive earthed is that the peak inverse voltage amounting to 5 kV is kept away from the transformer windings, and the coupling condensers to the deflecting plates can be made medium voltage working.

Other methods such as R.F. oscillators and step-connected rectifiers can be used for obtaining E.H.T., but the most satisfactory method is undoubtedly the mains transformer.

E.H.T. for Magnetic Tubes

Magnetic tubes present a different problem ; the required voltages are much higher and the currents much lower.

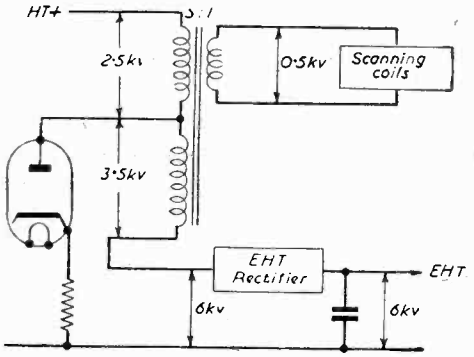


Fig. 30.—This is the flyback E.H.T. arrangement.

The present tendency is for higher and still higher potentials. Where really large tubes are used, up to 15 kV is required, while the special tubes used for projection require voltages in excess of 25 kV.

The present trend in televisors is to employ a voltage source which is already available in the televisor. This is partly for economy reasons and enables the costs of production to be kept down.

The available source is the line flyback. The rapid collapse of the field in the line coils at the end of the line stroke generates quite a high voltage, which is stepped up by the normal action of the line output transformer. The result is that transient potentials in excess of 2.5 kV appear at the anode of the line output valve. This voltage can be further increased by overwinding the primary of the line transformer.

One of the difficulties associated with this system is that the amplitude of the E.H.T. is dependent upon the output of the line amplifier and some interaction occurs ; this is not nearly so serious in practice as it might appear to be and satisfactory operation is obtained.

Fig. 30 shows a representative scheme.

The main disadvantage of the flyback source is that it is intimately tied up with the operation of the line output valve. The R.F. oscillator and the voltage-multiplier using stepped rectifiers do not suffer from this defect, though the cost is much greater.

The R.F. oscillator is simply a heavy duty valve connected in an oscillatory circuit operating at a high frequency, usually around 50 kc/s. High voltages at low current are produced. Such circuits are used for projection tubes where over 25 kV. is required. Where experiments are being carried out in the design of line output circuits, this form of E.H.T. supply is advantageous as it is entirely independent of the line circuit.

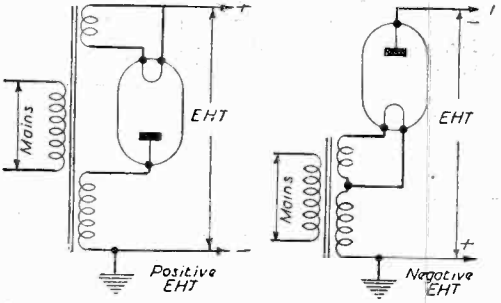


Fig. 29.—Showing the differences between a positive (left) and negative (right) E.H.T. supply.

Voltage-multipliers use a series of metal rectifiers connected "step" fashion. It is possible to obtain over 5 kV. from a 350-0-350 winding on the normal mains transformer by this method. A complete unit is marketed under the title of "Westelt," and needs only connection to the transformer to be made.

It is possible to obtain the high E.H.T.'s required by using mains transformers as for electrostatic tubes. The snag is that such transformers are expensive to produce and while, so far as the operation is concerned they provide the best form of E.H.T., the regulation of the supply is too good ; the novice is advised against their use.

The term "regulation" may need some explanation. It is actually a kind of comparison between the voltage applied and the current drawn. Under no-load conditions the applied voltage is at its peak, but as soon as current is drawn the voltage will begin to fall. This forms a certain measure of the "goodness" of a transformer or source of supply.

(To be continued)

PICTURE DEFINITION

A SIMPLE ARITHMETICAL EXPLANATION OF THE BBC PICTURE STANDARD

By W. J. Delaney (G2FMY)

TEST Card C contains, on each side of the circle, two graduated grids which represent bandwidths from 1 to 3 Mc/s per second, in steps of .5 Mc/s. Many viewers have, from time to time, asked why the limit is set at 3 Mc/s and not some other value, and a familiar argument is often raised that we should increase the number of lines in our transmission to compare with the higher number used in the U.S.A. and on the Continent. When it is stated that this would be of no value unless at the same time the bandwidth was increased, the non-technical viewer asks "Why?" It is instructive, therefore, to see why the BBC bandwidth is set at the present value,

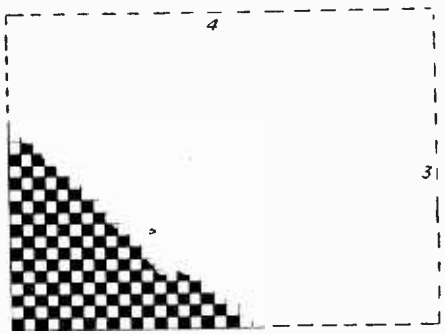


Fig. 1.—Standard raster with picture elements indicated as a check pattern.

and why it is desirable for our receivers to be capable of receiving a bandwidth of at least 2.75 Mc/s for maximum picture definition.

As is well known, the transmitted picture is rectangular in shape. and the width in proportion to the height has a definite ratio of 4 to 3. Originally, the ratio was 5 to 4, but it was later modified to bring it into line with film and American standards so that an interchange of film recordings could be made without upsetting the proportions. In addition to the ratio of width to height, which is officially known as the "Aspect Ratio," there are also two other vital factors in the transmission — the number of horizontal lines in the picture and the number of pictures per second. The present system utilises 405 lines in the actual transmission, 377 forming the active picture area, the rest being used for sync, etc., and the pictures are actually transmitted in two sets of 202½ lines at 25 pictures per second. This makes, of course, a complete picture of 405 lines at 50 per second.

Picture Elements

As the number of horizontal lines is fixed, and the proportion of width to height is also fixed, we can see that, in effect, the picture area could be divided up into squares or picture elements, as by simple arithmetic if there are 405 lines across, represented by the figure 3 of the aspect ratio, then vertically there must be 405 divided by 3 and multiplied by 4, thus:

$$\frac{405 \times 4}{3} = \frac{1620}{3} = 540$$

The picture thus in effect consists of 540 by 405 squares and a corner of this is shown in Fig. 1, in which maximum definition has been indicated by making the squares alternate black and white. Another simple bit of arithmetic will give the total number of squares in the picture area, and is simply 540 multiplied by 405 which equals 218,700.

Without going into detailed technicalities, it may briefly be stated that the current which is transmitted in the form of the signal is what is known as a sine wave, that is, the current rises and falls round a midway position, the maximum in one direction corresponding to peak white and the maximum fall in the other direction representing black.

In Fig. 2, a short strip of one line of the black and white squares is shown, and below it the form which the signal current should take. This is a square wave, but it corresponds in the same fashion to a sine wave which is shown below it, from which it is seen that one complete wave—that is from any part of one curve to the same part on the next curve actually corresponds to two squares. This gives us another little bit of arithmetic in our explanation, namely, that to arrive at the number of curves or cycles per second which are required for the complete area we can divide the total figure previously arrived at by 2. This then, gives us $\frac{218700}{2} = 109350$. In our rectangle representing a picture of black and white squares, therefore, we need 109,350 cycles, but as time has to be considered in the transmission we must consider the number of times this block has to be repeated in a second. We said at the beginning that the BBC adopted the interlaced system of 202½ lines repeated at 25 per second. As each lines of the interlaced resultant picture has the maximum number of picture elements (the vertical definition is not halved, the odd and even lines merely being separately transmitted), the frequency required for our current is obtained by

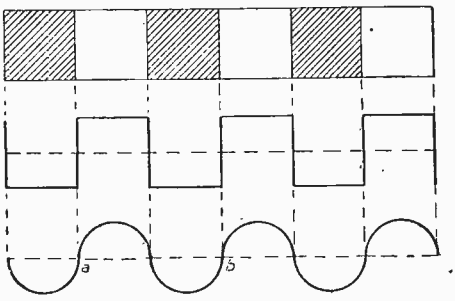


Fig. 2.—Type of wave giving the black and white pattern. One cycle is from a to b.

multiplying the number of cycles by the number of repetitions per second. This gives us:

$109,350 \times 25 = 2,733,750$ cycles per second.

The majority of readers will know that the prefix "Mega" means a million, and, therefore, we can express the figure just arrived at as 2.73375 Megacycles per second, or 2.74 Mc/s approximately. From the illustration in Fig. 2, it will be seen that the smallest detail which can be transmitted is one square, and if there is any detail smaller than that the curve would not be fast enough to follow it—therefore, there is little use in making a receiver to receive more than 3 Mc/s, and no object in increasing the number of horizontal lines—unless the vertical lines are increased in the same proportion, which means that a wider bandwidth would be needed to transmit the resultant smaller squares or picture elements.

The above explanation shows why it is desirable that the receiver should be capable of receiving a bandwidth of 2.75 Mc/s for maximum detail, and why a receiver which has a bandwidth of only 2.5 Mc/s or less will not produce such a fine detailed picture. There are, of course, a number of faults which can arise in a receiver which, although it has a bandwith of 3 Mc/s will still produce a poor picture, but these are concerned with the multilation of the square waveform shown in Fig. 2 and other factors, which is another subject.

New BBC Film-dubbing Suite

Film-dubbing Suite

THE new dubbing suite is the second to have been built for the Film Unit, the first coming into action at Alexandra Palace in 1949. The Lime Grove dubbing suite embodies all the improvements shown to be desirable as a result of four years' experience.

The purpose of a dubbing suite is to provide musical and sound effects recordings together with commentaries for use in television films. Briefly, it comprises a studio which is also a film theatre. Behind this and looking into it are a sound-mixing room and two sound camera rooms, above these is the projection room, the whole comprising a dubbing suite. In the projection room there are 35 mm. and 16 mm. film projectors, and 35 mm. film phonographs. These phonographs are essentially devices for playing sound track only. The outputs of the various film phonographs are fed down to a mixer in the sound-mixing room. The equipment of the sound-mixing room comprises a mixer console, capable of accepting ten various inputs, and there is also a band of "equalisers" (tone controls) to enable adjustment to be made in the sound quality of the various films sent to us from overseas. And elsewhere there is also a bank of six gramophone turntables for use in the adding of sound effects. This is a technique which has been considerably developed by the Television Film Unit, and makes it possible to dub films at very high speed.

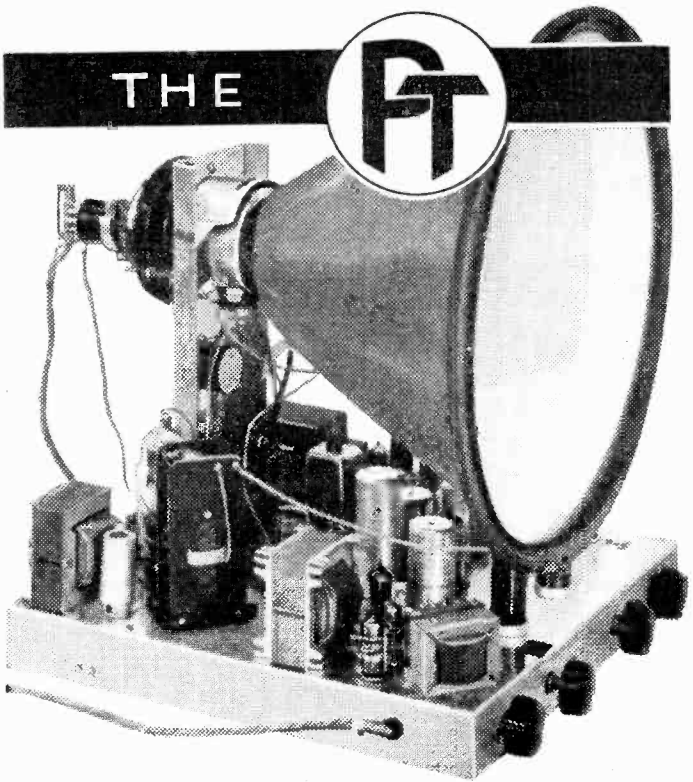
Mixing

In a typical dubbing session there would be, say, four sound tracks on the film phonographs together with the picture film, all previously synchronised in the cutting rooms. The picture film is projected upon a screen and a commentator sitting in the theatre will speak the previously written script into a microphone. In the mixing room the film recordist has complete control of the various sounds coming from the film phonographs, the gramophone banks and the commentator, and can adjust the relative levels to suit the requirements of the particular production. A valuable aid is the footage counter which is seen on a small screen beneath the projected picture and gives the exact footage of film at any instant. All the cue sheets for the particular film being handled are marked in footages, and this facility is of great help to the recordist and his assistants.

Photo Track

The recordist hears the total mixed result on a loud-speaker beside him, and this mixed result is also fed into one of the sound cameras for recording. One of the sound-recording cameras gives a photographic sound track similar to that used in normal cinemas, and the other records on magnetic film, not to be confused with tape. The sound cameras are electrically interlocked with the projectors and phonographs. The use of magnetic film has enabled such topical programmes as "Television Newsreel" to be dubbed immediately previous to transmission. For instance, it is normally dubbed between 5.00 and 7.00 p.m. for transmission at 8.00 p.m. on a given evening. If compelled to use photographic track it would have been necessary to hold the dubbing session three or four hours earlier. Another great advantage of magnetic recording is the extremely high sound quality which it is capable of giving. It also has a great value in economising photographic stock because on a complicated dubbing session for films that are eventually to be put on to photographic sound track it is possible to carry out the dubbing on magnetic film, continuing "takes" until a satisfactory result is obtained. The chosen "take" is then transferred to photographic sound track. The dubbing suite is connected by lines to all the studios in Lime Grove. This makes it possible to use any of the studios for the shooting of film sequences.

THE PT SUPER-VISOR



FURTHER CONSTRUCTIONAL DETAILS AND LINING-UP INSTRUCTIONS OF OUR LATEST RECEIVER

BEFORE going on to further constructional and lining-up details there are one or two points to be cleared up. As many readers will have noted there were two duplications in the reference numbers on the circuit published in the August issue. The resistance joined between VR5 and the chassis, marked R70 in the circuit, should have been R71, whilst the resistor between one grid of V15 and VR6 should be R70 as shown. One further point may be mentioned here and that is the type number of the English Electric tube which is used. This is the T901 as given in the list of parts in the August issue.

Tube Mounting

It was stated last month that the tube is retained in position by two metal clips attached to the condensers C70 and C71. Alternatives are, however, available to the constructor. Firstly, in place of two separate clips a single clip extending the whole of the way between the two condensers may be used, or the tube may be held by the mask. The English Electric can supply a moulded polythene type of mask into which the anti-corona ring will just fit. A small quantity of vaseline or similar lubricant should be smeared round the ring to assist its passage, and the mask is then attached to the front of the cabinet. The mask will hold the tube which is then supported at the neck by the focus mount as already described.

With regard to the scanning accessories, coil, line and frame transformer, etc., these are supplied by Denco and Allen and are interchangeable. It will be found, for instance, that Allen box up a complete kit of the parts, and although in the prototype a Denco component was used for the line and frame output transformer, the Allen parts may be used and vice versa in the case of the other wide-angle components.

Wiring

When all of the parts have been mounted wiring may be commenced, and the diagram on the next two pages shows a reduced scale drawing of this part of the work. It must be emphasised that the artist has not drawn the various condensers and resistors in their actual scale proportions as this would make the drawing difficult to follow at a reduced scale. The positions are approximately correct, however, and wherever possible the wire ends of the components should be cut back to the minimum.

Where wires are attached to the spills projecting from the coils care is necessary to avoid damage or loosening of the coil connections inside the can. The connections which are to be made to the spills should, therefore, be made in the form of small tight rings, preferably with the aid of round-nosed pliers, and where two or more connections are to be made to the same spill, they should all be placed in position at one time, so that only one application of the soldering iron will be needed. A really hot iron must be used and a non-corrosive flux such as Multicore. This will ensure a good clean joint which will not give trouble after a lapse of time. The iron should be sufficiently hot so that the solder runs instantly it is touched to the iron, and it should be emphasised

that the correct method is to place the connections in position first, as just mentioned for the coil spills and then to bring the iron and the cored solder to the joint. Apply both together and the solder should instantly run and form a clean silvery blob, and as soon as sufficient is seen to be round the joint both the iron and solder should be withdrawn. If the iron is not hot enough the component will become unduly heated before the solder runs with possible change of value or damage to the component. The actual solder which we used is the 18 s.w.g. 60/40 which is conveniently strong and of a light enough gauge to enable a small electric soldering iron to be employed.

It will be noted in the wiring plan that some leads are terminated in arrow heads carrying either letters or numbers. Where there is a letter the other end of that lead will be found on the same drawing, roughly in a direction as indicated by the arrow head. This is, of course, to enable the drawing to be kept clean and free from wires criss-crossing which would confuse the constructor. Where there is a number, however, the continuation of that wire will be found on the separate illustration on page 218. This is the scanning coils, focus control and other items mounted on the focus support. The small tag-strip at lower right in this illustration is the connecting tag unit of the scanning coils, and to obtain the picture the right way round this should be mounted so that the two resistors R78 and R79 are to the rear when viewing the complete receiver from the front. The tube base should be wired with the condenser C32 across pins 7 and 11 and lengths of flex attached to the remaining pins as shown. The length of the flex, from the point where it leaves the chassis to the tube base should be 12in. The high-voltage lead to the clip supporting the tube should be made from an 8in. length of ordinary 70-ohm coaxial lead with the outer covering stripped off. Alternatively ordinary motor-car ignition cable may be used but usually this is awkward to solder and unduly heavy.

Lining Up

When all the wiring has been completed go over it again and carefully check with the theoretical diagram if you can read a circuit diagram, but if not, check it against the wiring diagram by carefully marking through each lead so that you can be certain that no wires have been left out or wrongly connected. When finally satisfied that everything is in order turn all variable controls to a fully anti-clockwise position, plug in the fuse connector on the voltage selector panel to the voltage of your mains (or the nearest *higher* voltage if your particular figure is not shown), and insert the valves in their respective valveholders. To avoid turning back to your list of parts the valves are inserted in the following positions: V1, V2, V3, V4, V5, Z77; V6, N78; V7, D77; V8, 12AU7; V9 is the C.R. tube; V10, Z77; V11, DH77; V12, N78; V13, Z77; V14, D77; V15, 12AU7; V16, N78; V17, 6CD6G; V18, 6U4GT; V20, 12AU7; V21, D77. Now slip the tube sheath over the picture tube

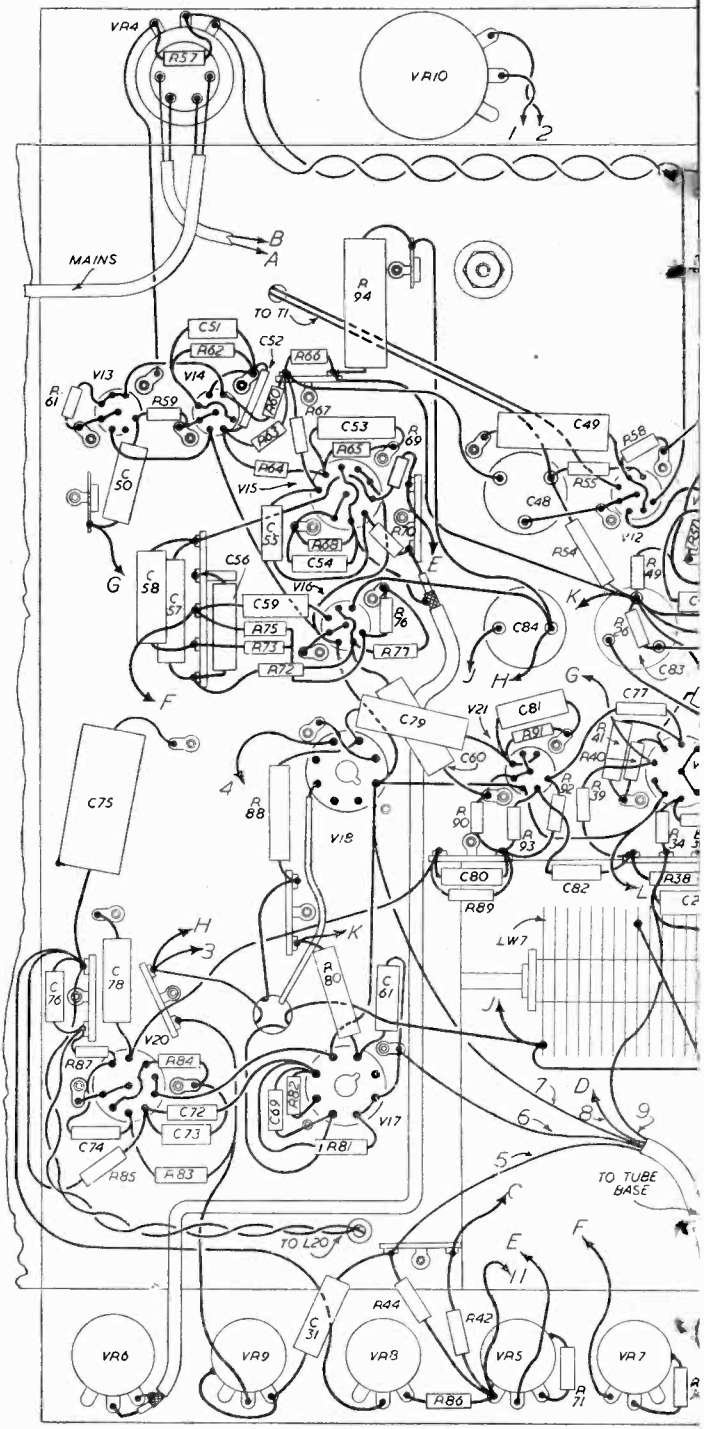
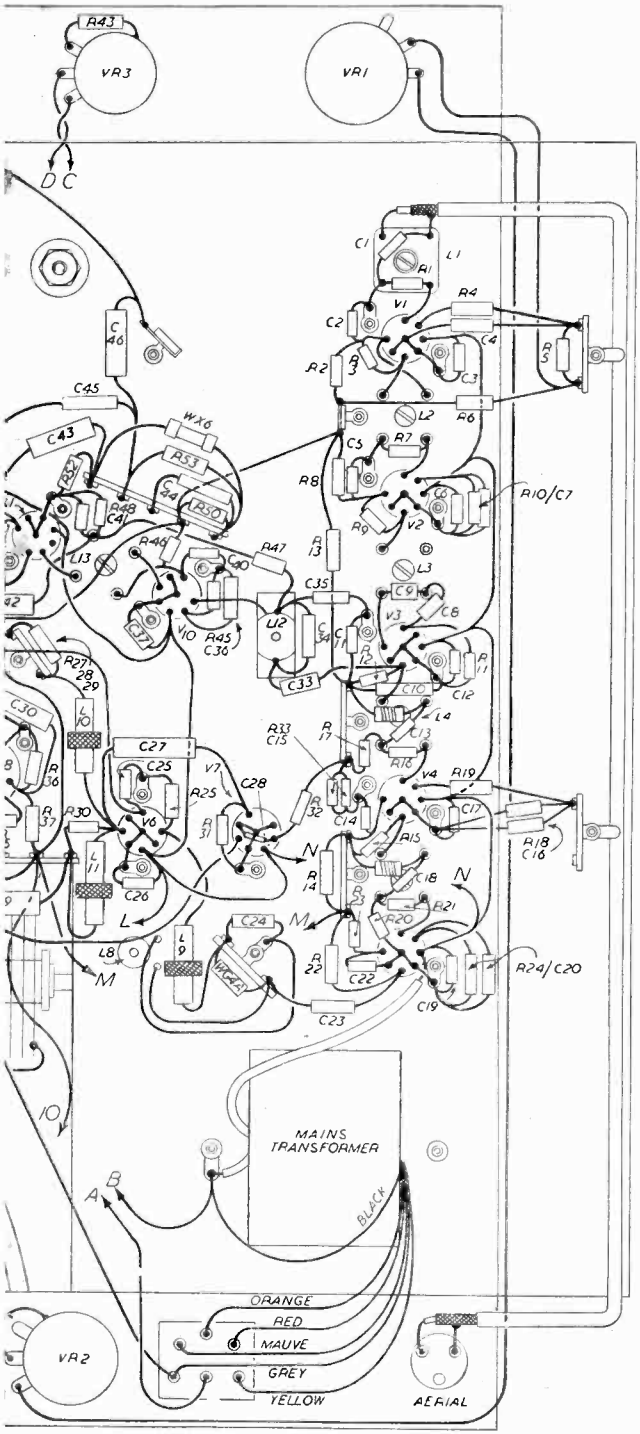


Fig. 5.—Main wiring details below chassis.



ee also Fig. 6 on the following page.

and attach the anti-corona ring to the edge, tucking the edge of the sheath under it to hold it in position. The ring will have to be cut to permit the supporting metal strips to go inside and make contact with the edge of the tube. Now carefully insert the neck of the tube through the coils and rest the edge of the tube on the supports and it should be found quite firm. Slip the ion trap over the neck of the tube with the arrow pointing to the front and push on the base connector. Connect the loudspeaker to the output transformer and plug in the aerial. Before carrying out the trimming it is necessary to short-circuit C15 and C35 by connecting short pieces of wire across them.

Make quite certain that the correct cores and capacitor across L3B are in use for your particular station — as shown in the chart on page 122 of the August issue.

Attach control knobs to the various controls to avoid any risk of shock, as the chassis is "live," and then turn the left-hand control on the front clockwise slowly until a click is heard. The set is now switched on and you should wait two or three minutes for the valves to heat up and attain normal emission. Turn up the brilliance control (VR3) until the tube face becomes illuminated, and then rotate the ion trap, at the same time sliding it backwards and forwards to obtain the brightest possible tube face. As improvement is obtained reduce brilliancy by means of the brilliance control, and continue to adjust the ion trap until you have found its correct position. It is not possible to indicate just where this will be as it varies from tube to tube, but the correct position is that where the tube is brightest, and if there is any shadowing in the corners it will probably mean that it must be moved further backwards or forwards or that the scanning coils need adjustment. When the optimum position has been found carefully lock the trap in position so that it cannot move, but do not tighten it unduly so that you fracture the neck of the tube. The set is now ready for trimming, and this should be carried out in the following manner.

Turn up the volume control to maximum.

Adjust core at the bottom of L3B until sound is heard in the speaker.

Adjust core in L12 until sound becomes maximum, reducing the volume by means of the volume control so that changes can more easily be noted.

When L12 has been set to its best position the programme should be clearly heard in the speaker as the sound transformer L13A and L13B is pre-set by the makers and does not need any adjustment.

The setting of L3B will no doubt have permitted some sort of signal to pass to the tube so the brilliance control should now be turned up slowly until the raster is visible.

Rotate VR10 and VR11 alternately until the lines on the screen are sharply defined and then steady the picture by adjusting the vertical and horizontal hold controls (VR6 and VR9).

Adjust VR8 (horizontal drive) until any

white lines near the centre of the picture disappear.

Adjust VR2 until a good picture control is obtained. This will require balancing with the brilliance control and although the quality of the picture at this point will not be good a compromise should be effected in the balance of black and white.

Adjust the top core of L8A and readjust L12 until any wavering in the picture in sympathy with the sound disappears. This wavering is sound breakthrough and is easy to recognise as it "dances" with the music. The top core of L8A and correct adjustment of L12 (which acts as a sound trap on the vision circuits) will remove this.

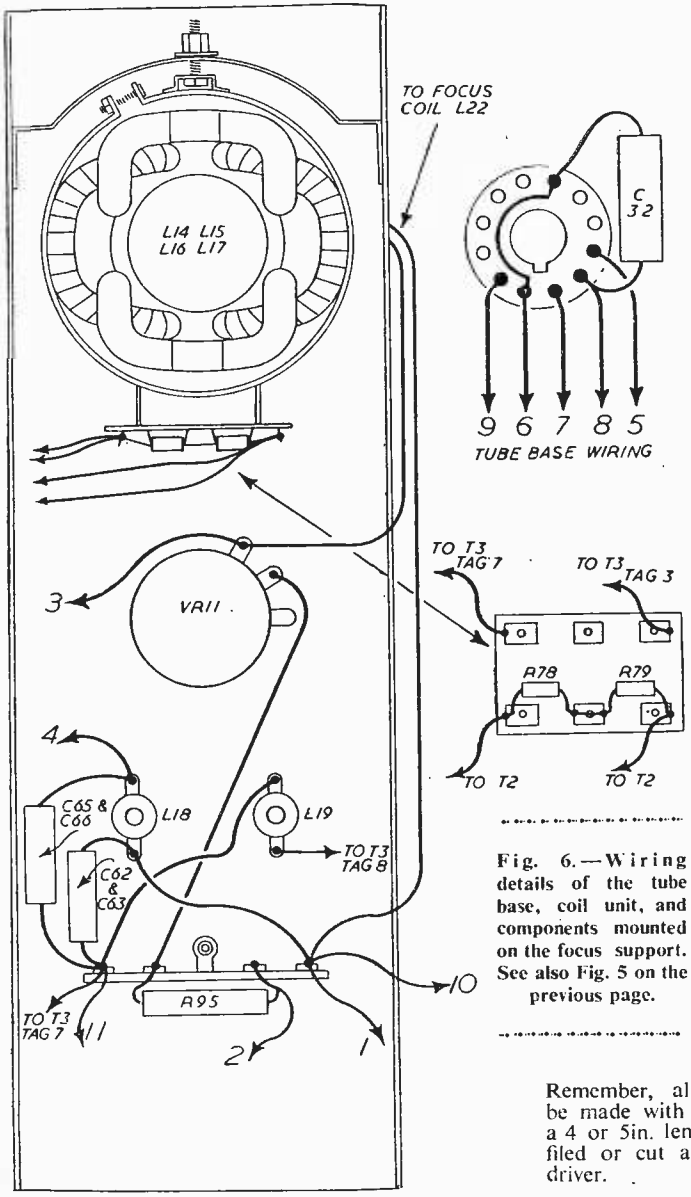


Fig. 6.—Wiring details of the tube base, coil unit, and components mounted on the focus support. See also Fig. 5 on the previous page.

Now short-circuit G1 on V10 to chassis with a short piece of wire temporarily soldered between the pin and the nearest earth point, and again adjust L8A top core until all trace of breakthrough has gone. Then remove the short-circuit.

Adjust the top core of L3A and the bottom of L8B to improve the sharpness of the picture, keeping the sensitivity control in step with any improvements to avoid overloading and to maintain the black and white balance.

Next adjust L1B for optimum brightness.

Now adjust L2A and L2C for best picture.

With the exception of L3B and L13A and L13B all the remaining cores may now be adjusted to give the best picture, remembering to keep the sensitivity control and the brilliance controls nicely balanced to avoid thin or harsh contrasts in the picture.

The short-circuits across C15 and C35 should now be removed.

Adjust VR1 to about the mid-way position and again re-adjust the sensitivity control.

The picture should now be satisfactory from all points of view except that of proportion, and the height and width and linearity controls should now be adjusted to obtain maximum results, whilst L20 should be adjusted for the best horizontal hold. This test is, of course, best carried out when Test Card C is being radiated as then the correct linearity settings may more easily be seen. It may be found here that when adjusting L19, the width control, it will be only just possible to fill the screen with the core screwed fully in. If this is the case the value of condenser C64 should be 4,000 pF., whilst if the width cannot be reduced the condenser should be reduced to 3,000 pF.

To avoid any confusion regarding the positions of the different types of core for reception of Channel 3, 4 and 5, it may be mentioned that in the various screened coils the grid coil is at the lower end. Therefore, in the case of Channels 1 and 2 iron cores are used throughout. For Channels 4 and 5 a brass core takes the place of iron in the *top* of the can for L3, whilst for Channels 3, 4 and 5 a brass core should be inserted at the lower end of the first coil—underneath the chassis. Finally, for Channel 5 a brass core takes the place of the iron cores in both top and bottom of the second coil can. Brass cores may easily be made by cutting off short lengths of OBA rod, to the lengths of the iron cores, and slotting the end with a hacksaw.

Remember, all adjustments of the cores should be made with an insulated implement—preferably a 4 or 5in. length of plastic or bone knitting needle filed or cut at the end in the form of a screwdriver.

(To be continued)

Pages from a TELEVISION ENGINEERS Notebook

9.—VIDEO AMPLIFIERS

A POINT that is often overlooked by the amateur in the design of a video amplifier is the problem of the phase characteristic. Often a stage is designed to give a constant gain over the video-frequency band, but little thought is given to the phase characteristic as it affects the time delay in the passage of the signal through the amplifier.

Video amplifiers used on the present 405-line interlaced system must be capable of passing, with constant gain, all frequencies from 50 cycles per second to at least 2.5 megacycles, and the time delay must be substantially independent of the frequency.

The necessity for a constant time delay over the video band may best be explained by considering the effect upon the picture characteristics that an amplifier having an appreciable high-frequency delay will have, that is, an amplifier is being considered in which the H.F. end of the video band takes a greater time in passing through the stage than the L.F. end. There is, of course, no sharp transition point, and the delay in time gradually increases as the frequency increases. This condition is the general tendency in a practical case.

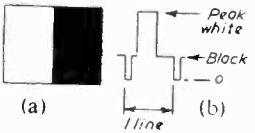
With 405-line scanning and a picture 12in. in width, the spot moves at the rate of roughly 1in. in 7 microseconds across the screen. For a simple picture consisting, as Fig. 1(a) shows, of half-white and half-black pattern, the video signal is a square wave of the form shown at (b), containing a fundamental frequency of 10,125 cycles per second (405 lines at 25 frames), and all its odd harmonics. If this waveform is to pass through the video amplifier without distortion, the stage must have a time delay that is absolutely constant for all frequencies. If the delay decreases with frequency, the higher harmonics of the square wave will be delayed less than the lower frequencies, and the pattern appearing on the tube screen will not be one having a sharp demarcation between white and black as Fig. 1(a) depicts. A difference of as little as 1 microsecond between the time of transit of the H.F. and L.F. ends of the band will bring about a horizontal shift in the H.F. components of the image of about 0.15in. with respect to the L.F. components.

Generally, of course, the picture does not consist of such a sharp demarcation as the example discussed, but is made up of irregular, random variations of light and shade. The necessity for constant time delay is, however, of no less importance in this case, for a poor delay characteristic will lead to severe distortion, particularly in scenes having appreciable detail.

In order to cover all aspects of video amplifier design in a small space, the problem of gain will be dealt with this month, with phase characteristics to follow next month.

Gain Analysis

In a great many home-constructed television receivers, a picture with ragged edges to all outlines, noisy, dirty appearance, smearing and trouble from black-after-white, can be traced to the video amplifier stage having an excessive low- or high-frequency response.



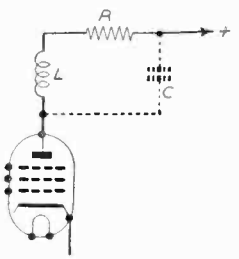


Fig. 1 (above).—A simple black and white example, and Fig. 2 (right).—Stray capacities indicated by C are across the load.

In a normal R.C. coupled amplifier, the upper frequency which can be amplified without appreciable loss of gain is determined by the shunting effect of the valve and stray capacities across the anode load. As this reactance falls with increasing frequency, the use of a very low anode resistive load compensates for the effect to a certain extent and the high-frequency response can be readily extended by this means. The overall gain, however, falls as the load is reduced, and so the extended response is only obtained at the expense of amplification.

The commonest method of maintaining the response of the stage at the highest video frequencies, and the one that is simplest to set up from the amateur point of view, is to insert a properly proportioned inductance in series with the anode load. The effect of this is to equalize the anode impedance at all frequencies up to the higher limit which is determined then by the load R, the inductance L and the total shunting capacity C (Fig. 2).

The gain of such a stage is roughly constant at a value given by g_mR up to and including the frequency f_o which is the top frequency it is desired to amplify. To achieve this it is necessary for R to be made equal to the reactance of the load shunting capacity C at the frequency f_o, that is, $R = \frac{1}{2\pi f_o C}$; and

the reactance of the inductance at f_o must be equal to *half* the load resistance, that is, $R=4\pi f_o L$.

In an uncompensated case, the gain at a frequency f within the video range is given by

$$\frac{g_m R}{\sqrt{1+\frac{f^2}{f_o^2}}} \text{ if } R=\frac{1}{2\pi f_o C}$$

When $f=f_o$, the gain $=\frac{g_m R}{\sqrt{2}}=0.707 g_m R$, and hence the loss is roughly 30 per cent. with respect to the gain of the stage using anode compensation.

It is not possible, of course, to increase f_o indefinitely in the compensated stage. As we have already seen, as f_o is increased, R must be decreased, and since the gain falls off inversely with f_o $(=\frac{g_m}{2\pi f_o C})$ the limiting condition is reached when $\frac{g_m}{2\pi f_o C}=1$, or when $f_o=\frac{g_m}{2\pi C}$. At frequencies higher than this, the amplification of the stage is less than unity.

In the estimation of the capacity C, the output capacity of the amplifier valve, the input capacity of the tube, and strays in the wiring (with care this may be from 5 to 10 pF), must be added. An average total of 20 pF should be allowed for.

A simple means of checking the load capacity experimentally makes use of the fact that the gain of an uncompensated stage falls to 0.707 of its L.F. value at a frequency f for which $R=\frac{1}{2\pi fC}$.

A valve biased just to cut-off is required as a "detector" and a suitable set-up is shown in Fig. 3, the control R_1 being set to reduce the meter reading to zero. With a signal of about 5 to 10 Kc/s applied to the grid of the stage, the input amplitude (which is metered in some way) is increased until the meter in the detector valve reads to, say, 0.1 mA. Now find the frequency f at which the input voltage must be increased to 1.414 ($\sqrt{2}$) times its original (low frequency) value to maintain the detector current at 0.1 mA., that is, f is the frequency at which the stage gain has fallen by about 30 per cent.

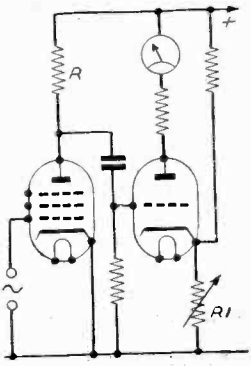


Fig. 3—A circuit arrangement for checking the load capacity.

Knowing this frequency, the shunting capacities making up C can be calculated from $C=\frac{1}{2\pi fR}$. From this must be subtracted the input capacity of the detector valve, unless the tube itself is used as the detector.

It will generally be found that f is lower than the upper frequency limit f_o required. Having found C, R_c can be calculated to satisfy $R_c=\frac{1}{2\pi f_o C}$ R_c being the load to be used with the compensated circuit. Finally, the compensating inductance can be found by using the relationship $R_c=4\pi f_o L$.

The subject of phase delay and other forms of compensation will be dealt with in the next article.

Studio E—Lime Grove

STUDIO E at Lime Grove, London, the initial stage of which was completed and went on the air on August 21, is the first television studio fitted with vision equipment designed for studio use by Marconi's Wireless Telegraph Co., Ltd., for the BBC. Equipment for the studio has been designed to meet the BBC specification.

The studio has a production suite including separate control rooms for both sound and vision. During a programme the producer and his assistants will work at the controls of the large vision mixer in the vision control room, with a view overlooking the studio, while the actual mixer, together with camera control units and distribution amplifiers, is in the nearby apparatus room.

Six Cameras

The studio has been provided with six Marconi image orthicon cameras. Four of these are for normal use during programmes, a fifth will be kept as an operational spare for immediate use if required, while the sixth is for maintenance. This is not assembled, but remains a pool for spare parts.

The mixer control panel has been designed as part of a large desk in front of which are the production and preview monitor screens. The remainder of the mixer consists of rack mounted units which are situated in the apparatus room.

The mixer has 16 inputs, i.e., 16 "services" which can be selected and prepared for transmission. These include the signals from any one of the cameras in use, telecine pictures, different effects and a series of test signals. The controls take any selected input, prepare it—cut, mix or fade, etc.—for transmission, or feed it to any of eight monitor screens; the existing monitors will later be replaced by those of a particularly high quality—14in. for production purposes and 17in. for transmission checking.

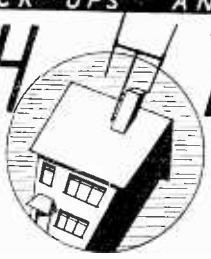
From the mixer and amplifiers, the signals are next passed to Lime Grove's central control room on one of duplicated output channels, and then sent for transmission over the air.

At central control's own apparatus room, Marconi's have installed two synchronising generators which synchronise all pulses from Lime Grove, and five test signal generators. Eventually they will also supply six monoscope cameras for the transmission of captions and test cards.

The firm supplied the main part of the original transmitter equipment for Alexandra Palace—the world's first public television station—at its outset in 1936, and which is still in use today.

TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

EARNING THE DOLLARS

TELEVISION has become quite a valuable dollar-producing export. The production in England of films for American television has been proceeding quietly for two or three years, but British viewers have had little or no opportunity of seeing the results. Documentary features, variety shows and the inevitable parlour games have been duly filmed, canned up and sent to the U.S.A., and more recently there has been an increase in the number of filmed playlets, well produced and cast with top-line stage and film actors. A series of filmed TV plays made at Elstree probably tops this class and some at least of these will be seen by British viewers—at the cinema!

THREE'S COMPANY

LAST month, many first-run cinemas advertised a full length feature film entitled *Three's Company*, which was in actual fact a combination of three contrasting 26 minute magazine stories, designed for American TV, linked together with a smooth commentary by the producer, Douglas Fairbanks, Jnr. Omnibus or group stories have achieved a good measure of popularity following the international success of *Trio* and *Quartet*, both adapted from Somerset Maugham's short stories, *To-night at Eight-Thirty*, from Noël Coward's one-act plays, and *Dead of Night*, Ealing's ghostly saga. It was a clever idea to combine three of the Fairbanks-filmed TV plays into a composite comedy melodrama, in which the satirical humour of *Take a Number* offset the tense macabre atmosphere of *The Scream* and the would-be murder problem of *The Surgeon*. This was quite in the vein of the old Grande Guignol presentations by Sybil Thorndike and her husband, Lewis Casson, at the Little Theatre many years ago.

Since there has been so much public criticism in advance of what sponsored television is going to be like in England, it is worth examining the production values of the trio of playlets which comprise *Three's Company*. Following an agreeable introduction by Douglas Fairbanks (which presumably replaces the preliminary American "commercial") *The Surgeon* presents the problem of a good-for-nothing waster who was shot in the head by the daughter of an eminent surgeon. A twist ending to the story gives a reasonably happy answer to the problem of whether he should save the man or let him die and save his daughter. Next comes *Take a Number*, an extremely funny comedy idea arising from a telephone mix-up and the ruffling of a self-proclaimed unruffled city man. Finally, with *The Scream*, the series winds up with an arresting study of a married man who rents a house which proves to be haunted by the dying scream of his wife, but before she is killed. Absolutely first-class players, including Douglas Fairbanks Jnr. himself (in *The Scream*), supported by Elizabeth Sellars, Basil Sydney, George Benson. Constance Cummings and Basil Sydney give excellent performances, and the direction and production values are of a very high standard. As might be expected, there was a concentration by the cameramen on head close-ups and the photography was in a surprisingly low key, considering its eventual television objective. Nevertheless, the general result was highly entertaining and I will make a point of seeing another similar composite TV feature, released to the cinemas under the title, *The Triangle*.

"SOUNDING BRASS"

THE story of George Hudson, the railway financier of a hundred-or-so years ago, seems to have had a fascination for the BBC and members of its staff. First, Hudson's biography, entitled *The Railway "King"*, was written by R. S. Lambert, a BBC executive, and published in 1934. Then, a year or so ago, there was a biographical radio play, based largely upon certain incidents in the book. Now comes *Sounding Brass*, a TV biography which seems to have acquired a title reminiscent more of an early Mannin novel than the documentary chronicle of an unscrupulous visionary and railway promoter. The facts of Hudson's life story are important, since it was his ambition and ruthlessness which shaped the railway systems of Britain and contributed largely to the industrial progress of the nation in the mid-Victorian era. The rise and fall of this extraordinary man is in itself a greater-than-fiction story, in which famous characters of history, George and Robert Stephenson, the Duke of Wellington, Gladstone, Joseph Locke, Brunel and the Queen Victoria herself, play their parts. The television version by Leslie Burgess truncated the long and chequered real-life story into a series of situations largely taking place in conventional stage-play settings. Edward Chapman gave a very fine performance as Hudson, though he did not entirely convey the tremendous dynamic personality of the great man in Lambert's biography. Megs Jenkins, with her usual clarity of diction, made an excellent Mrs. Hudson, and Ronald Adam did his best with rather poor lines in the part of Meek, Hudson's enemy. The vast canvas of Hudson's life, details of his early railways and their technical trappings were beyond the normal scope of a television play, but nevertheless, Leslie Burgess managed to grasp the mid-Victorian "gaslight" atmosphere. Andrew Osborn is to be congratulated on his production, which ought to be repeated in a few months with additional out-of-door scenes filmed and interpolated. The York Railway Museum could provide the necessary properties if not the Titfield Thunderbolt itself!

RUMOURS

NORMAN COLLINS' offer to the Alexandra Palace Trustees for a lease of the premises upon the departure of the BBC received much publicity in the national Press, as have other possible developments connected

with sponsored television, including a crop of rumours. One "authenticated" story was the establishment of a sponsored TV transmitter at Walton-on-Thames, the actual site mentioned being New Zealand Avenue, a by-pass road around the town. Considering that this point lies at a very low level, only a hundred yards or so away from the banks of the Thames, it would not appear to be the best site for a V.H.F. transmitter. On the other hand, it might be quite a reasonable centre for studio facilities. Not many yards away from the suggested site is situated the Nettlefold Studios, a very well-equipped film studio, having three stages, a fine power plant for lighting, and plenty of workshop, theatre, dressing-room and office accommodation. There is no doubt that having such studio plant adjacent to a TV studio would be a great convenience. In the case of Norman Collins' own High Definition Films, the old film studio at Highbury was taken over and rapidly adapted for the new purposes. Up to now, TV films made there have been filmed in the conventional manner, but it should not be long before the electronic camera system is in use.

OLD THEATRES

TWO or three years ago a good many theatres and music-halls in New York City closed their doors to their normal public and were leased to the television corporations. In a smaller way, the same thing has been happening here with cinemas and theatres taken over by the BBC for both sound radio and television. The Bedford Theatre, Camden Town, The Paris Cinema, Shepherds Bush Empire and other erstwhile places of live entertainment have turned over on a temporary or permanent basis to the BBC. Sponsored TV promoters have made excellent use of the Princes Theatre, Shaftesbury Avenue, and the Penge Empire.

The Shepherds Bush Empire has long been one of the principal suburban music-halls of the Stoll Circuit, but its very proximity to the Lime Grove Studios rendered it a very desirable property to the BBC. TV transmissions from the theatre have been excellent up to now and an important point is that the larger Chiswick Empire, belonging to the same circuit, is only about a mile away. Many of us will regret the passing of so many live theatres, but I suppose that this is one of the things we must expect in this mechanical and electronic age.

BIG-SCREEN TV

IN spite of the tremendous impact of big-screen television on Coronation Day, entertainment proprietors seem to be holding back from investing in this particular type of presentation. A trade technical committee investigated the costs of relaying by V.H.F. or line from central studios and found the cost appalling. In the meantime, along came other "attractions" of a technical character, such as 3-D, Wide Screen and Stereophonic Sound. Each of these things cost a lot of money and will make obsolescent much existing equipment. Nevertheless, polarised spectacles or not, the stereoscopic craze has caught on and is drawing the crowds. What happens when the producers run out of "horrific" stories upon which this medium seems to depend for its appeal?

Television Presentation Suite

THE BBC Television Service has long felt the need for better means than have existed up to now at Alexandra Palace for programme presentation—that is to say, for ensuring the smooth running of the day's programme from item to item, the handling of announcements, intervals and, of course, emergencies and breakdowns when they occur. Consequently, in the planning of Lime Grove, provision was made for a presentation suite, somewhat on the lines of the continuity suites used in the sound service.

The new suite contains three main elements, the central control room, the presentation studio with its own vision-and-sound control room and the technical quality checking room. The principal functions of this suite are :

1. Switching from one source of programme to another as item succeeds item.
2. Handling all announcements and interludes, opening and closing routine and weather reports.
3. Handling breakdown procedure when technical trouble arises.
4. Maintaining a constant check on the technical quality of the sound and picture signals as they leave Lime Grove on their way to the transmitters.

The studio is quite small—27ft. by 20ft., by 10ft. high. It contains two cameras and very simple lighting and sound equipment, the object being to keep to a minimum the number of staff needed to work the studio. One of the cameras will normally be used on the announcer and the other on weather charts, captions, and so on. Next door to the studio, and separated from it by a window, is the room in which both sound and vision from the presentation studio are controlled.

Next door again—and again with large windows in the intervening wall—is the central control room. This room is of the utmost importance, being the focal point for both collection and distribution of all programme items except some of those originating in the regions. There are, in fact, two identical central control rooms next door to one another. This will allow for possible future programme developments. In the meantime one of the two will be in daily use for handling the transmitted programme, whilst the other will be used occasionally for the control of composite programmes involving two or more programme sources, for example, two Lime Grove studios or a studio and an outside broadcast point.

In each C.C.R. there are two desks. One of these contains the switching equipment, both vision and sound, by means of which one programme source after another is connected to the outgoing lines.

The technical quality checking room, which is not yet ready for operation, will be equipped with vision and sound monitoring apparatus of the highest standard. The picture and sound signals from the C.C.R. which is on transmission will be passed through this room so that they can be kept under continuous observation by an engineer whose responsibility it will be to take action or to initiate action if any falling off in quality should be noticeable.

Television Licences

THE following statement shows the approximate number of television licences issued during the year ended July, 1953. The grand total of sound and television licences was 13,010,856.

Region	Number
London Postal ...	785,164
Home Counties ...	280,008
Midland	513,630
North Eastern ...	292,496
North Western ...	325,389
South Western ...	88,904
Wales and Border ...	100,929
Total Eng. and Wales	2,386,520
Scotland	88,634
Northern Ireland ...	4,300
Grand Total ...	2,479,454

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 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.

One Year Needed

COVENTRY CORPORATION has been told that a radio and television relay system could be completely installed in 500 homes within a year of the issue of a licence by the Postmaster-General.

Norway Prepares

IT is reported from Oslo that the Norwegian Government hopes to commence transmitting experimental television signals early next year.

Equipment has been ordered from the Philips works in Holland and the Pye company in England.

Sewing Machine Culprit

ACCORDING to the complaints of TV interference received by G.P.O. engineers, almost a fifth were caused by electric sewing machines. Hair dryers were responsible for 4,000 of the 53,000 cases reported last year while only 1,800 of them were put down to car ignition.

Earlier Evening Services

IT is understood that one of the smaller religious societies has announced in its monthly magazine that evening services on a Sunday will commence in future at 6 p.m. and finish at 7.30 p.m.

This change, the society states, "has been occasioned by the impact of television, for it is believed that many people are remaining at home to see the Sunday evening play. By changing the time of our service, members of the congregation will now be able to return home in time to see most of the television broadcast."

Belgian Commercial TV

THE Belgian Government proposes to introduce a Bill authorising a sponsored radio and television service in which all programmes would be kept outside the Broadcasting Institute's capacity.

No Admittance

WHILE the high-power television transmitters at Sutton Coldfield are being overhauled, a "No Trespassing" rule has been adopted in order to keep away onlookers who might unknowingly damage some of the highly valuable equipment strewn around on the ground.

Costly and delicate transmitter valves are among the mechanisms being checked and replaced and these may only be approached and handled by the qualified technicians.

Dartmoor TV Inquiry

AN inquiry will be held on September 29th at the Castle, Exeter, into the BBC's intention of erecting a television mast on North Hessary Tor in the Dartmoor National Park.

Mr. H. G. Warren has been appointed by Mr. Harold Macmillan, Minister of Housing and Local Government, to conduct the meeting.

TV City

THE first section of the BBC's television building at the White City, London, is completed and should be ready for the BBC to move in by October.

Managers Move

MR. A. E. LAWSON has been appointed assistant sales manager for H.M.V. Radio, Television and Gramophones, following the appointment of Mr. A. E. Newland to an executive position in the E.M.I. International Department at the Dublin branch of the company.

Mr. A. E. Lawson.

Mr. A. E. Newland.

Mr. A. E. Lawson was at one time London manager of the Edison Bell Company, later becoming assistant manager of the Oxford Street showrooms of The Gramophone Company. He was appointed television manager for H.M.V. in April, 1949.

Mr. Newland has been with the company for 37 years, joining

as a junior correspondence clerk in 1916. He was appointed home sales manager for H.M.V. Radio and Television in March, 1949.

Island Station

SPEAKING at a fête at Freshwater, Isle of Wight, recently, Sir Peter MacDonald, K.B.E., M.P., told the public that it had been rumoured that the new TV station on the island would be completed within six months.

This was untrue, he said. It was hoped that construction would begin in six months and that the transmitter would be ready within 18 months.

of cinemas in the United States, but now Hollywood's "better pictures" policy is beginning to pay dividends. Several films, some British, have established attendance records at New York cinemas. Most popular American picture in recent months has been "From Here To Eternity," while Britain's coloured Coronation film, "A Queen Is Crowned" and "The Cruel Sea," have also been drawing in the crowds. Although English films have a large following in New York, however, they are not so greatly favoured by picture-goers in the smaller American towns.

British soldiers repatriated from prison camps in North Korea pass through Freedom Village on the first stage of their journey home. BBC cameraman, Ronnie Noble, takes a shot of a group of them for Television Newsreel.

New Post

MR. ROBIN WHITWORTH, 42, producer of senior features in the BBC Midland Region, will take up the position from October 1st of documentary organiser in the television service.

He becomes assistant to Paul Rotha, who was recently made chief of the documentary department.

Cinema Looks Up

FOLLOWING a steady decline in box-office takings, New York cinemas appear to be entering a "boom" period.

The impact of television has resulted in the closing of hundreds

No Plugging on Colour

WHEN it gave permission for the Columbia Broadcasting System to send out colour transmissions on September 10th, the Federal Communications Commission ruled that the broadcasts should be entirely non-commercial.

Workers Like TV

THE latest G.P.O. television licence survey shows that 80 per cent. of the viewers in the Midlands are miners or factory workers; in some areas almost every working-class family possesses a receiver.

It is considered that the Black Country has more television sets than any other area in the country, especially in the Dudley, Walsall and Cannock districts.

Barney's New Post

BARNEY COLEHAN, 39, who has just completed a six months' television training course in London, has been appointed as second TV announcer for the North Region.

Radio listeners will remember him for his "Have A Go" in the Light Programme. His northern productions to date include "City Varieties" from Leeds and "Stars At Blackpool."

"Brutal Awakening"

HOLIDAYING in Biarritz, film producer Sam Goldwyn has given thanks for television which, he says, is "a brutal but necessary awakening for the film industry."

Commenting on the fact that there are 50 million TV receivers in America, he continues: "While television is the most formidable competitor Hollywood has ever known, I personally am grateful to television. It provided the film industry with a badly-needed rival. The public does not want to see films replaced except by better films."

Canada Buys More

WHEREAS Canada bought only 2,442,781 dollars' worth of TV sets in June, 1952, the value of sets bought in June of this year amounted to 4,234,035 dollars.

"Teleclub"

A NEW fortnightly series entitled "Teleclub" will start on Friday, October 9th. It is designed especially for young people between the ages of sixteen and twenty-one, each programme lasting an hour.

The programme will be written and produced on magazine lines, with a script by Larry Forrester. The resident host at the "Teleclub" will be Benny Lee, assisted by Jean Aubrey. Each edition is to include about seven separate items, ranging from advice on careers to jam sessions.

Possibly the most important single feature of the series is the extent to which young people are themselves brought into it. All the items except one, Valentine Dyall in an "Explain This" spot, are to include youngsters from different parts of the country.

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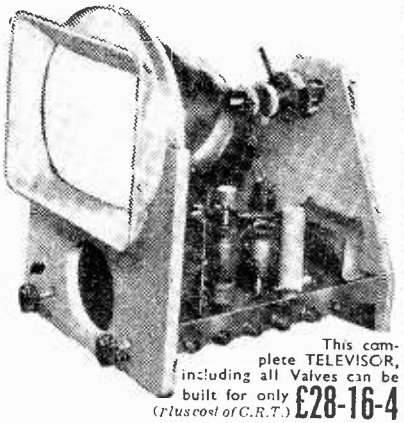

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CORRESPONDENCE

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

A PLEA TO THE BBC

SIR,—Might I through the medium of your journal make a plea to the BBC for some modification to their lighting when performing plays.

For some reason plays are apparently given in semi-darkness, and this puts a big handicap on sets which are not so young; in fact, to get adequate illumination with an older C.R.T., that is to say, one that has had considerable use, it is often necessary to turn up brilliance until the fly-back lines are clearly visible, spoiling the whole effect.

I have two identical sets using 12in. C.R.Ts., E.H.T. voltage 10 kV., which is ample. One has a fairly new C.R.T. and the other one with some two and a half years' service to its credit; the one with the new tube gives an adequately illuminated picture even on dark scenes, but the older tube gives a thinner picture and is just not quite bright enough unless the fly-back lines are just visible.

Changing the tubes reverses the situation, so neither set is at fault, and I am well within the service area of Holme Moss.

I feel that there must be thousands of viewers with not so new C.R.Ts. and the BBC ought to consider these people, because as time goes on thousands more will join their ranks.

Café Continental is often spoiled by inadequate general lighting, and too much spot lighting, until it becomes irritating.

What do other readers think? I should be interested to hear their views.—CECIL HARPER (Bolton).

"DANGEROUS" TUBES

SIR,—In answer to "Live" tube face in the September issue of P.T. Only yesterday my friend and I tried a faulty CRM123, which we acquired during the week, in his set. The tube gave a perfect picture during the morning and afternoon transmissions. Then on switching on for the evening, the tube gave a pale watery picture. The top of the cabinet was removed. I at once detected the sound of arcing towards the front of the set. (The receivers are mounted on stands about half the height of the tube, the end corners coming to within a ¼in. of the tube bulb.) Although not visible, the arcing was between the tube bulb and the corner of the sound chassis. I touched the face of the tube but withdrew smartly. The bulb and face were charged with E.H.T.!

To me the explanation looks obvious. A good inspection of the tube, and I noticed that just behind the E.H.T. cap, where the bulb drops steeply to join the neck, the silver coating inside the tube was partly "eaten" away. This looks to me as though the E.H.T. is jumping from the wire just under the anode cap to the internal coating.

Tube Reactivating: Another contact of mine rigged a tube for reactivating CRM121 H.T. he got from his Viewmaster. He put 8 volts on the heater, allowed the emission to rise to its maximum, then drop to zero. He then put the tube into the set. It has been working at about 80 per cent. for a few weeks now. The job took about 20 minutes.—J. CONNELL (Radcliffe).

REACTIVATING TUBES

SIR,—Having read R. L. King's letter on reactivating and your quest for practical information, I should like to provide a few comments on the process.

A fellow TV engineer and myself made a reactivator about ten months ago and for a period kept graphs of all tube relifing attempts. Unfortunately, these graphs are not available now for your perusal, as we reached certain conclusions months ago upon which we base our chances of success, and the graphs were allowed to lapse. A large number of tests were carried out with Mazda, Mullard, Emiscope and Brimar tubes, and conclusions reached stand for these four types.

We found that in the event of an immediate rise in current (heater voltage 20 per cent. more than rated) no success could be expected, although Brimar tubes would give a good picture for about two weeks, but would then drop to their original low emission state in company with the others, these taking only a matter of hours to fade out.

(1) *Conclusion:* Rapid rise to 10 mA. or more on starting reactivation—switch off and if possible run the tube at 50 per cent. over rated heater voltage, when a reasonable picture has always been obtained; this has, in some cases, lasted six months or more.

If, on the other hand, a gradual rise in current is experienced (20 per cent. over rated heaters) taking anything over 20 minutes to reach 10 mA.s or more, then a reasonable picture can be confidently expected. In no case has a reactivation in this manner failed to work. One 10in. E.M.I. tube dealt with last autumn providing a perfect picture up to date: this was the first after the original experiments and all others since then have kept up to scratch.

(2) *Conclusion:* Gradual rise in current—success.

Other points that I would like to make are:

All Brimar tubes have fallen in the first class, probably a coincidence, but even so I prefer not to attempt this type of tube. Overrunning the heaters seems a better proposition.

Mazda tubes fall into both categories and give a good picture after reactivation, but it has been found that if the tube in the first class is overrun on the heaters to obtain a picture, no more than 25 per cent. should be added or the heaters will fail after a few hours' running.

Mullard tubes fall mainly into the second class and no overrunning of the heaters has yet been necessary.

E.M.I. tubes are unpredictable, and very few have been dealt with due to a nasty habit of going O.C. heater at the slightest excuse, but as detailed above success has been obtained.

Our gear is very much as you published: we watch both current and heater voltage during the process and find it unnecessary to go above 50 per cent. over rated heaters for success. We have so much confidence in the system, providing the tube falls within the second category, that we have no hesitation in applying it to customers' sets, providing their permission is obtained. As only labour costs are involved it is quite a cheap method of providing a useful extension to viewing.—H. Hall (Loughton).

(*See Editorial article on page* 195.—ED.)

TEST GEAR CONSTRUCTION

SIR,—As a full-time radio and television service engineer, I receive plenty of technical reading matter, but always find it refreshing to read some article by Mr. Gordon J. King or Mr. Edwin N. Bradley. They are both to be congratulated on the standard of their articles.

May we have a few articles on test-gear construction? Many readers must have made up test-gear to fill some particular want of their own, as I have done, and I am sure that one thing you seem to have left out of your excellent journal is the Wobbulator for TV. Could we hope for an article on this useful and interesting instrument, which I am sure would be of great use to the many amateur constructors of TV receivers who are in possession of oscilloscopes? I have searched in vain for information on this instrument in many libraries.—A. J. WALTON (Preston).

PRE-DETECTOR STAGES

SIR,—May I express appreciation for the series of articles under the heading of "Pre-detector Stages," and previous to that the series concerning the video amplifier stage. I would, however, request you to supplement the series with some practical guidance upon some of the simpler points such as the minimum values of bias and screen-grid by-pass capacitors for R.F. and I.F. stages.

Further, whenever quantitative information is possible it is a boon to the experimenter constructor. As an example, let me say I have all copies of PRACTICAL TELEVISION except five, and after thorough search through the issues I have only found one reference to the output of the video detector, and if I remember rightly this was quoted as 125 microamps approximately. Of course, each design will vary, indeed, and any measurement taken will be an approximation of the average D.C. content only if taken with an ordinary milliamp meter, but the average constructor does not possess costly equipment and must perforce rely upon simple meters.

I would say that I fail to understand how 125 microamps across a normal load of 5 KΩ could produce sufficient signal amplitude when applied to the most ambitious video stage, possibly to modulate a C.R.T. with anything but a very modest grid base. However, my deductions may be wrong and I would welcome some guidance upon this particular point, as I can obtain a reading of 150 micro-amps flowing through a 100 KΩ resistor with all circuits peaked and the diode load resistor remaining in circuit. With the I.F. stages well staggered, the modulation is sufficient to produce a dim picture with a diode current reading of 20 to 30 micro-amps flowing through the 100 K. resistor. By my calculations this produces approximately 2-3 volts or, conversely, between 400 and 500 microamps flowing through the 5 KΩ load resistor.

Assuming many factors, including an excellent video stage producing amplification of 15 times (at some frequencies), one could expect an output ranging from 0 to peak white at about 55 volts.

Could any reader advise me what reading to expect from a circuit like the "P.W." or "Lynx" when measured through the diode load? Also, is it usual to obtain a fairly loud audible signal by connecting 'phones and isolating capacitor from screen-grid or final R.F. or I.F. stage? I can obtain as loud a signal by this means as from the diode, in spite of wide experiment with decoupling values and bias adjustments.—L. A. BARKER (Liverpool).

AIRCRAFT FLUTTER

SIR,—Much has been written and said in the past about motor-car interference and the need for litigation or Parliamentary action to make it illegal to run a vehicle which can interfere with television programmes. But little appears to have been said concerning something which I think, and indeed find, much more annoying. I refer to the flutter and variation in picture caused by passing aircraft. Living on a civil airline route, we are debarred from maximum enjoyment by the way the picture moves and goes alternately bright and dark, and I should have thought it possible to make a regulation to ensure that 'planes keep at a certain height to avoid this trouble. There seems to be no cure which I can add as in the case of car interference.—H. DISNEY (Barnet).

(One of the most satisfactory ways of reducing the interference is by the use of a reliable H-type aerial, as you will almost certainly find that the majority of the picture variation takes place after the aircraft has passed your location in relation to the transmitter. Additionally, the special filter between the video stage and the tube will help to even out the variations and you should not find the entertainment value ruined if attention is paid to these points.—ED.)

TWISTED VERTICALS

SIR,—I am very interested by the queries of both Mr. Blackwood and Mr. Gascoigne in the August issue as I think that these two faults are, to a certain extent, associated.

I have converted a new 62A unit (surely about the best there is for the job) into a 20-valve receiver, using a T.R.F. vision strip, standard Muller timebases and VCR97 tube (full picture). The five-valve sound unit is on the same chassis, while all power supplies and speaker are external. This gives good results using a single dipole aerial approximately 25 miles from Alexandra Palace, except for the fault described by Mr. Gascoigne. I should add here that in my case the distortion on the picture is hardly noticeable and does not detract from an evening's viewing.

If Mr. Gascoigne disconnects his aerial and turns the brilliance down as far as possible, he may find a dark band across the screen, the width of which coincides with the width of his "bulge" in the frame scan. This may be across the centre or at the top and one at the bottom of the picture. This is the trouble that I experienced, although I found that it almost vanished when the signal was applied, due to the action of the D.C. restorer.

Now this is where Mr. Blackwood's trouble comes in. I, too, found that these dark bands reversed themselves on change of programme, i.e., from the top and bottom of the picture to the centre, and vice versa. From the details given by Mr. Blackwood I should say that he is using enough picture brightness to overcome the dark bands, but the distortion associated with them is still present. Hence when the distortion is present across the centre of the screen, Mr. Blackwood would notice it more easily than after a change of programme when it has moved to the top and bottom of the screen.

If Mr. Blackwood and Mr. Gascoigne concentrate on frame timebase details, design and layout, they may be able to effect an improvement, although it will probably be rather difficult to remove the fault altogether, especially where the E.H.T. is derived via a mains transformer.—F. COLE (Greenhithe).

YOUR Problems SOLVED

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 239 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

E.H.T. FAULT

My televisor, a Phillips Projection Model, 1400A, has been giving me focusing trouble; the screen has been covered with what I should describe as snow falling quickly. The picture lacked both depth and tone and definition. After checking the deflector coil, focus control and smoothing capacitors which were found to be O.K., I accidentally found the trouble. When the aerial connections from the dipole are connected to the televisor, the picture is as stated above, hut when only using one-half of the dipole the picture strength is, to make a guess, doubled, and everything concerning the picture is normal. Although this has cleared up the trouble for the present, I feel sure that there is still some fault that should be corrected.—J. Steele (Staffs).

The effect you describe is probably due to a breakdown or poor insulation somewhere in the feeder cable, though we fail to see how the picture signal strength can directly affect the focusing performance. Usually, a poor focus performance on your model receiver is the result of a defective E.H.T. unit, for sometimes the "ringing" transformer develops short-circuit turns, or one of the E.H.T. rectifier valves loses emission slightly to reduce the overall E.H.T. potential and thus affect focusing and E.H.T. regulation by this means.

CORONA DISCHARGE

I would be glad if you can assist me with a problem concerning my Ferguson TV receiver, model 968T.

There was quite a bad corona discharge around the E751 heater pins on the line output and E.H.T. transformer.

I have since changed the latter with a new one, have put in a new PL38 (line output) and a new E.H.T. rectifier (EY51).

In spite of this I can still see slight discharge around the heater pins on the transformer, and can occasionally see a spark jump across from points marked × on the enclosed plan view of the transformer; all this, of course, is in a darkened room.

I can see the effect of this on a blank raster when aerial is removed; it is a pin-prick spark on the screen every now and again.

I have tried cleaning up the pins on the transformer, but it hasn't stopped the fault—what can you suggest? And what would you say is the cause of this trouble? —B. A. Firth (High Wycombe).

An uneven soldered connection or a strand of wire projecting from the soldered joint will most certainly aggravate the effect of a corona discharge across the two points mentioned. Considerable time should be spent in remaking the connections until a perfectly symmetrical blob of solder embraces the entire joint. It is sometimes advisable to solder a flat disc about ½in. in diameter to the E.H.T. rectifier heater connection, and a similar disc to the red wire connection. The discs should be so positioned that their faces are parallel and as far as possible away from each other. Such an inclusion has the effect of reducing any high static charge, such as may occur between two points, and thereby eases the possibility of corona.

FRAME FAULT

My TV set (Model 968T) is two and a half years old and up to recently has given good service; it works perfectly for a few days and then the height of the picture shortens, leaving a margin of ½in. at the top and bottom of the screen. Even after adjusting the picture height knob to the fullest extent it still leaves a margin of a ½in. at the top and bottom and anything in that reclaimed margin is pulled out. For instance, if a person stands up in the picture, the top of their head is pulled out egg shape.

The next time the set is switched on I have to turn the picture height knob back to the correct position.

Sometimes the picture shortening occurs half an hour after switching on, but mostly after two hours, and, as I said before, some days it is perfect.—W. McDowell (South Harrow).

The symptom you are experiencing is most likely the result of an intermittently defective valve in the frame timebase circuit. Two triode pentode valves (ECL80's) are used here, and the triode sections are cross coupled to operate in a multi-vibrator circuit. The pentode section of one valve is employed as sync separator, while the pentode of the other functions as frame output. The valve incorporating the sync separator is located on the right-hand side of the picture-tube neck, adjacent to the far face of the deflector coils. The other valve is positioned in the far left-hand corner of the chassis, close to a transformer (the frame output transformer)—both are viewed looking into the chassis from the rear of the receiver. It may be advisable to check these valves by substitution, if possible, for a normal emission test does not always reveal a valve defect that might give rise to a fault of this nature.

SCAN COILS RINGING

I completed a "View Master" about a month ago, using the wide-angle modifications as published in PRACTICAL TELEVISION. The tube is an Emitron 14KP4.

There are two faults on the picture, and I should be very grateful for any assistance you can give me. First, when the picture is on, there appear to be four bands of uneven illumination vertically on the tube face. When the picture goes off (unmodulated carrier only) the raster has alternate light and dark bands vertically.

I believe this is due to 100 cycle modulation of the line scan.

Could you please confirm if this is so?

Re the frame amp cathode resistor. In the article you state that a slight adjustment of this resistor will clear the fault. Could you tell me whether it needs to be greater or less than 330 ohms?

I have not much time available for dismantling the set so I cannot afford the time to adopt the trial and error method.—Eric Oldham (Manchester).

The vertical light and dark bands are not due to

100 cycle modulation of the line scan but are caused by leakage inductance in the scanning coils ringing. It can only be eliminated by careful adjustment of the condenser connected across one half of the scanning coils. Normally this is 47 pF., but it may be that in your case it requires to be altered, but we are unable to tell you to what value it should be altered.

Regarding the frame distortion, the best method of adjusting the cathode resistor is to connect a 500Ω variable resistor in series with a 220Ω fixed resistor in place of the 330Ω at present in use, then adjust the variable resistor on the tuning signal.

ION-TRAP ADJUSTMENT

I am just completing the construction of the "View Master" set and am troubled with cornering at the top left of the screen. I have discovered that the position of the ion-trap magnet—tube Mullard MW22-16—affects the area of cornering. By adjusting the magnet I can fill out to corner, but in so doing the brilliance is reduced to such a level that the raster disappears and if the brilliance control is advanced the area of cornering increases as the control is increased. Can you suggest the cause of this ?—James C. M. Masterton (Edinburgh).

From your description it is evident that your ion-trap magnet is not correctly adjusted ; it is essential that this should be adjusted to give the brightest picture and if you experience "corner cutting" it should be eliminated by adjusting the focus ring ; only a slight readjustment to the ion-trap magnet should normally be made. If the "corner cutting" is excessive it may be due to the scanning coils being too long or to the field of the focus magnet affecting the field of the ion-trap magnet.

BEGINNER'S TV RECEIVER

Will you please forward coil winding data for L3 and L5 of above receiver. I have a unit R.3131 in lieu of R.3170A.

Unfortunately this unit, although apparently very similar, has no sub-chassis and did not provide me with coils for alteration to your instructions.—R. H. Gibson (Liverpool, 21).

L3 should have 12 turns close-wound 30 s.w.g. on 3/8 former. L5 requires five turns 12 s.w.g. wire, ⅛in. spacing ½in. diameter.

SLIPPING SYNC

I built a "View Master" four months ago and it was working very well, giving a good clear picture, until lately when this fault arose: after the set has been running perfectly for about an hour the line sync starts slipping, followed by complete break up of picture, leaving a glaring white appearance to the screen. Switching the set off for about 15 minutes and then switching on brings the picture back as before but with a greatly reduced quality such as streaking and smearing on black and whites. Would be glad of any suggestion.—A. Jones (Wallasey).

The fault with the receiver which causes the line sync to fail is probably due to the alignment altering due to warming up of the receiver. It is possible that you have not adequately locked the iron dust cores, in which case these may shift due to mechanical vibration, or alternatively the coils may be loose or even condensers have an incorrect temperature coefficient. It is also possible for line sync to fail if R21 changes its resistance.

"VIEW MASTER" LINE TROUBLE

We were interested to see a query regarding the vertical white line on the View Master screen (July issue.) Our advice was sought on the same trouble some time ago.

The list of modifications given in the View Master manual for fitting a 12in. tube includes fitting a 0.5 μF condenser in parallel with C41. This seemed to us to be rather a drastic increase and we suggested fitting a 0.05 μF condenser instead, and this effected a complete cure.

Perhaps, through your journal, you could suggest to the designer of the "View Master" that a mistake has been made, possibly a printing error.—K. W. Newman (S.E.18).

There most certainly is not an error in specifying a 0.5 μF condenser to be connected in parallel with C41 ; the effect which you have experienced is due to either R46 or C38 being low in value ; possibly both are on the bottom tolerance, in which case the drive to the output valve becomes excessive and, therefore, the reduction in feed-back brought about by connecting a 0.5 μF condenser is sufficient to overdrive the valve. It is better therefore to connect the 0.5 μF condenser and increase the value of R46.

TUNING COIL DIFFICULTIES

I have just completed a "View Master" Sutton Coldfield set and have aligned to sound, but for some reason I cannot align to vision. I have tried with a signal generator, the first vision signal received from it at aerial input was 100 Mc/s and after long and careful stage-by-stage adjustment the aerial reading was 73 Mc/s at the expense of sound, and it seems impossible to get below that, also at that point I get oscillation which appears to come from U3.

Advice given to me recommends hanging a 10 pF condenser across each vision coil to bring the "megs" down and to put a variable resistor on R.17 to screen, which I must increase at oscillation point.—W. Hutchings (Wolverton).

There should be no difficulty in aligning to the vision channel and from your description we suspect that the sound rejector coils are too tightly coupled to the tuned circuits and the spacing should, therefore, be increased, the sound rejector coupling coils being left at the top of the moulded formers. Instability will only occur if the receiver has not been wired correctly to the specified diagram and we suggest that you carefully examine the wiring comparing this with the diagrams and particularly the tuning coils and the spigots of the EF50 valveholders.

BAD JOINT?

I built a set three years ago and it has recently developed the following fault.

After switching on and allowing it to warm up, then turning up the brightness control to the normal setting, *no* picture appears. Also the sound is very weak. By turning up the brightness beyond the normal setting, the raster appears but is unmodulated, as if no signal were being transmitted. By switching on and off quickly a number of times, everything returns to normal.

Sometimes during the programme, the picture will gradually fade out altogether and the sound diminishes greatly. Here again, it usually returns to normal by quickly switching on and off.

As the trouble appears to be getting worse I should very much appreciate your advice. — L. H. White (S.W.15).

The fault you mention is most likely to be in the V1 stage and is probably due to a partial disconnection of a high resistance joint and it will be necessary for you to examine closely each soldered joint and component in this stage including the valve itself.

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"VIEWMASTER" Valves, exact to specification, guaranteed new and boxed, comprising 5 EF50, 1 6P25, 1KT61, 1 EBC33, 1 EB91, 2 6K25, 1 6P28, set of 12 **£6/2/6**; with EF91 **7/-** extra (post and insurance 2/-); "Tele-King" 16in. Receiver, complete set of 17 valves exact to specification, **£9/9/-**; 6AM6, EF91, 6F12, Z77, 8D3, 6C4, L77, W77, EF92, 6AM5, EL91, 12AX7, **7/9**; any 8 for **56/-**; EB91, 6AL5, HVR2A, **6/9**; 1.4v miniatures, 1S5, 1R5, 1T4, 3S4, 3V4, 1L4, 3Q4, 3A4, **7/6**; set of any 4 **27/6**; 6V6G, 6F6G, KT63, Y63, EF8, EF39, EBC33, EF50, 20D1, 7B7, 7C5, 7C6, 7H7, 7S7, **7/6**; 5Z4G, 5U4G, MU14, 7Y4, U22, U78, DH77, 6AT6, 12AT7, ECC81, 6X4, 6BA6, 6BE6, 6BW6, 6J6, EC91, Pen46, 6V6GT, PY82, 6LD20, 6X5GT, **8/6**; EL38, PL38, **21/-**; PZ30, GZ32, 6U4GT, DK32, 1A7GT, **16/9**; 6P25, N78, **15/-**; CL33, U25, **13/6**; UU8, U16, DF33, 1N5GT, **12/6**; EAC91, ECC91, 6A7, UBF80, 6F1, 6F14, **12/-**; PL81, PL82, PY81, UCH42, UL41, X65, 10F9, 10LD11, 10C1, 10C2, **11/-**; ECL80, EF80, EY51, R12, PY80, 6F15, 6C9, 10F1, 10P13, AZ31, CY31, 43, KT33C, 6K8GT, 12K8GT, EAF42, R10, **10/6**; 25Z5, 25Z6GT, EBC41, UBC41, UF41, DL35, 1C5GT, DAC32, 1H5GT, DL33, 3Q5GT, **10/-**; 6SN7GT, 6SL7GT, 6Q7GT, 12Q7GT, 12K7GT, 6K8G, 25Z4G, 25A6G, EF41, **9/6**; U50, 5Y3GT, 25L6GT, 35L6GT, 50L6GT, 35Z4GT, 80, UU9, U404, UY41, EZ40, **9/-**; 6K7G, **6/-**. All new and boxed; postage 4d. per valve extra. READERS RADIO, 24, Colberg Place, Stamford Hill, London, N.16. (STA. 4587.)

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OFFERS: Viewmaster A.P. with preamp, less speaker; needs retrimming; Ferranti tube. Box No. 155, c/o PRACTICAL TELEVISION.

VIEWMASTER KITS, brand new, specified parts, complete less speaker, **£25/10/-**; assembled sound/vision Chassis, wired, lined up and tested, with specified parts, **£7/7/-**, with alternatives **£5/13/6**. Special offers: Wenvoe Coil Sets, **15/-**; Resistor Kits, each resistor in packet marked with value and place in set, **26/-**; Heater Transformer, **29/6**; Auto type, **35/-**. S.A.E. brings list. MASSEY, 58, Wakefield Ave., Hull.

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NEW VALVES WANTED, small or large quantities, 3Q4, 6V6, 5Z4, ECL80, EF80, KT66, KT61, 6L6N, VR150/30, 5R4, 80, etc., etc. Prompt cash. WM. CARVIS, 103, North Street, Leeds, 7.

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I.P.R.E. Data for constructing TV Aerial-strength Meter, **7/6**; 5,500 Alignment Peaks for superhets, **5/9**; sample copy "Practical Radio Engineer," 2/-. Membership-examination particulars, **1/-**. Syllabus of seven postal courses free and post free. SECRETARY, I.P.R.E., 20, Fairfield Road, London, N.8.

News from the Trade

Rainbow Pre-amplifier

RAINBOW RADIO announce the release of a new unit (seen below) which has decided advantages over their original 1-valve single and six outlet models.

A new feature is the gain control which allows optimum results to be obtained with all types of receivers. With this feature the amplifier may also be used for remote control. Of equal interest is the redesigned top panel. The single socket outlet section can easily be removed and replaced by a panel having 2 to 8 Belling-Lee co-axial socket outlets according to requirements, whilst retaining the 75 ohms balanced outlet, should this be required.

The unit has a built-in power supply using metal rectifier and is for use on A.C. mains 200/250 volts 50 cycles only. Excellent signal to valve noise ratio is obtained with a Mullard EF91 valve and the staggered input and output transformers are brass and iron cored, and well damped, to preserve the overall response.

It is suitable for use with all makes of TV receivers, including A.C./D.C. types, may be mounted on the back of most and is contained in a ventilated black crackle finished steel case measuring 8⅝in. x 4¾in. x 2½in., the panel being grey stove enamelled.

The retail price of a single outlet unit is £5 17s. 6d. and is increased by 3s. 6d. per outlet up to eight points.—Rainbow Radio Mfg. Co., Ltd., Mincing Lane, Blackburn.

The new Rainbow Pre-amp.

Preston "Lynx" Coils

READERS who do not wish to go to the trouble of winding their own coils and correction chokes for the "Lynx" receiver will be interested to know that a ready-made set of these components is available from Messrs. C. O. Preston and Son. These are wound exactly to specification and include the various condensers as described by the designer. The oscillator coil has the trimmer ready mounted, and the components have been tested and found satisfactory. Each can is labelled with the coil and condenser numbers, and is supplied with fixing screws. The price per set is 35s.—C. O. Preston and Son, Healey Lane, Batley, Yorks.

G.E.C. Germanium Diodes

THE range of G.E.C. germanium diodes which are of the point-contact glass capsule type has recently been revised and extended by the addition of several interesting new types.

Of the existing types, the GEX00 has been discontinued and the GEX44/1 replaced by the GEX34 for all purposes. The GEX34 is intended primarily for use as a television sound detector and sound noise limiter, and as a high level vision detector. It is capable of driving the sound output stage direct, where a sufficiently great R.F. input is available. The GEX35 remains the recommended type for low level vision detection and general purpose use.

The GEX45/1 and GEX55/1 high back resistance general purpose diodes are continued unchanged as is the GEX66 low-resistance V.H.F. mixer, which will operate efficiently up to 1,000 Mc/s and give a useful response at frequencies as high as 10,000 Mc/s.

The GEX64 low resistance mixer is now supplied in groups matched for 5 mA. forward current in the voltage range 0.2 to 0.3 volts for use in telephony modulators and similar bridge circuits where matched rectifiers are necessary for optimum operation.

The new types include the GEX36, a mixer diode and telephony modulator for use at higher voltage than the GEX64; it is available in groups matched for forward current at 5 mA. in the voltage range 0.675 to 0.875 volts.

A completely new group of diodes, the GEX54 group, comprises a number of highback voltage diodes, GEX54, GEX54/3, GEX54/4 and GEX54/5, which will operate at voltages of 80, 100, 150 and 200 volts respectively. The GEX54/3, GEX54/4 and GEX54/5 are directly comparable with the American types 1N38, 1N55 and 1N39 respectively.

The prices of the germanium diodes, which are free of purchase tax, are as follows: GEX34, 6s. 6d.; GEX35, 6s.; GEX36, 6s. 6d.; GEX45/1, 10s.; GEX54, £1; GEX54/3, £1 5s. 0d.; GEX54/4, £1 10s. 0d.; GEX54/5, £1 15s. 0d.; GEX55/1, 16s.; GEX64, 12s. 6d.; GEX66, 12s. 6d.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Aerialite Developments

AERIALITE announce that due to increased trade they have completed an extension to their factory. The building has a floor space of 20,000 square feet, and is wired with a special type of wiring known as Ashathene, which is a thermoplastic insulated cable which they themselves manufacture. They have also issued a new catalogue dealing with radio and television aerials, which is a 35-page production profusely illustrated, and containing much equipment which is associated with the aerial system. Copies may be obtained on application to the London office at 20/22, Craven Road, W.2, or the head office: Aerialite, Ltd., Castle Works, Stalybridge, Cheshire.

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