PROJECTION TELEVISION

PRACTICAL TELEVISION

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EDITOR F. J. CAMM

& "TELEVISION TIMES"

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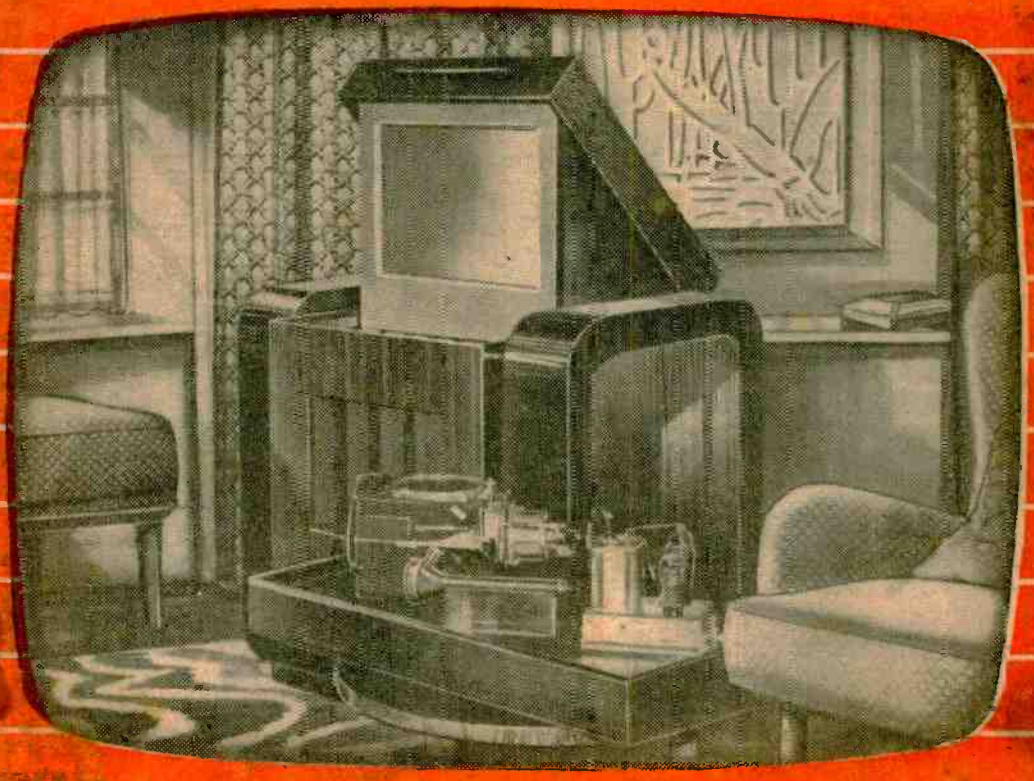

IN THIS ISSUE

PRACTICAL TELEVISION
& "TELEVISION TIMES"

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Televiews

Party Minnows!

THE decision to withdraw the play entitled "Party Manners" has roused considerable controversy, and rightly. It is reassuring, however, to know that the decision to do so was the sole responsibility of one of the Governors of the B.B.C., Lord Simon of Wythenshawe. He gave as his reasons the misgivings he has over the political implication in the dialogue, and his decision was made after an attack on the play in a London morning newspaper.

There was, he said, no outside pressure of any sort brought to bear on him. We are not interested in the politics of this matter, but on the principle involved. If, as one party succeeds another in Parliament, plays are to be withdrawn which advance views or criticisms of the policy of the particular party, television will become a game of political battledore and shuttlecock. The issues concerned are serious, and the public concern when the original announcement was made can be understood when it is remembered that on previous occasions members of the Government have objected to stage plays which have been critical, although in burlesque, of Government policy. They have objected to jokes over the radio. The public naturally came to the conclusion that this was a further attempt to stifle criticism.

The unsoundness of Lord Simon's decision is apparent when it is recalled that plays by Priestley and others, but which were critical of Opposition policy, have not been banned.

We say without equivocation that Lord Simon, a Liberal turned Socialist, should not have taken a decision on his own to ban a television play because it skitted Socialism.

His judgment was unsound on another score, for it is well known that the best method of publicising a book or a play is to ban it. This particular play, "Party Manners," had already been televised once and, as it had obviously been approved and was due to be repeated, the decision to ban the latter indicates that Lord Simon's judgment is unreliable. In any case now that his "misgivings" have been allayed and the play has been produced on the stage since, should he not now reverse his decision and allow the repeat performance to go forward?

We are glad to observe that Lord Simon admitted in the House of Lords on November 8 that he made a mistake in banning this play.

Our readers will have heard on the radio or read in the Press of the Printing dispute which has prevented normal publication of this journal since the issue dated September-October. We are happy to record that a settlement has been reached and we shall now be able to publish normally.

We greatly regret the inconvenience which our readers have suffered but feel sure it will be appreciated that this break in publication has been due to circumstances beyond our control.

UNREST AT A.P.

THE resignation of Norman Collins and the departure of many others from Alexandra Palace indicates a state of unhappiness amongst the executives there which ought not to exist at this stage in the development of television. The reasons behind these changes have not emerged at the time of going to press, although ambiguous statements have appeared in the Press. These leave an uncomfortable feeling that they obscure the facts, especially in view of previous resignations. There would appear to be keen rivalry between the sound broadcasting and television sides of the B.B.C. The former regard television as a sort of scientific Cinderella; they oppose the spending of the large sums of money necessary to develop it, doubtless fearing that in course of time television will kill sound broadcasting except for such items as news programmes.

Behind it all appears to be a struggle for power resulting in clashes of personalities. There is no assurance even with the present changes that this trouble will not recur. Palliative measures are not the solution, and there should be an official inquiry into causes with the object of finding a cure. The trouble may be at the top rather than the bottom, and this might be considered when the New Charter is debated.—F. J. C.

Two-valve Pre-amplifier

An Efficient Wide-band Amplifier Using a Type 24 Unit for Either London or Birmingham

By JOHN R. FENNESSY, M.I.R.E.

THE design of this amplifier is based upon the Type 24 R.F. unit, one of a series of R.F. heads originally intended for use with the familiar R1355 "Gee" receiver. This unit may be easily converted into an effective television pre-amplifier for either television frequency, as desired. Type 24 R.F. unit is in exceedingly good supply as a Government disposal item, and may be purchased new and complete with valves for as little as 12s. 6d. If the amplifier is made to draw its supply from the main television power unit, the final cost will not be in excess of £1 ; on the other hand, if it is constructed as a self-powered unit, complete with built-in transformer, rectifier valve and smoothing, the cost will not greatly exceed £2. Constructional details of both versions are given.

As purchased the unit consists of a three-valve circuit, all valves being of the VR65 type (Mazda SP61). The first valve is an R.F. amplifier, followed by a frequency-changer stage and separate oscillator.

In converting the unit for modern purposes, the R.F. stage is retained exactly as it stands ; the second stage is modified to become an additional R.F. stage with exactly the same circuit arrangement as the first stage.

The oscillator valve, its holder, components and wiring are removed completely. A circuit diagram of the completed amplifier is shown below. The circuit of each stage will be seen to be identical, with two minor exceptions—the second stage valve screening grid is fed from a 25 KΩ potentiometer to provide a variable-gain control, and the low value " stopper " resistors in series with the valve electrodes ; these were found to be unnecessary in the second stage.

If it is intended to allow the amplifier to " borrow " its power requirements from the main H.T. and L.T. supply, the power unit should be capable of providing an extra 1.2 amps. on the L.T. side and about 20 milli-amps. H.T. If it be desired to make the unit completely self-powered, a type 6X5G rectifier valve will take the place of the discarded oscillator valve ; there is ample room for the rest of the mains equipment inside the unit.

Converting the Unit

Work on the conversion should commence by removing the whole of the existing tuning arrangements. This is easily accomplished by taking out the wavechange switch, around which much of the tuning components are " Christmas-treed." Care should be observed in removing the numerous concentric variable capacitors ; three of these will be required for the new arrangement, the remainder will no doubt be found very useful for other purposes.

The front panel is now removed and discarded, and a " lid " made to fit the outer container from sheet aluminium or mild steel. This lid (Fig. 2) forms the new

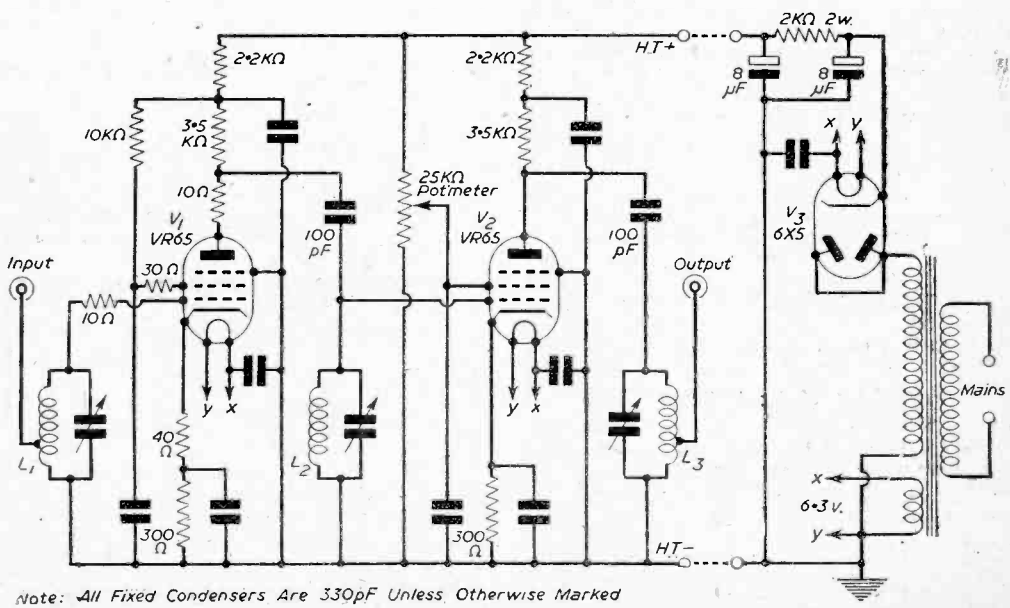


Fig. 1—Circuit of the pre-amplifier. The input and output sockets are of the coaxial type—the shell being earthed.

front panel, upon which is mounted the input socket and gain control.

When completed the unit is placed in its outer container and the "lid" pressed home over the container, giving the amplifier a finished appearance. Care should be taken when drilling and mounting the lid on the unit chassis to ensure that the unit may be pushed fully into its container with the lid fitted to the chassis.

The mounting spikes at the back of the unit, together with the original plug connector, are removed and a small sheet-aluminium plate used to blank off the holes. A single ¼in. hole is drilled through this plate and grommeted to carry the mains lead, in the case of a self-powered job, or the H.T. and L.T. leads when an external supply is to be used.

Wiring Modification

The next operation is to modify the wiring of the second stage (frequency changer) to coincide with the wiring of the R.F. stage, which is, as stated, left untouched.

Sufficient resistors and capacitors of approximately the correct values will be found in the unit to complete the work, which is largely a case of merely rearranging the wiring, but a word or two on the various circuit values may be of advantage at this stage.

These R.F. units were made during the war by various well-known manufacturers under Government contract (just which maker may often be learned by studying the A.I.D. stamp). There are slight variations in resistor values, according to make. For instance, the anode load resistors shown on the diagram have a value of 3.5KΩ, yet values of 3KΩ and even 3.9KΩ have been noted in different models; these variations are quite insignificant and may well be ignored in practice.

Tuning Coils and Capacitors

The new tuning arrangements are very simple: three of the concentric capacitors are selected, making sure that none has sustained damage during removal, and it is important to see that the ceramic centre stem is still firmly attached to the 2B.A. brass mounting shank.

The coils are quite simple, all being made from 18 s.w.g. tinned copper wire, and air spaced; they are soldered directly across the variable capacitor in each case (see Fig. 3).

Coil-winding details for both TV channels are as follows:

	L_1 and L_3	L_2
London	5 turns ⅜in. diameter, spacing equal to wire diameter (.048in.). Tap 1½ turns from earth end.	4 turns ⅜in. diameter, spacing equal to three diameters of the wire (·14in.).
Birmingham	3 turns ⅜in. diameter, spacing equal to wire diameter (.048in.). Tap 1 turn from earth end.	3 turns ⅜in. diameter, spacing equal to three diameters of the wire (·14in.).

The coils are made by winding the wire on a mandrel about 9/16in. in diameter and allowing the coil to spring out to ⅜in. diameter. Care should be taken not to solder the coils in position with the wire under tension or stress as this may eventually lead to them becoming mechanically distorted, causing seemingly inexplicable changes in trimming positions. One of the tuning assemblies is mounted in each of the three screened compartments used for the original tuning system. It will be found best to mount the assemblies near the top of the compartment and adjacent to the holes leading to respective valve control grid (top cap connected).

It is also recommended that use is made of the holes which originally accommodated the concentric capacitors, as, if this is done, it will be possible to tune the unit with the aid of a slim 4B.A. box spanner inserted through holes already provided in the outer case for that purpose; this will avoid the necessity of removing the case for trimming.

Internal Power Limit

If it is intended to make the amplifier entirely self-powered, the bottom dividing fin of the rear coil compartment should be cut away to permit the miniature mains transformer to be mounted; this may be done quite simply if the whole compartment is removed temporarily and the fin sawn off.

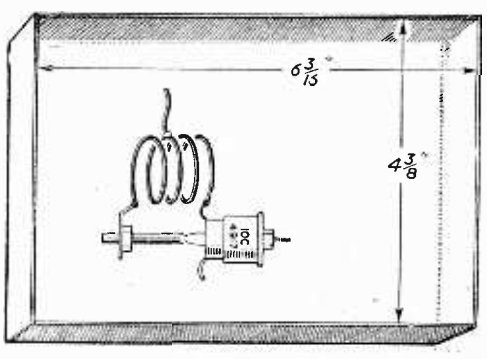
Care should be taken in selecting a transformer which will fit the available space and a suitable one is supplied by Messrs. Harmony House Sound Service, 116, Cambridge Road, Southport. This transformer is rated at 200 volts, 25 milliamps. and 6.3 volts at 2 amperes, which is ample. Half-wave rectification is used, and there is, therefore, no need for a centre-tapped

LIST OF COMPONENTS

1 R.F. unit, type 24
1 Wire-wound potentiometer 25KΩ (Reliance)
1 Aluminium or M/S "lid" panel
1 Aluminium plate
1 Panel mounting plug, "Pye" type
2 Cable mounting sockets, "Pye" type, or
2 Coaxial plugs and sockets
Leads to power unit.
(Belling Lee)

ADDITIONAL REQUIREMENTS FOR SELF-POWERED UNIT

1 Mains transformer, 200-250v. 50c. primary, sec. 0-200v., 25mA., 6.3v. 2A., type AD3 (Harmony House Sound Service, Southport).
2 8μF Electrolytic capacitors, "Micropack," type CE-19-P (T.C.C.).
1 Carbon resistor, 2 watts 2-KΩ (Erie, Morgan, etc.).
1 International octal valve-holder (Celestion, etc.).
1 Rectifier valve, type 6X5G, Brimar, Tungsram, etc. (S.T. and C., Tungsram, etc.).
Lead and mains plug.



Figs. 2 and 3.—The "lid" for the chassis—showing dimensions, and details of the coils and their mounting.

secondary winding. Also, no separate rectifier winding is required as the type 6X5G rectifier valve is designed to run on the heater winding common to all the valves.

A 2KΩ 2-watt carbon resistor is used in place of the usual smoothing choke. A point to note is that the octal valve-holder originally fitted to the oscillator section will *not* do for the 6X5G rectifier, which requires a standard international octal holder, whereas the holder originally fitted was of the British octal type (Mazda).

Connection Plugs and Sockets

Many home constructors will wish to use the inexpensive and easily obtained ex-Government "Pye" panel mounting plug and corresponding cable mounted socket. These are quite suitable and one such plug is provided on the Type 24 unit.

The input plug is fitted to the front panel "lid" near to the gain control, whilst the output plug is fitted to the rear panel by drilling a suitable hole and a larger hole in the outer case.

As an alternative to the "Pye" type plug, the new standard type Belling Lee coaxial plug and socket may be used. These plugs provide a really splendid connection for the usual small type coaxial cable (B.I. Callender's T3020 or T3022). If it is desired to use either a balanced input or output, the Belling Lee L-607-P plug and socket is recommended.

Fig. 1 shows an amplifier having both a coaxial and balanced twin output connection. If balanced arrangements are dictated by design features, such as the type of aerial downlead or the TV set input, the relative coil or coils should have the taps omitted, and coupling achieved by inserting a single-turn polythene-covered link into the relative coil, the link being connected to the appropriate plug.

Putting Into Service

The pre-amplifier is now ready for trimming up, which, if all the circuit wiring, etc., has been correctly done, may be carried out in a few moments; the trimmers and, if necessary, the coil spacings being merely adjusted to give optimum results on both vision and sound.

Amplification and band-width will be found more than adequate, even in "difficult" areas. The variable gain control will be found most useful during fading conditions.

This little unit has been giving quite a consistent performance for several months on an indoor aerial 100 miles from the Sutton Coldfield station. On a standard outdoor three-element aerial, really first-class entertainment has been achieved using it in conjunction with various home-made and commercial television sets.

Colour Filters for Receivers

THE increasing use of dark filters on commercial receivers has raised problems in the minds of many viewers as to the actual effect and possible damage which might arise from their use, and the following information supplied by Imperial Chemical Industries will, we hope, do much to clear the air concerning this television accessory.

In a television picture the "blacks" are actually the colour of the unexcited portions of the phosphors on the face of the cathode-ray tube as they appear in the particular conditions of external lighting which exist at the time of viewing. Consequently, if the external lighting is fairly high, considerable loss of contrast is noted in the picture, because the light reflected from the face of the tube gives a greyish look to the phosphors.

The obvious way of preventing this loss of contrast is to eliminate external light altogether, but beyond a certain degree this is undesirable. An alternative and much more satisfactory method of maintaining contrast under conditions of high external lighting is to use suitably tinted transparent light-filters in front of the cathode-ray tube to cut down the light reflected from the face of the tube.

The use of such a neutral tinted filter in the form of acrylic sheet is now an accepted feature of the British television industry. Such a sheet fulfils a double function. In addition to improving the contrast of the picture when viewed in a room not completely blacked-out, its strength in the appropriate thickness gives adequate protection to the viewer should the tube collapse.

The increased contrast is due to the fact that external light in the room passes through the filter, strikes the face of the cathode-ray tube and is reflected back through the filter again, whereas the radiations of the tube phosphors pass through the filter once only. This considerably reduces interference by reflected light.

Increased Brilliance

At first sight it would seem that, when using a filter, to obtain a picture of comparible brightness to that obtained on a set with the ordinary clear guard the tube brightness would have to be turned up considerably to make up for the light absorbed in the filter. This is true to a certain extent, but in practice the actual colour of the filter is not a true "straight line" neutral and, although the overall transmissions of the colours used are on the average about 50 to 55 per cent., their transmission curves show a considerable increase in transmission in the blue and red ranges. Transmission curves for the three "neutrals," which have been specially developed for this application, show that the transmission rises in the blue to about 70 per cent. and in the red to over 80 per cent. As the visible light from the excited phosphors of the average cathode-ray tube also peaks in the blue and red, the filter transmits about 70 per cent. of the phosphor radiations as against only about 50 per cent. of daylight or other external lighting.

A further point which must be remembered is that any type of clear guard of glass or plastic transmits at the best only about 90 per cent. of the light from the cathode-ray tube falling on it, so that the comparison of transmission of a tinted to a clear filter is about 70 : 90 and not 70 : 100.

A further advantage of the coloured filter is that it completely alters the "dead eye" effect of the cathode-ray tube and mask and considerably improves the appearance of the average TV set.

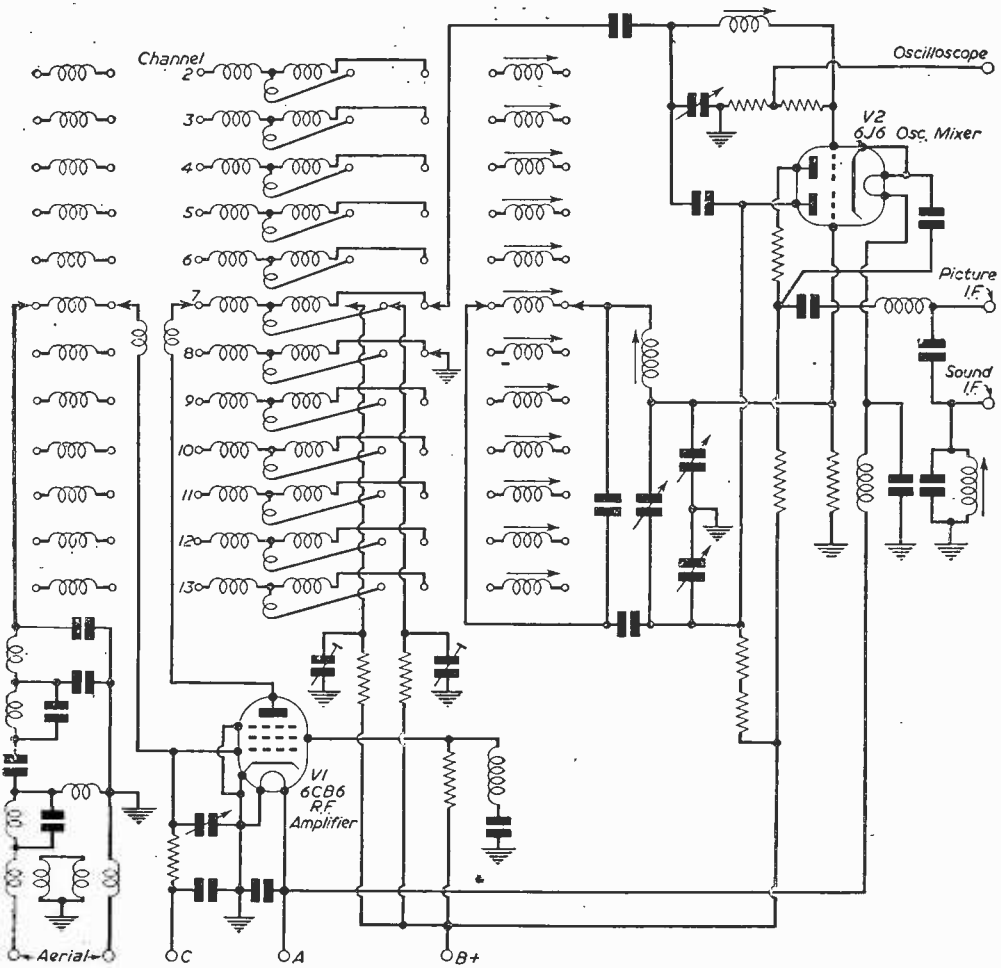
Tuner Unit for Television

A Description of the Multi-channel System Used in U.S.A.

By R. E. B. HICKMAN

WITH the opening of the second B.B.C. television transmitter operating on a frequency different from the Alexandra Palace transmitter, and the promise of others to come in the near future, on still different frequencies, one British manufacturer has introduced a television receiver with variable tuning, and it is to be expected that others will follow suit. The situation is not, however, likely to present the same problems for British manufacturers as for those of the U.S.A., where large towns may each have several television transmitters operating on different frequencies and presenting different programmes. In some locations the viewer may have the choice of as many as seven different programmes at the one time. Nevertheless the introduction of a receiver with a simple form of variable tuning would be of great usefulness to viewers in the fringe areas, and would of course become a necessity if alternative programmes were introduced.

The following notes on a radio frequency tuning system widely used in the U.S.A. may be of interest to British viewers. The method of channel selection employed is by means of a rotary switch. Individual channel selection has sufficient advantages over continuous tuning, both in simplicity of operation and in reliability of electrical performance, to be considered essential in good receiver design. The RCA 206E3 tuner is a turret-type employing printed circuit coils and covers, the U.S.A. television channels 2 to 13



Circuit of the American tuner referred to in this article. The heater and cathode of V2 are earthed.

inclusive. It is designed for use with a stagger-tuned I.F. system, having a picture carrier frequency of 25.75 Mc/s and a sound carrier frequency of 21.25 Mc/s.

Electrical Features

The tuner provides high and substantially uniform gain on all these channels, together with excellent noise factor, high reflection of all spurious responses, low oscillator radiation and low reflection coefficient in the transmission line.

The input circuit contains two transformers, which match the tuner input impedance to a 300 ohm balanced transmission line and also attenuates noise which may be induced in the transmission line.

This circuit also contains a high-pass filter which cuts off at approximately 47 Mc/s and has maximum attenuation at approximately 23.5 Mc/s. This arrangement rejects intermediate frequencies at the grid of the R.F. amplifier.

A tuned low-pass pi-network, with a coil for each channel, provides adequate gain and selectivity at the grid of the R.F. amplifier and reduces oscillator voltages at the antenna terminals. The constants of this filter have been so chosen as to provide a varying impedance transfer to the grid of the R.F. amplifier so that optimum noise factor is achieved on all channels. This feature is of considerable interest as it favours the operation of the tuner with indoor types of antenna.

Controlled negative resistance has been introduced at the grid of the R.F. amplifier to maintain high gain at the upper signal frequencies and to minimise the effect of cathode inductance. The R.F. amplifier is a type 6CB6 sharp cut-off miniature pentode. This valve has high gain, low inherent noise and a low input capacitance. The output of the R.F. amplifier contains a double-tuned, M-derived band-pass filter.

This filter has maximum attenuation at approximately the image frequency of each channel. It has coils for each channel and provides very high image rejection and at the same time severely attenuates voltages of oscillator frequency at the anode of the R.F. amplifier valve.

The oscillator, with adjustable inductances for each channel, contains a single-ended temperature-compensated Colpitts circuit to ensure oscillator stability. A fine tuning control which is located concentrically with the channel selector control, permits fine adjustment of the oscillator frequency.

The mixer anode circuit contains a tuned low-pass filter network for the picture I.F. output and a high-Q trap for the sound I.F. output. This trap is tuned to 21.25 M/cs and attenuates sound I.F. frequencies at the picture I.F. output. The low-pass filter section minimises oscillator frequencies at both picture I.F. and sound I.F. grids. The picture I.F. output frequency is normally 22 Mc/s, but may be adjusted for operation at any frequency in the range 21.8 Mc/s to 23 Mc/s, so that it may be used with various stagger-tuned I.F. circuits.

Mechanical Features

The tuner is compact and ruggedly constructed. The overall dimensions are : 3in. above the mounting surface, 3½in. below, 5in. back to front (exclusive of control shaft), and 3½in. wide. The turret comprises 12 easily removable segments each containing the coils for one channel. Tuning is accomplished by rotating the turret to connect the proper coils to stationary contacts of the switch. Adequate bearing surfaces are provided at all points to ensure easy operation and noise-free ground contacts. The stator contact springs are hard spring silver, while the turret contacts are solid coin silver. The tuner will withstand 50,000 complete revolutions without giving evidence of contact trouble.

Individual oscillator adjustments are readily accessible from the front of the chassis so that provision may be made for these adjustments while the receiver is in its cabinet. A terminal is provided for connecting to an oscilloscope for circuit alignment.

Performance Data

The following data was obtained with the tuner operating in a typical television receiver.

Gain, i.e. ratio of the voltage at the grid of the first picture I.F. amplifier to the voltage at the antenna terminals, varied from 35 db. for channel 2 (25 Mc/s-40 Mc/s) to 28 db. for channel 13 (210 Mc/s-216 Mc/s).

Image rejection, i.e. ratio of sum of the oscillator frequency voltage and the I.F. voltage to the signal frequency voltage, was better than 74 db. on all channels.

Oscillator radiation, i.e. voltage of oscillator frequency present at the antenna terminals when terminated by 300 ohms, was less than 3 mv. for channels 2 to 7, rising to 7 mv. for channel 13.

Manchester/Edinburgh Link

ON the heels of the recent extension of television to Sutton Coldfield and the plans made for service to Holme Moss, comes the news that the contract has been placed and work has commenced on the micro-wave television link which will further extend television to Scotland. The G.P.O. specification covers a two-way television radio-relay system which will make it possible for programmes to be fed to the B.B.C. Scottish television station now under construction at Kirk o' Shotts midway between Edinburgh and Glasgow and will also give facilities for the relaying of items from Scotland throughout the whole of the B.B.C. television network.

The new radio link, which will be the longest of its kind in Europe, is being designed and installed by Standard Telephones and Cables, Ltd., who, since the first demonstration of a micro-wave link which they gave between Dover and Calais in 1931, have been responsible for many micro-wave developments including some of the portable links at present being used by the B.B.C. Television Service for "outside broadcasts." A Standard portable micro-wave link was used to span the Channel during the recent television transmissions from Calais.

The radio-relay will follow a route from Manchester northward on the east side of the Pennine Chain to Kirk o' Shotts an overall distance of 245 miles. The contract includes the provision of seven unattended repeater stations spaced at about 30-mile intervals, to receive, amplify and re-transmit the requisite signals over successive line-of-sight transmission paths. Repeaters will consist of main and reserve receivers and transmitters with four paraboloid aerial assemblies mounted on steel towers ranging in height from 28 to 200 feet.

Servicing Television Receivers—7

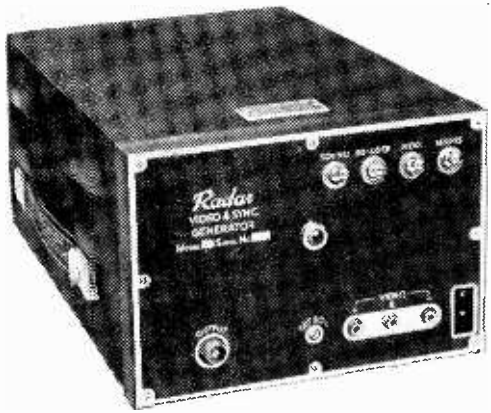
How to Locate Faults and Cure them in Commercial and Home-made Equipment

By W. J. DELANEY (G2FMY)

ON various occasions in the articles appearing under this heading various pieces of test equipment have been mentioned, and it would be appropriate before concluding the series to deal with those items which are desirable, if not essential, for the commercial servicing of television equipment. It will obviously be uneconomical for the builder of a single home television receiver to purchase a special piece of test equipment, although the keen experimenter may have in his possession a signal generator. Although it is often stated that this instrument and an oscilloscope are necessary for proper servicing, this is not so now that special instruments have been introduced, but this point will be dealt with later. Primarily, a signal input at the particular television frequency for which the receiver is designed is essential, and it was earlier shown that an oscilloscope is not necessary for lining up the tuning circuits—the existing picture tube giving a series of light and dark lines horizontally which can be used as an indication for adjusting the cores of the tuning coils, etc.

Signal Generator

These horizontal lines will not always reveal any defect in linearity, and will not show up a number of faults which may exist in the time bases or the sync separator circuits. The generator should be capable of being tuned on its fundamental to the television frequencies—not by using harmonics in view of the risk of selecting the wrong one. It should also have internal modulation at 400 or 1,000 c.p.s. and, most important of all, should have a reliably calibrated attenuator in order that some idea of stage gain may be obtained as the input to the receiver is transferred from stage to stage. A further important requirement is that the output should be fed to the receiver through a reliable matching device, using coaxial connecting leads and the very minimum of " bare " or unscreened leads.



The Radar, Video and Sync Generator for complete television servicing.

A wobbulator is not necessary in conjunction with the generator, as the majority of receivers use single tuned " staggered " circuits, but where transformer coupling is employed it is preferable to damp one of the coils whilst its partner is being adjusted. Manufacturers supply trimming and aligning data and their instructions should be followed, but in the majority of cases a fixed condenser or resistor (or both) is connected across an early circuit to cut out any damping compensation whilst the other circuit is tuned. The damping then transferred and the other circuit tuned, readjustments being made alternately until the optimum results are obtained.

Oscillograph

So much for the signal generator. The cathode-ray oscillograph is normally connected in place of the picture tube and thus it should be of a type which permits of its time bases, etc., being so adjusted that the tuning response curve is produced on the screen. This will, of course, as distinct from the use of the picture tube, show any dip in coupled circuits, peaks in the overall response, etc. It does not prove so useful, however, in revealing hum, which can be seen on the picture tube more readily, although it may be of only small dimensions. There is, however, a much more valuable use to which the oscilloscope may be put. If the time bases or sync separator are not working properly, and an irregular or broken raster is obtained, the problem is to find exactly what is causing the trouble. Even the modern television test sets will only reveal that the fault is present, but will not locate the exact position. This is an important point.

For instance, suppose that there is a normal pentode limiter followed by simple integrating and differentiating circuits, and that the condenser used in the feed to the frame oscillator is leaky. The most likely effect of this will be that line pulses will find their way into the frame time base. (It will be appreciated, of course, that other defects will arise, but this is a simple explanation of the use of the C.R.O.) Normal tests with voltmeters, etc., will not show what is happening, but if the 'scope is connected to the grid of the frame oscillator the line pulses will be apparent and the clean peaky frame pulse will be shown distorted.

Similarly, a picture which breaks up may be due to too strong a line pulse, wrongly peaked tuning circuits, or faulty discrimination in the limiter, that is, picture pulses getting through into the time bases. If the 'scope is connected to the anode of the limiter it will reveal at once whether picture modulation is present. In this connection it should be remembered that in simple limiters the picture pulse is not " removed " but merely of a reverse polarity and that the valve is working in such a manner that the pulses due to signal do not affect the time bases. These points are particular to individual receivers and must be borne in mind when testing or servicing the equipment. On the service sheets supplied by some manufacturers the wave-form which should be found at each point of the circuit is shown on the circuit

diagram and thus the point at which a fault occurs is rapidly found and its cause revealed. Standard servicing technique then enables the receiver to be put right in a very short while.

Special Instruments

We now come to the special instruments designed solely for television servicing, and they have no other application in radio whatsoever. The simplest of these is the pattern generator. It consists, in effect, of a signal generator so designed that the output is modulated to provide on the picture tube of the receiver a series of bars, horizontal, vertical or a combination of both. The bars should be equally displaced on the screen, and thus each time base may be checked individually for linearity, but the complete raster is not checked for size, nor is the sync circuit(s) accurately checked, and there may be a fault in the receiver which is permitting the mains frequency to lock the frame time base. It should be remembered that at the transmitter the mains are used as the frame lock, and if, due to some fault in the H.T. smoothing at the receiver, mains ripple is getting into this part of the circuit, it can lock the frame time base at the wrong point, and two or three cases have been found personally where the ripple was not sufficient to cause waviness of the verticals but was definitely tripping the frame oscillator, and mains fluctuations resulted in erratic frame scanning on two or three nights a week. It is, therefore, a good plan, where frame lock is not reliable, to try the effect of connecting a large electrolytic condenser across the H.T. connections at the frame time base to see if any improvement is effected.

These pattern generators save considerable time by permitting many adjustments to be made which would otherwise have to be carried out when a transmission is on the air, and which can only be done under such conditions. It is interesting to note the form taken by one of the latest of these specialised instruments, illustrated on page 297.

Radar Tester

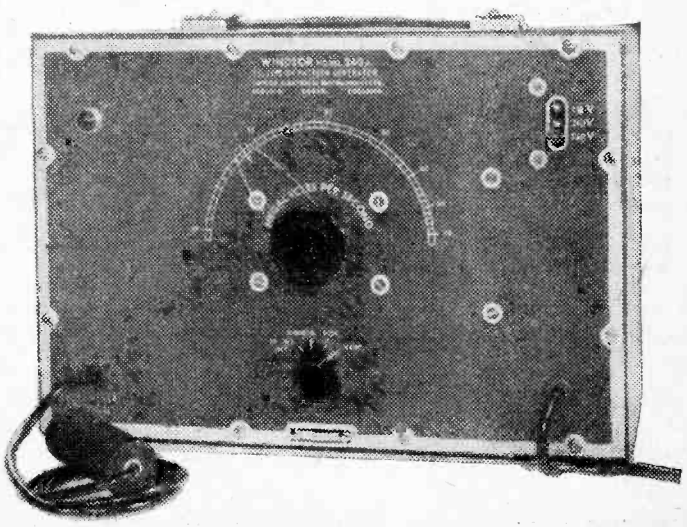
This particular instrument is known as the Radar Video and Sync Generator, not because it has anything to do with radiolocation, but because it is produced by a firm known as Radar, Radio and Television. The instrument takes the design of the signal generator and pattern generator a stage further, and produces a fully synchronised test pattern which, in addition to the cross mesh of black bars, produces a shaded gradation in each of the resulting white squares. When properly adjusted there thus appears on the picture tube two wide vertical bars, three horizontal thin bars, giving 12 white squares.

The upper edge of each square is darkened to the D.C. transmission level (30 per cent.) and fades up to peak white (100 per cent. modulation) at the bottom of each square. This latter feature enables the brilliancy and contrast controls to be set properly. The modulation circuits producing this tonal gradation are switched so that, if desired, they may be cut out and a blank synchronised raster left. The frame frequency in this test set is also locked to the mains and when the frame frequency or hold adjustment in the receiver is properly set the three black horizontal lines are steady. Faulty frame circuits will result in more or unsteady lines, and with the synchronising circuits provided it is even possible to check that interlacing is satisfactory. A switch is provided to " unlock " the frame sync from the mains and this, of course, as previously mentioned, enables one to check for mains ripple or hum.

A further feature of this particular instrument is that a sound output is provided so that one can also check whether there is "sound on vision " or vice versa, and thus it is possible to check every part of a receiver and adjust it outside of broadcast hours, leaving it in such a condition that the user can switch on when the programmes are being radiated with the certain knowledge that it will not require any further adjustment. The time saved to service engineers by an instrument of this nature is, of course, obvious.

Valve Tests

When checking the operation of a complete receiver—especially when provided with a table of voltage and current readings supplied by a designer or manufacturer, it is essential to know just what type of meter is employed, or was employed in the original test. Thus, a simple 1,000 ohms per volt test set will give quite a different set of readings from those given by a valve-voltmeter, and when consulting such a table it should be remembered that the readings which are given in many cases are not the dynamic readings, that is to say, if, for instance, an anode is stated to be receiving 180 volts as shown by a meter, this may actually be much lower than the voltage actually applied to the anode under normal operating conditions, as the test instrument is in parallel with the valve and is therefore taking additional current and modifying the entire stage.



A pattern generator from the Windsor range of test instruments.

Building the

P.W. TELEVISION RECEIVER—4

Building and Wiring the Mains Unit and Audio Output Stage

THE second unit of this receiver, as mentioned last month, consists of the complete power supply and the audio output stage with loudspeaker. The chassis measures 12in. by 10½in. (not 12in. by 14in. as stated in the August issue) and has 2½in. runners just as in the vision unit.

It should be made in the same manner. from stout aluminium, and full cutting and drilling details will be found on the next page. As in the case of the previous unit, all fixing holes are ⅛in. in diameter and the only "odd" hole is that required for clearance of the grommet on the E.H.T. unit. It is recommended that this be 1in. in diameter, and its exact position should be marked by placing the E.H.T. unit on the chassis. No fixing holes have been shown on the drilling plan for this unit and it is suggested that all the remaining holes be drilled, the chassis bent up to shape, and the mains transformer, etc., mounted before marking out for the E.H.T. unit.

The illustration on page 300 shows the irregular cut-out which should be made to clear the tags on the mains transformer. Some care must be taken here to avoid short-circuits or risk of flash-overs, and the four fixing holes should be drilled, the opening cut roughly to shape either by drilling all round with the ⅛in. drill and knocking out the inner piece and then cleaning up the edges with a file, or, better still, by drilling a single hole at one corner and then cutting out the opening with one of the abrasive hacksaw blades designed for such purposes.

Speaker Mounting

The chassis is given rigidity by the speaker mounting board bolted to the front edge (through the four 3/16in. holes), and this is made from the same material as the board carrying the cathode-ray tube on the vision chassis —½in. plywood measuring 10½in. by 14in. high. A hole 9in. in diameter is cut with its upper edge 1in. from the top and with its centre on the vertical centre line, and four fixing holes should be drilled to accommodate the speaker used. The speaker should be held in position and the E.H.T. unit then placed on the chassis so that it is just clear of the rear of the speaker-magnet and its position may then be accurately marked and the clearance hole drilled in a suitable position to clear the grommet through which the supply leads pass. If the units are to stand side by side the leads already provided for carrying the high voltage will be found long enough and merely needs an octal type connecting clip soldered to its end. If, however, the unit is being placed some distance away a new lead should be fitted. Do not connect another length of wire to the end of the existing wire and rely upon insulating tape round the joint, as extremely high insulation is required on this lead to avoid flash-over to any nearby metal. The lead used should be soldered direct to the same point as the existing lead and should be of either standard ignition cable such as is used in cars for sparking plug leads, etc., or properly designed high-voltage lead.

The multi-cable connecting the two units together must also, obviously, be long enough to enable the two units to take up their respective position according to the cabinet in use, and when connecting the plug to the end make quite certain that the correct pins are connected. It is a simple matter to look at the plug from one end or the other and thus reverse the connections. but to avoid difficulty we have shown the plug separately on the wiring diagram on page 302 and have also numbered the pins on the top view of the socket at the upper part of the same wiring diagram, so no trouble should be experienced. The screened cable connected to pin 1 should have its metal sheathing joined to pin 3, and insulation tape should be wrapped round the exposed portion of the braiding to prevent a short-circuit to pin 2, across which it must pass. The smoothing choke is mounted on the side runner of the chassis. and should be put in position last—after the E.H.T. unit has been wired to the appropriate points.

Clearance holes for the centre lug of the two smoothing condensers C37 and C38 should be adequate, and to guard against possible short-circuits the condensers should be held slightly clear of the chassis before the clamping rings are locked up. The end of the bent-up lug may then be pushed over to come in the centre of the clearance hole.

Earth Connection

In the original model a three-pin mains socket was employed. The earthing connection of this socket is connected to the common negative line of the complete receiver, and as this carries the total amperage of the heater circuits a heavy gauge wire should be used throughout. A double length of standard lighting flex is probably the simplest method of carrying out this connection, soldering the ends together. This applies also, of course, to the lead connecting the two chassis together. If the house mains outlet socket is of the three-pin type, then a three-wire lead should be used to supply the receiver, and an earth connection is thus automatically obtained. It was found, however, that results were more reliable when a separate earth connection was employed on the receiver section, and it will have been noted that a socket is attached on the vision receiver, on the small bracket carrying the coaxial aerial socket, and this former socket is in direct connection with the metal bracket. In the installation used the aerial coaxial lead was taken to a three-socket Belling-Lee connector mounted on the window-sill, and the inner lead of the coaxial was taken to one socket, and the outer braiding to another socket. A separate lead was then connected from the third socket to a buried copper earth spike. The lead from the receiver consisted of a length of coaxial to which was taped a length of insulated flex, provided at the set end with a plug for insertion in the earth socket, and the coaxial fitted with the plug portion of the standard Belling-Lee coaxial connector. This separate earthing arrangement seemed to assist in holding the set perfectly stable under the most drastic interfering conditions, namely, low-flying aircraft. These gave only a rapid fade on the picture, but no picture slip or tearing of lines which sometimes occurred if the separate earth spike connection was omitted.

Preliminary Tests

The complete receiver is now ready for preliminary tests, and the following procedure should be adopted.

The tube should be inserted in its mount and the appropriate socket placed on its base. The scanning coil assembly should be pushed as far forward as possible, and to keep it secure it is desirable to wrap a layer or two of thick paper round the tube, adjusting the thickness until the coil unit is a nice tight fit and will not rotate or slip. Connect the E.H.T. lead to the anode cap on the tube and, assuming that you have previously checked that there are no short-circuits or wrong connections, plug in all valves, making quite certain that the time base amplifiers are in their correct sockets. Turn Height and Width control to their maximum anti-clockwise direction, Volume to minimum, and remaining four time-base controls to a mid-way position. Contrast should also be set to minimum—that is, maximum rotation anti-clockwise.

Now rotate the combined Brightness-on/off switch until the switch clicks but do not turn it any further. As soon as the valves reach operating temperature this control may be advanced slowly, but keep a careful look round for any suggestion of trouble due to an overlooked faulty connection. At about the centre of its travel the raster should begin to appear, but if a single spot, or a single horizontal or vertical line, appears turn off instantly. As a further check at this point turn up the Volume Control, when a rushing noise should be heard from the loudspeaker without trace of instability.

Raster Adjustment

If there is some sort of raster, and not just a single line, the appropriate time-base controls may now be adjusted to provide the required area of scan. It is

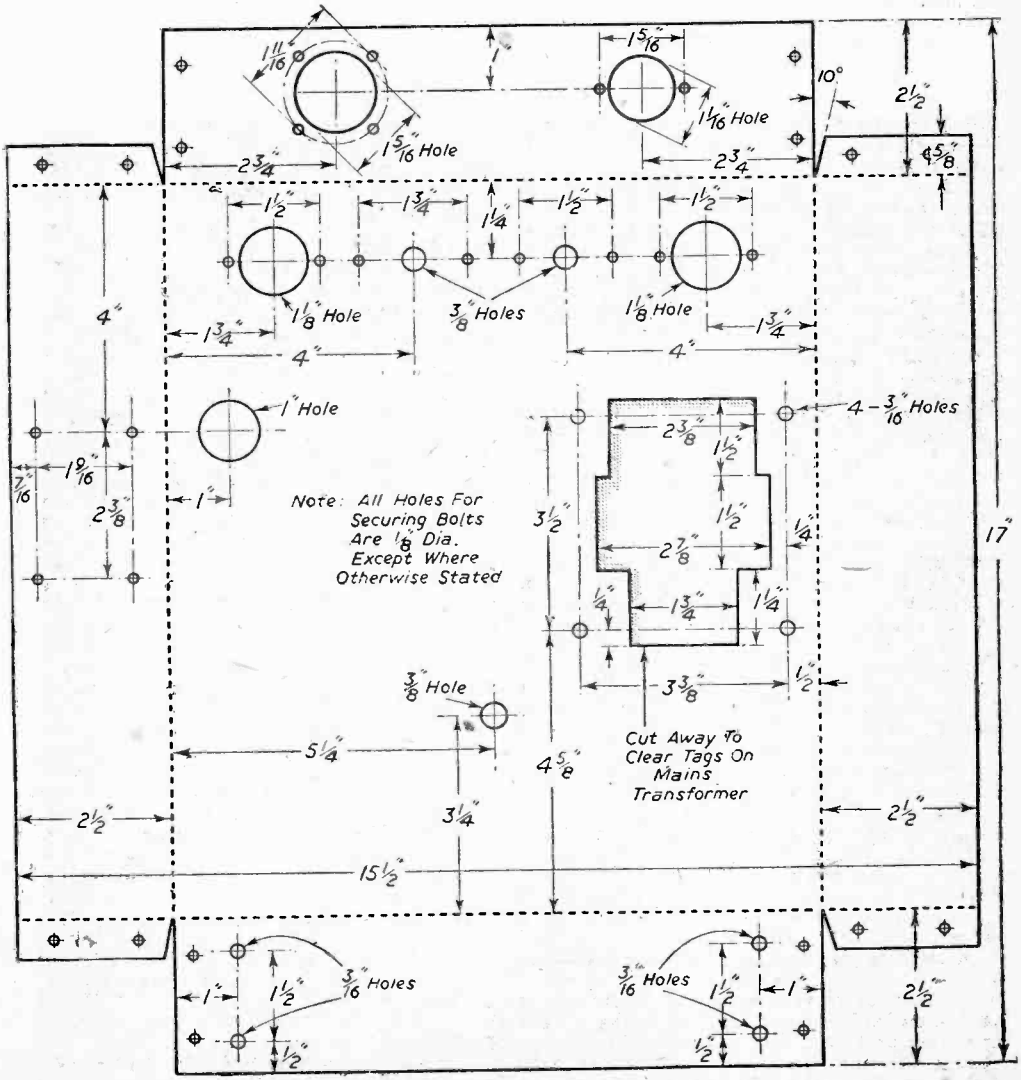


Fig. 1.—Cutting and drilling data for the chassis of the mains unit.

extremely unlikely that the four controls will be in the correct position so the Hold and Form controls should be adjusted with the Height and Width controls to obtain a steady raster just filling the rubber mask. In this particular receiver it is not necessary to receive synchronising pulses from the transmitter to obtain a steady raster, and it should not be found difficult to obtain the necessary picture area. A horizontal black line running down or up across the screen indicates that the Frame Hold needs adjustment and if the scanning lines are running diagonally across the picture the Line Hold control should be adjusted until they are horizontal and steady. Similarly, the Line Form and Hold controls will bring the lines to rest and a few minutes with these six controls will soon show their effect on the scan, and although it has taken several lines to describe the adjustment it will be found that the actual work is exceedingly simple and will only take a few seconds. Look carefully at the raster and note whether the lines are all parallel and of equal separation. It may be found that the upper part of the raster, for instance, has the lines gradually increasing in spacing. Frame Form should close them up. On the line scan you really need a picture of the test card to adjust Form to obtain the required linearity. (It might be mentioned here that the term "linearity" is sometimes used in place of Form, and Frequency and Speed are sometimes used in place of Hold.) You are now in a position to connect a suitable signal generator (or the aerial) and line up the vision and sound circuits.

Lining Up

Assuming that the raster has been accurately obtained, the receiver is now ready for alignment. This may be carried out in either of two ways —with or without a signal generator. The latter method is definitely to be preferred, as it eliminates all guesswork, and enables an accurate response curve of the receiver to be taken for checking purposes. As the method using the signal alone is simplest it will be described first. All cores should be adjusted level with the top of the coil formers. Connect the aerial

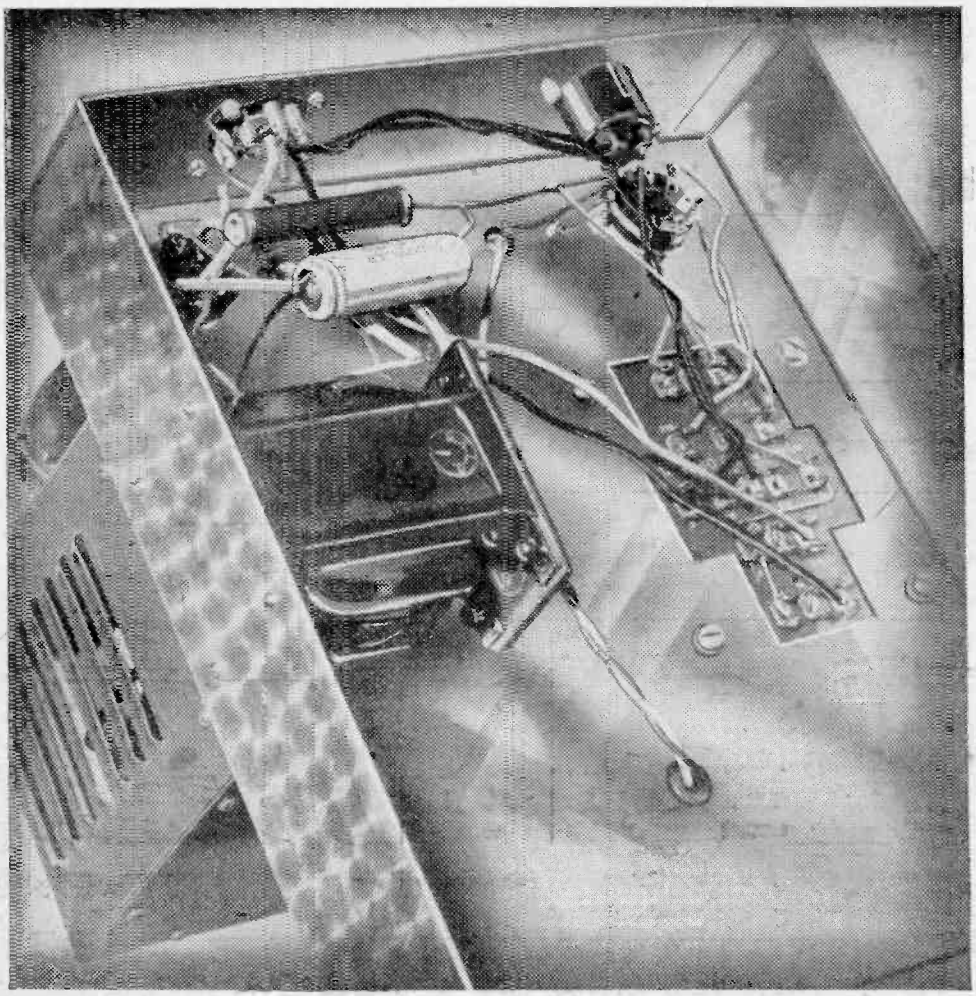


Fig. 2.—This illustration shows the underside and wiring of the power pack.

and, with brilliance right down and volume right up, turn up the contrast control until sound is heard from the speaker. If contrast has to be turned right up without hearing any sound, slowly turn up the brilliance control until some modulation appears on the screen. If the circuits are nearly in tune, then the contrast will have to be reduced to avoid overloading. As soon as some sort of modulation is seen, endeavour to adjust all cores to exactly 45 Mc/s or the vision frequency. This will be indicated by flaring on the tube face, but the brilliance control should be kept well down. Maximum flaring will indicate that all coils are more or less peaked at 45 M/cs.

(To be continued.)

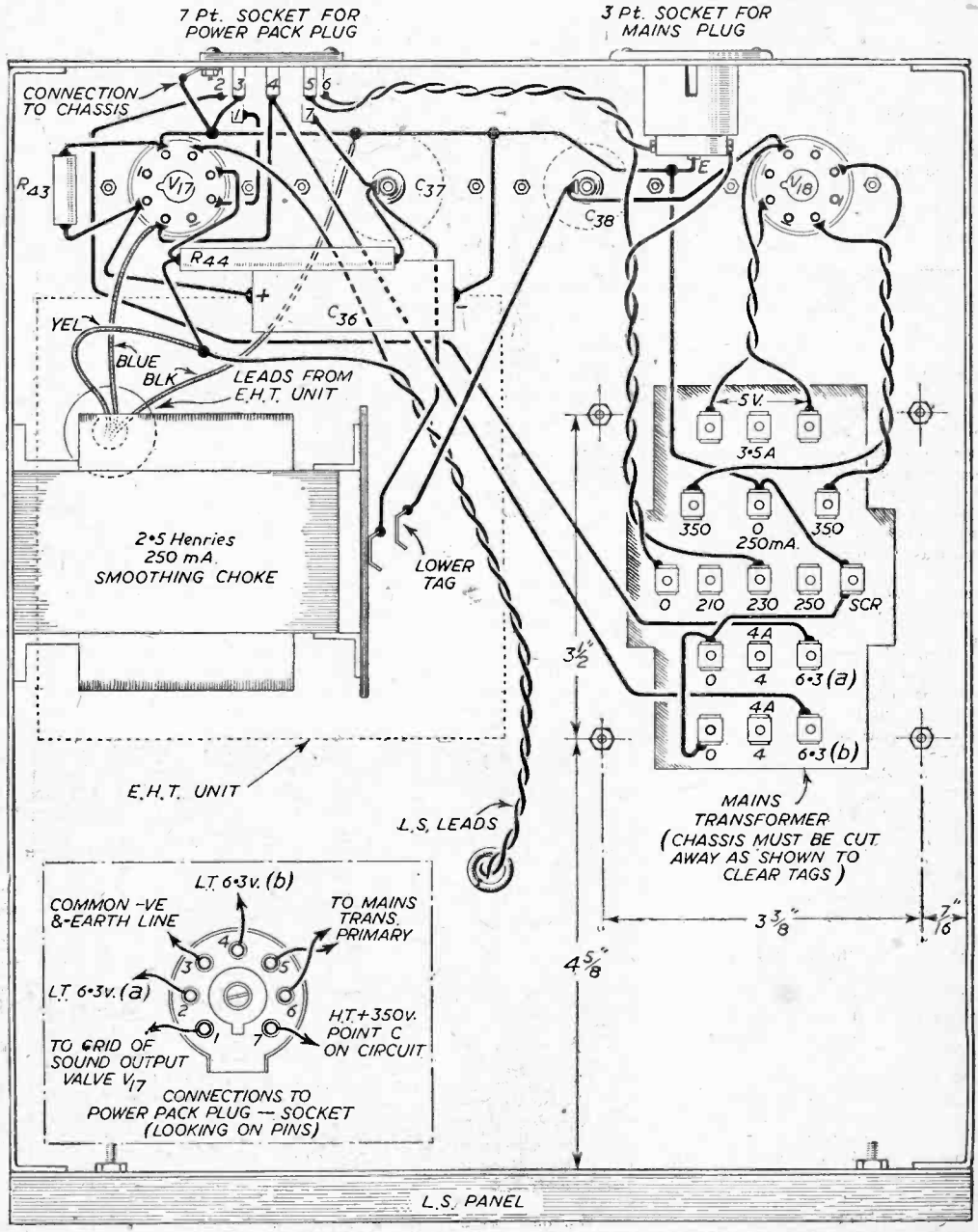
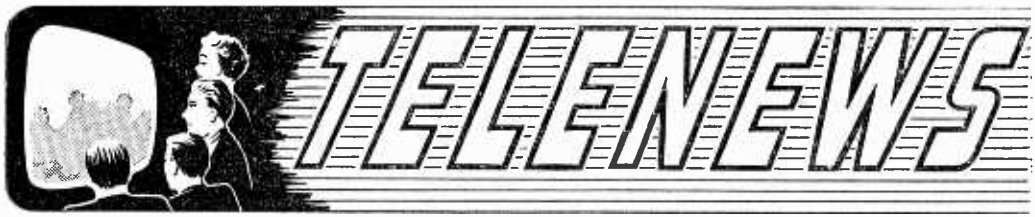


Fig. 3.—Wiring diagram of the power supply and audio output stage.



M.E. Radio Exhibit

AT a model engineering exhibition recently staged at Hastings, a local society of model and experimental engineers had a stand devoted to television and radio. Erected by the Hastings Television Club in co-operation with a local radio firm television was demonstrated each evening, and a demonstration set was working daily connected to various forms of interference to impress on the public the need for suppressors. Over 4,000 people visited the exhibition.

New Lens

A SPECIAL lens used in a television broadcast from Fort Dunlop gave a closer view of a tyre running at 400 m.p.h. than has ever been possible before. The feature, in the series Other People's Jobs, produced by Keith Rogers, was the first industrial television outside broadcast from the Midlands.

Fourth Annual R.S.G.B. Amateur Radio Exhibition

THE Fourth Annual Amateur Radio Exhibition, organised by the Radio Society of Great Britain, is to be held at the Royal Hotel, Woburn Place, London, W.C.1, from Wednesday, November 22nd to Saturday, November 25th.

The exhibition will be opened at 2.30 p.m. on November 22nd by Mr. Hugh Pocock, M.I.E.E.

Admission will be by catalogue obtainable at the door (price 1s.), or on application from the Radio Society of Great Britain, New Ruskin House, Little Russell Street, London, W.C.1 (price 1s. 3d. post free).

Members of the Society receive a catalogue free of charge. The exhibition will open at 11 a.m. on November 23rd, 24th and 25th and will close at 9 p.m. each evening.

Ignition Interference

A LEADING manufacturer of motor-car and motor-vehicle ignition systems demonstrated at the Commercial Motor Show how a standard ignition system can spoil a television picture.

A pattern generator on the stand provided a picture in a normal television receiver. The visitor was able to switch on an unsuppressed ignition system or one fitted with suppressors and see for himself the marked difference in the picture.

Also on the stand was a prototype of a new distributor in which suppression is "built in," the carbon brush being made of resistive material and taking the place of a resistor in the high-tension lead.

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 wireless 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.

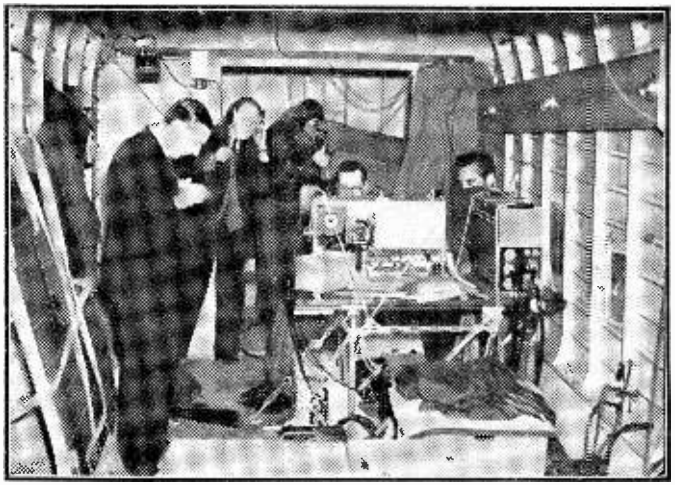
Over Five Million Homes See Show

"BEAT the Clock," U. S. television's hilarious party game, which started under Sylvania Electric's sponsorship recently, will reach television screens in over five million homes from coast to coast, it was announced.

Commercials on "Beat the Clock" will feature Sylvania's entire line: television sets, fluorescent and incandescent lamps, radio and television tubes, photolamps, electrical devices and other products.

British Television in Berlin

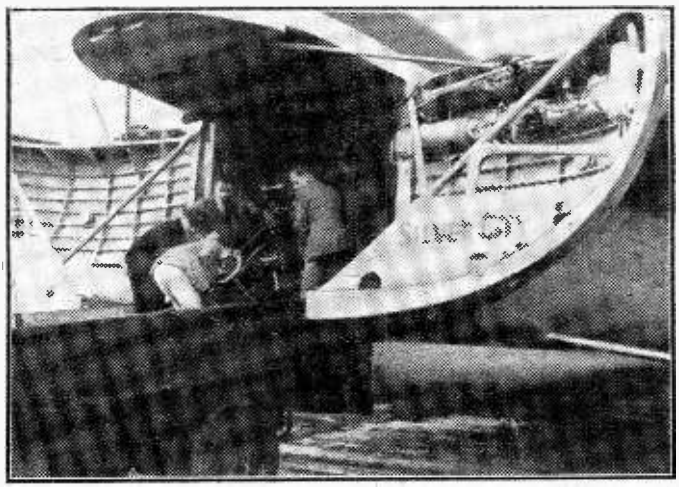
BRITISH television recently demonstrated at the International Industries Fair in Berlin proved itself the star attraction of the whole exhibition. More than 25,000 visitors packed into the viewing room in the first three days. Object of the demonstration was to emphasise British technical ability, and beyond any doubt every visitor expressed surprise that such a service is available in Britain to-day.



The Marconi image Orthicon camera in the Bristol Freighter during the first television from the air broadcast recently.

The Jerboa Cinema was converted into a studio by Pye, Limited, of Cambridge, who were responsible for all the transmission equipment, and for the technical side of the eight hundred yards of closed-circuit transmission.

Eric Fawcett—loaned to the demonstration by the B.B.C., used German cabaret artists for the main part of his programme which was backed by films from the special Pye film scanner.



Pye TV camera equipment being loaded on a freight 'plane for shipment to Berlin for the recent television demonstrations there.

Broadcast Receiving Licences

THE following statement shows the approximate numbers issued during the year ended September 30th, 1950.

Region	Number
London Postal ..	2,336,000
Home Counties ..	1,639,000
Midland	1,726,000
North Eastern ..	1,888,000
North Western ..	1,600,000
South Western ..	1,058,000
Welsh and Border Counties	728,000
Total England and Wales	10,975,000
Scotland	1,125,000
Northern Ireland ..	205,000
Grand Total ..	12,305,000

The above total includes 470,800 television licences.

The Television Society

THE following meeting will be held at the Cinematograph Exhibitors' Association, 164, Shaftesbury Avenue, W.C.2, at 7.0 p.m. November 24th.—"Feedback Methods of Scan Linearisation," by A. W. Keen (Member) (E.M.I. Research, Ltd.). In this paper an introductory analysis of negative feedback amplifiers employing wave-shaping feedback networks is followed by a systematic account of the known ways of applying linearising feedback to the various stages of scanning circuits, including those employing high efficiency methods such as the resonant return principle.

Motor Show Cars "Suppressed"

ALL Morris, Riley, Wolseley and M.G. cars at the Motor Show were "suppressed" to prevent interference with television. The method used was that recommended by the Radio Industry Council—a single resistor in the high-tension lead between the coil and the distributor.

Speed of Light

LIGHT travels at 11 miles a second faster than the figure generally accepted by scientists for the past 15 years. This discovery was made from experiments at the National Physical Laboratory which show that the figure should be 186,282 miles per second and not 186,271.

TV on the Up-grade

ACCORDING to the B.B.C. Listener Research Dept., although the number of wireless licence holders has increased by 252,150 since last year to 12,269,650, there has been a drop of more than 150,000 regular listeners.

This is, no doubt, due to the increasing interest in television. The drift seems to be away from the Third Programme, because the Light Programme shows only a slight diminution.

B.B.C. Policy Retrograde !

THE chairman of the Radio Industry Council, referring to the resignation of Norman Collins, stated that he believed that the TV service must be separated from the sound radio service. The industry will press this policy.

The Place of Films in Television

An Explanation of Film Technique

By PHILIP H. DORTE, O.B.E. (Head of Television Films, B.B.C.)

ALTHOUGH it will doubtless be shared by others, it is my opinion that if a Television Station were to be erected in, say, Johannesburg or Winnipeg, where theatrical talent is comparatively limited, it would clearly have to rely very largely on film to provide its programmes. Where, however, a station is installed in such a city as London, Paris or New York, where theatrical talent abounds, the situation is radically different and, moreover, if a station so located is the key station of a network, its provincial satellites too need not suffer from a lack of "live" studio and outside broadcast programmes featuring the varied talent which is always available in a centre with a flourishing theatre.

Nevertheless, even in this latter case, film has to play a not inconsiderable role in providing material which for various reasons *can* only come from film—and the uses to which film is put do, in the case of the B.B.C. Television Service anyway, fall quite naturally under five distinct headings.

News

The majority of news events occur beyond the range of Outside Broadcast Units, and the only method of bringing these to the television screen is, of course, by means of film. But even when home events fall within Outside Broadcast range, and even when the principal countries of the world are so linked that the B.B.C. can relay a topical television broadcast being staged in any of the five continents, many of these transmissions will be at inconvenient hours during the working week when the television audience is at its minimum.

Every justification, therefore, exists for filming the subject-matter of the outside broadcast so as to make possible re-transmission in whole or in part at a peak-audience viewing time. And in this connection it is interesting to note that it is no longer necessary to send film cameras to site : a complete sound-film can now be shot at base by recording the outside broadcast—viz., by making what we call a "Telefilm" or what the Americans call a "Kinescope Recording." The B.B.C. Television Newsreel of to-day occasionally uses such telefilms even though its main content is the result of normal filming by its own cameramen, by cameramen of overseas Television Broadcasting Systems and by agency and free-lance cameramen throughout the world. The B.B.C. Television Newsreel of to-morrow will contain also a quota of "live" material such as spot interviews with personalities of the day televised by highly mobile outside broadcast cameras at the appropriate locations, or by studio cameras when it is more convenient to invite the "victims" to the Television Studios.

And, incidentally, the B.B.C. Television Newsreel will not stay very much longer at just two editions per week and an occasional Special Edition ; there is every expectation that in the near future it will have grown to three editions per week and to seven editions per week by some as yet undetermined date in the future.

News for Children must not, of course, be forgotten either. In the middle of May the B.B.C. Television Children's Newsreel was launched on a one-edition-per-week basis and when, in due course, this has settled down and found its final form, I do not doubt that it too will grow as has its adult counterpart.

But news film need not necessarily be transmitted under a newsreel title, for some news subjects merit more than the two, three or four minutes which is all that can normally be allocated to a single story in a fifteen-minute reel. Programmes of the type of "Foreign Correspondent" are, virtually, news programmes and, by their very nature, contain more film than "live" subject matter. This is in contrast to the situation where film is used to great effect in what we call "Film Sequences."

Film Sequences

Many good drama scripts would have to be rejected for television if it were not possible to film short sections of them in order to overcome situations where plot calls for rapid changes of costume. And it is for the purpose of making these sequences that the very important Documentary and Sequence Section of the B.B.C. Television Film Department mainly exists.

But this section can, and does, do more than just provide essential film sequences ; by means of filmed establishing shots and by means of film montage it can give a studio production an air of realism which it may well lack without it.

The film sequence will undoubtedly become of ever-increasing importance even though, as its use is perfected, it does intentionally but permissibly "fool more of the public all of the time."

Documentary Films

What the film industry refers to as the "documentary," and the B.B.C. calls the "feature," will undoubtedly play an increasing part in television programmes. Viewers who have had their sets for some time will remember such programmes as "I Want to be a Doctor," "I Want to be a Chorus Girl," and so on, while more recent viewers can hardly be unaware of the "Made by Hand" and "War on Crime" series, and that very popular programme "London Town." In all these programmes film has to play a large part—not an incidental part as in the case of drama productions and, indeed, in many of them at least half their screen time is derived from specially shot film.

It can be argued that little or nothing is gained by staging any part of these programmes "live," viz., that the programmes would lose nothing if they were wholly filmed. But few of us at Alexandra Palace subscribe to this argument : we feel that, in the case of "London Town," as an example, the fact that Richard Dimbleby is actually talking to the television audience during the course of the programme gives it an air of reality and of excitement which would be entirely absent if the viewer knew that he was looking solely at a piece of film—film which had been cut to the perfection with which it is possible to cut film and out of which, in the process, would have been removed those shots where anything had gone wrong, where Dimbleby had "fluffed" or got himself into some undignified position ; in other words, the very human element which makes television so fascinating would have been removed, not with the stroke of a pen, but quite literally with a pair of scissors.

There is, of course, a place in television for the wholly filmed documentary similar in concept to the documentary film made for the cinema, but specialised; perhaps, in

style and content. I refer to such films as "Around the World in Eight Days," to "How Television Came to the Midlands," and, I am glad to say, to a film which is even now in the making, "How Television Came to the North." Such films, however (and they may, incidentally, run anything from ten minutes to an hour), are designed for transmission on a specific occasion and are not the type of film which can be kept on the shelf and transmitted when convenience or necessity dictate.

The Feature Film

Yet both convenience and necessity do, I assure you, call from time to time for the transmission of a full-length film—and this despite the fact that film-making is an exceedingly expensive business, and that it is just not economic to make a full-length film for one Television Broadcasting Service; for such a Service cannot possibly televise it more than two or three times over a period of a year or so and thus cannot justify paying exorbitant production costs. Equally, the film industry as a whole has decided not to make its films available to television, and so all that can be done at the moment (and this applies to American and French television just as much as it does to the B.B.C. Television Service) is for television to transmit such pictures as it *can* obtain—vintage pictures which have had not only their general releases on the cinema circuits but, often, a re-release, too.

That this is unsatisfactory to the television viewer there is no doubt; sometimes it is even held that it is bad for the cinema itself, because an old film does unquestionably look old even though the print be in perfect condition from the purely technical point of view; for even if the production technique is not antiquated, and the theme of the film is still acceptable, such things as dresses and hair styles look clearly out of date in anything other than a period picture and, taken by and large, it reminds the viewer of the worst, rather than the best, of what Hollywood and the English film studios can produce in competition with the television studio.

To the absence of really good modern films there is, I believe, only one answer: the filming of the initial performance of selected studio productions—in other words the Telefilm to which I have already referred.

The Telefilm

If a first-class drama or light entertainment production were "telefilmed" during its live performance, a film would exist which would more than fill the needs which normally arise for full-length films because, if the production had been an outstanding one designed especially for television, the film would provide an automatic repeat performance irrespective of the availability of the artists, the studios and the scenery employed in the original broadcast.

Technically, such Telefilms can now be made to almost near-perfection, and if one was transmitted the viewer would, unless he were warned by the announcer, probably be unaware that he was viewing a film made other than by the standard film-studio method. Practically, however, there is, at the moment, a certain amount of copyright and other difficulty which has still to be overcome before we can bring into operation what will doubtless become one of the greatest of all television boons.

Lastly, and not inappropriately, the Telefilm will, I believe, provide the first large-scale answer to international television. Even if all the television systems now operating or projected were to adopt the same technical standards—and this at the moment seems most unlikely—the transmission of the picture from one country to another would present often difficult and sometimes insoluble problems. And even if a certain amount of direct international relay is possible, and the British viewer of to-morrow will thus be able to see just what his French counterpart is seeing, rapid telefilm processing and the use of aircraft could alone make it possible for the British viewer to see to-night exactly what the American or South American viewer witnessed last night—and, of course, vice-versa.

Summary

The use of film in television is various—some of it highly specialised; but it is very important, for only with the aid of film can all news be brought to the home screen at a convenient time, can the most be got out of certain types of studio television programme, and can television screen-time be filled when circumstances make it difficult, if not impossible, to provide "live" programme material. Further, only by the use of film in the form of telefilm will the television viewer of one country be able to see and enjoy the best that is being transmitted by the television systems of other countries—at least for a very long time to come.

Ion Trap Tubes

Television receivers are in use in which tubes fitted with an ion trap are employed. Some doubt exists amongst users as to the method of adjusting such traps, and the following details, recently issued by Mullard, may be of assistance to those who are interested in this particular type of tube:

1. This adjustment is best performed with a stationary test pattern.
2. Push the ion-trap magnet over the base with the arrow pointing towards the screen and over the line marked on the tube neck. This line will normally be found to be in line with pin No. 3 on the base. Push the magnet just beyond the base.
3. Replace the tube socket. Switch on, turn up the brightness control until the raster is just visible.
4. With the arrow over the line on the neck move the magnet towards the screen until the focused raster is at its brightest. Rotate the magnet a few degrees around the neck in order to obtain the position of maximum brilliance. Now increase the brightness control to give the correct level for the peak-whites and, if necessary, readjust the position of the magnet slightly to obtain maximum brilliance.
5. If the raster cannot be centred by adjusting the position of the focus field, the magnet may now be rotated slightly in order to assist in centring *provided that this does not cause any decrease in brilliance.*
6. Lock the magnet in position by tightening the thumb screw, making sure that the position of the magnet is not altered.
7. If a position of maximum brilliance is not obtained a new magnet should be tried.

SOME OF THOSE DAYS

Television Programme Organiser CECIL MADDEN Looks Back on the Pre-war Programmes

HERE'S Looking at You !—that was the title of the first song written for television at Alexandra Palace, so, as first television programme organiser, I christened the first high-definition programme with this title. It is now part of television history. We knew we had a lot to learn and we learnt fast by having only a few days to prepare for Radiolympia, 1936. That was in August. The official opening came later in November, but by then I had been able to create " Picture Page." which has literally gone on ever since, a record which has only been beaten by my own radio programme " Variety Bandbox," now in its ninth continuous year.

People to-day find it hard to realise that in those days we had to contend with programmes by two different systems each week—Baird and Marconi EMI—and the Baird system was complicated by both intermediate film and mechanical scanning. On the other hand, we started with certain programme advantages, a commercial newsreel in every transmission and unlimited Mickey Mouse cartoons.

We started quietly with short versions of plays, but soon brought these up to full length. The very first play was " Marigold " (on the Baird system), with Sophie Stewart and John Bailey ; a week later " The Tiger." about Clemenceau (on the EMI system), with William Devlin and Joan Miller, both produced by George More O'Farrell, who inserted war films dramatically for the first time.

Parallel with these we experimented with ballet ; the first to come in was the Mercury ; the second the Vic-Wells in " Job " with Robert Helpmann, closely followed by Frederick Ashton and " Facade." We next added opera, and British at that—Coates' " Mr. Pickwick " with Dennis Noble and William Parsons.

If you think back to the time we opened, it was the hey-day of the dance band. Henry Hall was then conducting the B.B.C. Dance Orchestra, with George Elrick singing. Henry came along at once and became a TV favourite. He was followed by Jack Jackson's Band, with Jackie Hunter getting the laughs. and Jack Payne and Jack Hylton too, not forgetting Freddy the Clown.

In December, 1936, we started a Children's Hour with Joan Luxton and her Children's Theatre Company.

Gerald Cock, our boss, inspired us all with a wonderful spirit. We were a happy team, technical and programme staffs co-operating as one family. Round that time I freely admit I was working day and night, planning all the programmes, trying to make the programme money fit our soaring ideas, editing " Picture Page," producing some Variety too. Gale Pedrick, in an " Evening News " article, " Man of Vision," at the time wrote " Planning, telephoning, bounding up flights of stairs, spending hours in an atmosphere where every day sees panic, despair and chaos transformed somehow or other into achievement." This could only have been possible by the encouragement and some kind of pioneering spirit that also imbued our 20,000 viewers. They were critical all right—we welcomed that—but they were on our side.

I tried to find a formula for pure television, something no other medium could do, and evolved " Cabaret Cartoons." I got Harry Rutherford. a Royal Academy exhibitor, to draw cartoons (I have always had a weakness for cartoonists, especially Thurber) of the stars while they performed, both working simultaneously then closing each act with the finished drawing—no curtains, no trappings of the theatre. Chaz Chase took part in the first one, eating his hat and then devouring his dickey.

" So much fuss about Brumas! " A favourite bear cub from the Zoo in pre-war programmes.

Stars of Yesterday

What of the television stars of yester-year ? Unquestionably the first were the three announcers. Elizabeth Cowell and Jasmine Bligh. both pretty as paint. and stalwart Leslie Mitchell, who over-worked to such an extent that he once arrived so tired he opened the afternoon transmission by closing the station down ! I feel I can tell stories against Leslie because I count him one of my best friends. Once, thinking about something else, he forgot to brake his car as he stepped out of it. Looking out of my office window, three floors up, I was horrified to see his empty car start moving. dive off the parapet, cross the road, charge down the hill past the golf course and crash into the edge of the racecourse ! We once sent him up a fire-escape in his best suit only to have his trousers ripped up by a projecting ladder at the very top and in full view of a vast crowd ! Jasmine Bligh once distinguished herself by trying to stop a valuable Australian bush rat from jumping off a table by grabbing its tail. After a stiff tussle the tail came away in her hands !

Television had its pin-ups then : Trudi Binar, " Miss Czechoslovakia," who made more appearances than anyone ; Lisa Minghetti, the red-haired violinist ; Evelyn Dall, blonde American singer of " True Blue Lil," and the Giant Panda, who actually came to the studio—direct from Tibet—in a taxi !

In 1937 we said good-bye to the Baird system and annexed Studio B at the same time. How much we needed a third, and we said so. Oddly enough, we are saying so to-day.

The producer strength then was interesting and exciting. Dallas Bower, the film man, was experimenting all the time. He started with revues, and in one I recall lovely Valerie Hobson standing on a dummy yacht singing a song about sailing down the river, to music by no less than Dr. William Walton ! Bower produced " Julius Caesar " in modern dress (it was at the time of the Nazis) with Sebastian Shaw as Brutus ; and " Tristan and Isolde " in a novel way, the singers and orchestra banished in one studio, the action mimed by such a good-looking couple as Oriel Ross and Basil Bartlett. Stephen Thomas produced operettas and " The Insect Play " ; Eric Crozier ran " comic strip " programmes of American humour. D. H. Munro, an inspired producer of ballet, did a memorable presentation of the Bliss-Kaufman " Checkmate " and reproduced the current musical comedy " On Your Toes " with its popular creators Zorina, Jack Whiting and Gina Malo. George More O'Farrell then came up with " Hassan " in two parts : in this Greer Garson played, for her, the unusual role of Yasmin, the prostitute of Bagdad.

Music

A note on music. From the word go we had our own orchestra. It was conducted by the late " Bumps " Greenbaum and a certain white-faced young man played second fiddle, his name—Eric Robinson. The orchestra also split into groups, such as the Tea-Timers, in which he played Guitar. I still have a photo of Eric perched precariously on top of a vast teapot ! Moiseiwitsch was a regular visitor and even Piatigorsky came to play a concerto with the television orchestra.

We soon had a staff of 450 (it is nearer 650 now), and by then certain personalities had emerged as potential award winners, Marcel Boulestin, the French cook, and Mr. Middleton, the gardening expert. Among distinguished visitors were Amy Johnson, Jean Batten, Axel Munthe, Elizabeth Schumann, Tyrone Power, Leslie Howard and Rouben Mamoulian, but, of course, before he had produced " Oklahoma ! "

Television's first original pantomime turned up at Christmas, 1937, in " Dick Whittington," starring Queenie Leonard and Cyril Fletcher (as Emperor of Morocco). It was authored by no less than Arthur Askey and produced by Reggie Smith, specialist in Coward plays.

Some of the great drama stars of the time were coaxed to Ally Pally, Laurence Olivier and the Old Vic Company in " Macbeth," Balliol Holloway and Celia Johnson in " Othello," Dame Sybil Thorndike in the American play " Sun Up," Lilli Palmer and Barry Jones in " One Night, One Day," about a man and his conscience, Ralph Richardson in Priestley's " Bees on the Boat Deck, Ivor Novello and his company from Drury Lane. Even Ruth Draper was persuaded to conquer her dislike of mechanical means to art, and the other great diseuse Yvette Guilbert crossed the Channel for a visit.

We also had a lot of the spice of life, variety : Gracie Fields, Tommy Handley with his company in " The Disorderly Room," Sophie Tucker sang " Some of These Days," Lou Holtz introduced Mr. Lapidus, Joe E. Brown brought his big mouth, and amongst others, under the wholly deceptive billing of " Nick Long Junior and Partner," in a Dorchester show came the fabulous Danny Kaye. I remember producing this programme myself. He did his comic Russian " Orchicharnia " number. Looking over my records years later I was startled to find that my diligent secretary had logged him as " Russian Comedian." There was so much American talent in town and such lovely transatlantic showgirls, I was able to run a series honestly called " Hundred Per Cent. Broadway." The accent of Alexandra Palace in those days was on glamour.

The outside units came into their own with the Procession at the Coronation of King George VI. The Wimbledon Championships, produced the astonishing result that Alice Marble not only won the tennis but agreed to come and sing in the studios in " Starlight," a triumph of personal contact. Other highlights were the professional boxing fight, Boon v. Danahar, and the first television of the Derby. Even as early as 1937, our mobile units were visiting the film studios, at Denham, Pinewood and Elstree, to see such famous stars at work as Vivien Leigh, Merle Oberon, Raymond Massey and Maurice Chevalier.

Crazy Cabaret

Every April the First, we established a tradition of a Crazy Cabaret. In one we put Nelson Keys, immaculately top-hatted, as compere, in a bath in his dressing-room and assembled all the famous pantomime animals we could out of season ! I had somehow acquired a reputation for female leg shows from our association with the Windmill Theatre and lush supper resorts on Park Lane, so by way of contrast for once I engaged every male troupe in the country ! We dug up a film of the South Seas and another of the Industrial North, playing one sound track to the film of the other. Horace Goldin himself sawed a woman in half, Mr. Middleton appeared in a sketch. After the title, " Nuts to You," had been censored by Broadcasting House, we called the afternoon edition " Nice Work," and the evening, " If You Can Get It."

Basil Bartlett and Oriel Ross as Tristan and Isolde in a pre-war production.

Two weekly serials popped into programmes, too, one dramatic, or rather sentimental, the other comedy, or rather domestic farce. "Ann and Harold," starred Ann Todd, while the "Percy Ponsonby" series brought in Charles Heslop and a company, really an off-shoot of "1066 and All That," since it was also written by Reginald Arkell.

Probably our most daring programme idea was to invite the Habimah Theatre from Tel Aviv to the heights of Muswell Hill not only once but twice, and playing—if you please—in ancient Hebrew! We also enjoyed performances by the celebrated Chauve Souris, complete with Parade of the Wooden Soldiers, lugubrious compere and all.

I count it a great achievement to have persuaded our greatest playwright the late Bernard Shaw, to pay us a visit. We had televised his "Geneva." The occasion was our televising his "How He Lied to Her Husband." He went so far as to admit with a wink it was a very bad play and we all had a jolly tea party at which he revealed himself as a considerable comic actor, popping in and out of a property door with immense gusto!

One little thing I have learnt is never to book an act you haven't personally seen. Names are deceptive. For instance, the "Pal" of "Dixon and Pal" is (or was) a seal.

I remember once a performing sea lion arrived rather early in the afternoon for the evening show. His trainer wanted to get him into water. In a loose moment I said, "Put him in the dressing-room with a bath," and flung open the door. And the room at the time was empty. In the general flurry of band calls and rehearsals no-one remembered to warn the occupant, the star actor, Robert Douglas, who was at the time working in the other studio in a matinee of "The Royal Family of Broadway." When he returned and was sitting at his table taking off his make-up, he was, to say the least of it, a trifle startled to see in his mirror what appeared to be an old gentleman with whiskers leering at him, taking a bath!

I could carry on yarning about comic incidents like this indefinitely. They say pioneers do no good for themselves—still I am proud to be a television pioneer, and still at it to-day. The pre-war years were happy, though exhausting days, which only ended for us in September, 1939, when Hitler's war clouds darkened every British screen for so long.

In three formative television years viewers saw 402 different plays (15 being entirely new writing for television), 35 dance bands, including the original Lecuona Cuban Boys, 150 cabaret shows and revues, 98 star musicians, 25 cartoonists, 80 ballets, 50 operettas, 42 personalities "Speaking Personally," 57 "starlight" stars, 56 public events, 165 documentary and light features, 17 puppeteers, 10 relays direct from West-End theatres.

Among my souvenirs I shall never forget Lady Hart-Dyke's gallant little silk worm who stuck it out erect till the end of her interview and then his head fell off! Yes, those were the days!

CLUB Reports

SOUTH COAST TELEVIEWERS' ASSOCIATION

Hon. Sec.: R. Sawyer, 74, Berriedale Drive, Sompting, Worthing.

THE S.C.T.A. has a present membership of over one thousand viewers formed in Branches at Worthing, Lancing, Brighton and Hove, Eastbourne and outlying villages.

It has affiliated viewers Clubs, and the movement is expanding so rapidly since its formation in 1949 that organisation on a national scale is now contemplated.

The Association's main aim is to raise the standard of television reception in areas where such reception is unreasonably and unnecessarily poor, and to press for a television station which will adequately serve London and the South Coast of England.

Other functions include the tracing and suppression of local interference to TV reception and a certain amount of social activity.

Membership is open to any person who owns a television set. The subscription is five shillings annually.

THE BRITISH TELEVISION VIEWERS' SOCIETY

Hon. Sec.: Leslie G. Pace, 140, Fairlands Avenue, Thornton Heath, Surrey.

THE Television magazine feature "London Town" formed the subject of an interesting and informative talk by the B.B.C. producer Stephen McCormack at the monthly meeting of the British Television Viewers' Society held at Kennard's Restaurant, Croydon, recently. Mr. McCormack who was accompanied by stage-manager Harry Lane mentioned the early ideas and suggestions which originated some months ago in the first edition of "London Town."

He described in detail the work involved in contacting the various authorities, i.e., Scotland Yard, London Fire Brigade, etc., interviewing, filming whenever necessary, arranging a suitable commentary and sound background and production in general.

The speaker mentioned with gratitude the great help rendered by Mr. Richard Dimbleby who, as viewers will appreciate, plays such an important part in the successful presentation of "London Town" on the television screen.

BRISTOL AND BATH TELEVISION CLUB

Hon. Sec.: P. Harper, 57, Queenshill Road, Bristol 4.

THE above club has been running for twelve months or so, with a membership of some 20 to 30 keen viewers. It caters for those with commercial receivers, as well as amateur constructors. An interesting series of meetings is planned for the future, with talks of a practical nature by members, and lectures by representatives of leading manufacturers.

New members are welcome at the club's headquarters, Keene's Café, Cannon Street, Bedminster, Bristol 3. Meetings are held fortnightly on Tuesdays at 7.30 p.m.

NEW LONDON TRANSMITTER SITE?

THE South Coast Televiewers' Association are making some interesting proposals concerning an alternative site for the A.P. transmitter. In a pamphlet issued by them, they say, amongst other things:

"... From the viewer's point of view the present transmitting range of Alexandra Palace is most unsatisfactory. A 'guaranteed range' of 30 miles is all the B.B.C. is able to offer. Viewers outside this area suffer from an erratic service which involves heavy aerial installation costs. The South Coast of England endures particularly poor conditions. There, even 'blind radio' reception is so bad that protests, investigations and inadequate remedies have for years been the basis of the B.B.C.'s relationship with the vast number of people who live in the area from Deal in Kent to Bognor in Sussex. Now that TV has very much 'arrived' the position has become farcical and *no plans* to deal with the situation have been announced by the B.B.C.

We propose that a high-power, well-situated TV transmitter be brought into service to give Londoners (including the Home Counties) a better TV service, and to send TV programmes well over those great barriers to good reception from Alexandra Palace—the North and South Downs.

Where should the new station be? This is where our scheme becomes very feasible. No Official Plan or Great Decision is really necessary.

The B.B.C.'s new London Television Station already exists. At Wrotham, in Kent, there is a B.B.C. establishment known as the Wrotham Experimental V.H.F. (Very High Frequency) Station. If you live in that area you cannot fail to see the brand new, 470ft. mast. The height of the mast itself, when added to that of the high ground on which it stands, gives a total aerial height above sea level which is very little lower than that of the much-boosted Sutton Coldfield TV transmitter. Actual height of the Wrotham mast above sea level is 1,210ft. Sutton Coldfield is 1,300ft.

If you look closely at the buildings which house the B.B.C.'s experimental radio equipment at Wrotham, you will notice an important architectural point. The buttresses are so arranged that a rapid extension to these buildings could be made easily and at once. There is also plenty of land available for expansion.

PROJECTION

Report of a Lecture Given to the I
to Honour the Memory of
by Mr. Emlyn Jon

Introduction

THE equipment to be described is the result of continuous development over the past seven or eight years, during which time many important improvements have been incorporated. The latest version differs in many respects even from the models which were described in 1948 and 1949, and since this new projection unit is being installed in commercial receivers at the present time it is felt that many practical engineers will welcome an account of it. Certain allied subjects will also be dealt with, such as directional viewing-screens, and the circuit arrangements developed for driving the equipment.

Why Larger Pictures?

The need for a large picture in a cinema is obvious. We are not here concerned with the cinema, but with television at home, so it may well be of interest first to consider the reasons for attempting to increase the size of the home television picture.

It is well known that if a viewer stands far enough away from a television picture to render the line structure invisible, the angle it subtends at his eye is fixed and does not depend on the size of the picture. This is shown in Fig. 1 (a) in which the three smaller vertical lines correspond roughly to the picture-heights on 9in., 12in., 15in. diameter C.R. tubes, and the three larger lines to the heights proposed for projection television. When the viewer adjusts his distance from all these different picture-sizes until he just cannot see the lines he finds that they all subtend the same angle θ. The image thrown on his retina is therefore of the same size whichever picture he looks at, so that at first sight there is no point in making a large picture. This is borne out by the census of television receivers recently undertaken by the B.B.C. viewer research department, who found 60 per cent. of the public using the 9in. tube (Fig. 1 (b)).

Such an argument is, however, extremely superficial, as anyone who discusses television with his friends soon discovers. Almost the first thing the expert is asked is "When are you going to give us some bigger pictures?" and if he tries to persuade the ordinary viewer that he doesn't really want bigger pictures, on the grounds of our previous argument, he will in most cases be wasting his time. The viewer knows what he wants, and the expert's job is to give it to him.

The most obvious advantage of a large picture is the improved angle of view which it permits for people sitting on one side of the axis. Fig. 1 (c) shows three people sitting on ordinary dining-room chairs. It would be difficult to pack them more closely together. Yet the two outer viewers are at an angle of 30 degrees from the axis when viewing a 9in. C.R. tube. For the largest projection picture this angle is reduced to only 12 degrees.

Another advantage, which is not so obvious, concerns the distance at which the eye muscles are at rest. A certain amount of effort is needed to focus things which are very close, or very far away. But in the region of

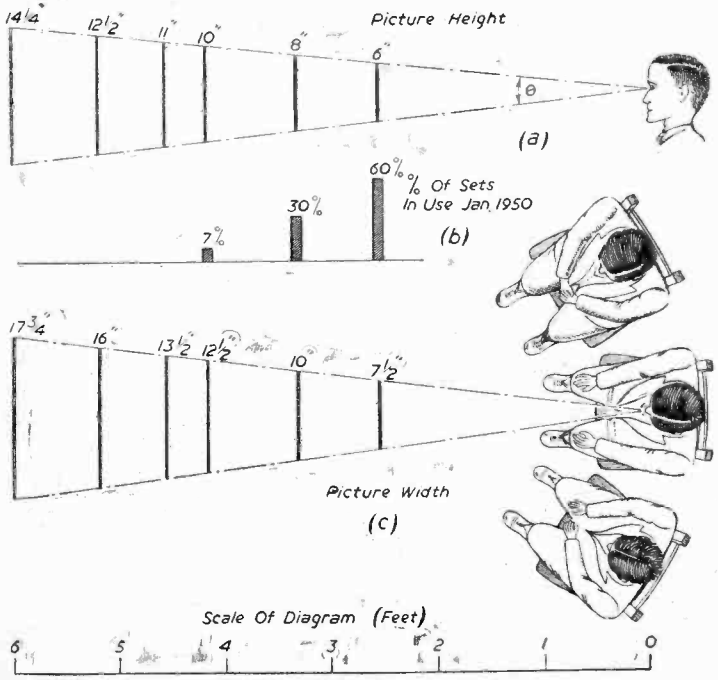


Fig. 1.—(a) Angle of view depends on the number of lines, not on picture size. (b) Most receivers in use have small pictures. (c) A large picture enables more people to view in comfort.

A modern version of a television receiver

TELEVISION

stitute of Practical Radio Engineers
the late Mr. D. F. Harrison,
s, B.Sc., A.M.I.E.E.

20ft. the eye muscles are much more relaxed. The 9in. tube, viewed at 2½ft., therefore, is more tiring to the eye muscles than the larger pictures viewed at a greater distance.

A third advantage, much more subtle, but soon appreciated by those fortunate enough to own a large-screen receiver, is purely psychological. On a 14in. by 18in. picture a head-and-shoulders shot is about life size. Television is an intimate medium, and such a picture brings a realism quite unobtainable with larger pictures, as in the cinema, or with smaller ones on a 9in. tube.

using projection apparatus.

We see, therefore, that the viewer has good reasons for wanting a larger picture, and the reason for the popularity of the 9in. tube is purely one of cost. There is, of course, an upper limit to the practicable size of the picture which is set by the size of the average living-room, and in most cases no great benefit is obtained from going above 14½in. by 18in.

Difficulties of Large C.R. Tubes

Let us now turn to the means whereby a large picture can be achieved. The obvious solution is to increase the size of the C.R. tube, but a consideration of Fig. 2 will soon show that there is a limit to this process. The air-pressure on the tube faces increases as the square of the diameter. Consequently the glass thickness has to be increased to withstand this pressure, which in turn increases the cost of the bulb. During manufacture these large bulbs have to be degassed individually under vacuum in a stove for a considerable time, which is a slow and expensive process. It is not surprising therefore that the cost increases with size, even though the gun structures may be identical. A large cabinet and rigid chassis are needed to accommodate a larger and heavier tube, so that further expense is incurred from this cause. Finally, when eventually replacement is necessary the high cost of the large tube has to be paid all over again.

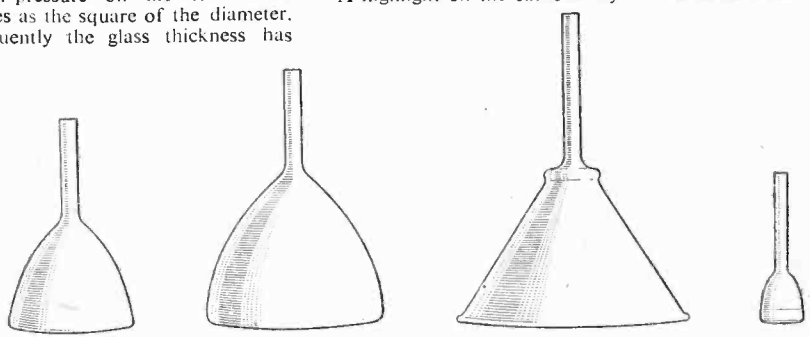
Advantage of Projection

By using a small but very bright picture on a small C.R. tube, and projecting this on to a screen, many of these disadvantages are avoided. The tube becomes much cheaper, but on the other hand there is the cost of the projection equipment to be considered. One must not forget, however, that the projected picture has certain advantages over its equally large directly viewed counterpart. It is quite flat. Even for the same size of picture it is more comfortable to view, as will be explained later. The low replacement cost has already been mentioned. There is no danger from implosion.

Mirrors and Lenses

When we talk of projecting a picture we immediately think of the cinema. One's first reaction is, therefore, to attempt to copy the film projector, but to use a small cathode-ray tube instead of the film. In practice this does not prove very useful. The film projector uses a very powerful light source—a carbon arc—and collects the light from this by means of a condenser-lens system which need be only very crudely made. All this condenser has to do is to focus most of the light into the projection-lens. A highlight on the film, i.e., almost clear celluloid, merely lets this light through. It is already beamed into the lens, and proceeds to illuminate the highlight on the screen (Fig. 3 (a)).

A highlight on the cathode-ray tube is itself a source



Picture Size (ins.)	7¾ x 6¼	10 x 8	13⅛ x 10½	17¾ x 14 3/16
Tube Type	MW 22–14C	MW 31–14C	16 AP 4	MW 6–2
Tube Face (dia.)	9 ins.	12 ins.	16 ins.	2½ ins.
Tube Length	14·8 ins.	18·4 ins.	22 ins.	10½ ins.
Weight	3½ lbs.	6½ lbs.	11 lbs.	6 ozs.
Price	£9	£12	74 Dollars	£5
Thrust on Face	8½ cwt.	15 cwt.	1 ton 7 cwt.	56 lbs.

Fig. 2.—Weight, cost, and air pressure on face of tubes of increasing size.

of light, and it gives out this light in all directions. From Fig. 3 (b) it will be seen that only a very small amount of light is collected by the lens, because there is no pre-focusing action as in the film projector. In fact, one can show that the light efficiency of this simple lens system is given by

$$\frac{\text{Light reaching screen}}{\text{Light leaving C.R. tube}} = \frac{K}{4f^2}$$

where K = transmission coefficient, and f = "F Number" of lens.

Table I.—Mirrors versus lenses.

Mirrors	Lenses
Achromatic	Chromatic
One optical surface	Many optical surfaces
Glass not of optical quality	Glass must be optically sound
Less spherical aberration	More spherical aberration
Easily made in large sizes	Cannot be made in large sizes
Cheap	Expensive
Light obstruction	No obstruction
Aspheric corrector plate	No aspheric surfaces

Taking a lens of good aperture and perfect transmission, i.e., f=2, K=1, this works out to 6¼ per cent. overall efficiency.

Higher efficiencies than this can only be obtained by collecting more light, and Fig. 3 (c) shows how this can be achieved by a large diameter spherical mirror. The action of the "corrector plate" will be explained later. The many advantages of a mirror over a lens are shown in the upper part of Table I, but there are two disadvantages, listed below the line, and both of these must be overcome if a mirror is to be used. We will consider them in turn.

Obstruction of Light

Fig. 4 shows a mirror collecting light from a luminous point near one edge of the C.R. tube. The lower ray

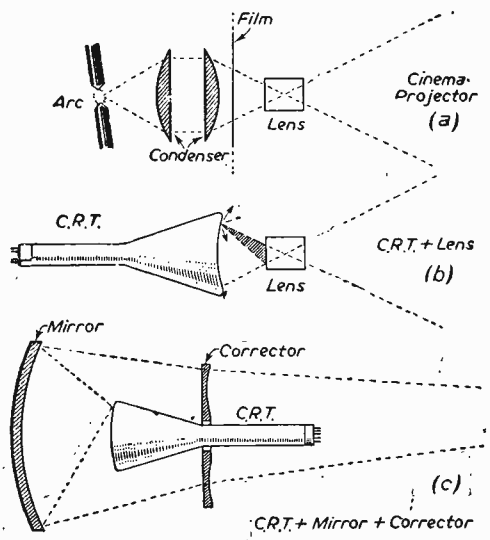


Fig. 3.—Projection systems: (a) Cinema projector. (b) C.R. tube and lens. (c) C.R. tube and mirror.

proceeds to the screen without hindrance. The upper one is, however, obstructed by the scanning and focusing coils around the neck of the tube. Fig. 5 shows how this difficulty is overcome in the Mullard equipment. The tube face is passed through a hole in a plane mirror E, which is inclined at 45 deg. to the axis of the tube. This mirror "folds" the whole optical path through 90 deg. so that the scanning and focusing coils are outside it. These components can now be made as large as one pleases, so removing a serious restriction on their design.

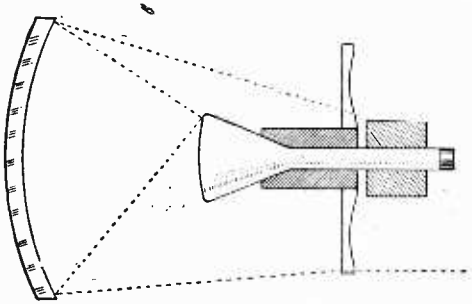


Fig. 4.—Obstruction of light by the scanning and focusing coils.

The upper ray from point A, which was previously obstructed, is reflected from the surface of the mirror E, passes through the corrector plate, possibly is again reflected from another mirror G placed in the lid of the cabinet as shown, and finally reaches its focal plane at the viewing-screen H. In this way the obstruction imposed by the scanning components has been removed. That produced by the face of the C.R. tube cannot be avoided. To prevent light being reflected straight back to the tube face, where it would illuminate dark areas and so spoil the contrast, the central portion of the mirror is blacked out. Although this appears to cause a great loss of light when shown in a sectional drawing, it must be remembered that the black part is quite a small proportion of the total mirror *area* and the loss of light is not so serious as might be imagined.

The Corrector Plate

Coming now to the corrector plate, it is first necessary to explain why this component is required.

Fig. 6 (A) shows a spherical mirror reflecting the light

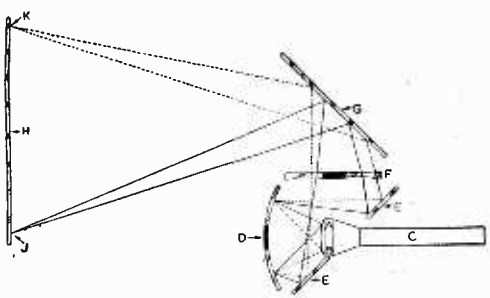


Fig. 5.—Optical system of the Mullard unit. A and B are two picture points on the face of cathode-ray tube C. D is the spherical mirror, E the 45 degree mirror through which the tube is placed. F is the correction lens, G a mirror in the lid of the cabinet, and H the viewing-screen. Light from A is focused at J and light from B at K.

received from luminous point A on the axis. If pairs of rays 1, 2 and 3 are drawn, it will be found that they come to a focus at corresponding points F1, F2 and F3 on the axis. No single point can be found at which all the rays are in focus, and consequently a simple mirror would be too imperfect for our purpose. This defect is known as spherical aberration. If now a special lens is made, so proportioned that the rays, as they come from the mirror, are bent just sufficiently to bring them all to a focus at F1, the defect is corrected. Such a lens is shown at (B). In practice it is combined with a simple convex lens in order to reduce the curvature at the edges, and the system then becomes as at (C). Besides improving the contour of the lens, this also shortens the throw, so reducing the cabinet size. Now, a corrector-lens as shown at (B) or (C) has a surface which does not form part of a sphere, and such "aspheric" components cannot be made by the normal lens-manufacturing techniques. Some simple method of manufacture had to be found for making corrector plates before they could be used for television.

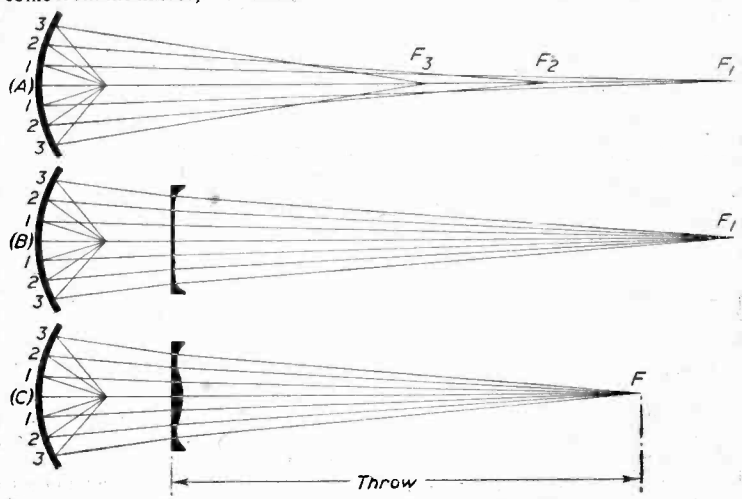


Fig. 6.—The principle of the correction lens.

Manufacture of Corrector Plate

Fig. 7 shows the ingenious way in which the plates are manufactured. A steel mould is made, the upper surface of which is carefully finished to a contour ten times more pronounced axially than that eventually required for the corrector plate. The centre of the mould is hollow so that its temperature can be quickly changed by admitting hot or cold water. With the mould hot, gelatine is run over the top surface and is covered with a glass plate, leaving no air spaces between the gelatine and the glass. Cold water is then passed through the mould, so solidifying the gelatine. The glass plate, with the gelatine attached, can be stripped off the highly polished surface of the mould. The gelatine is then dried, and if the original concentration was correct, it will shrink to exactly one-tenth of its previous thickness. Another glass plate is placed over the gelatine and the two sealed together to prevent the ingress of moisture. It will be seen that by this means the accuracy of the gelatine contour is ten times better than that of the mould. The same mould can be used over and over again, and different corrector-plates can be made by the very simple process of altering the concentration of the gelatine solution.

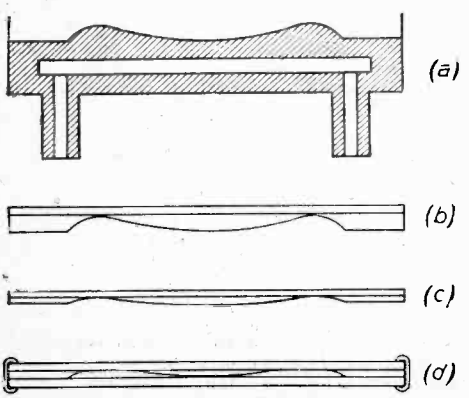


Fig. 7.—Manufacture of gelatine correction lens; (a) Mould; (b) Wet gelatine; (c) Dried gelatine; (d) Completed lens.

The Complete Optical Unit

Fig. 8 (to be given next month) shows the completed optical unit. Parts 1, 2 and 3 are permanently fixed in correct optical relationship. The cathode-ray tube is carried in an adjustable carriage 4, and can be moved to the correct position, during the operation of focusing, by three screw adjustments.

The unit is carefully made dustproof, all cracks being sealed with felt strips, and the tube face is held in a flexible rubber housing. The mirrors are surface-silvered and must not be touched. The only exposed optical surface is the plain glass face of the corrector plate. This is not easily scratched and can be dusted with a clean cloth or chamois leather.

The plated portion of the unit in which the tube is clamped withdraws from the part 5 by a slight rotation, after slackening three clamping screws, and the whole C.R. tube—focus coil—scanning coil assembly comes away complete. Room must be left in the cabinet for this to be done when necessary.

The sharpness of the image produced by this optical unit is more than adequate for reproduction of a 625 line picture.

The Scale Factor—How Big?

In describing the optical unit we have said nothing about its absolute size. The Mullard unit uses a C.R. tube of 2½in. face diameter. Why this figure? Would a larger or smaller tube be better?

If the extra light made available by a large C.R. tube is to be collected without loss of efficiency, the mirror diameter must be increased in proportion to the tube diameter, and the corrector-plate diameter must increase in proportion to the mirror. Similarly, the focal length and throw distances will all increase in proportion. The system thus soon becomes expensive and unwieldy.

(To be continued.)

COLOUR TELEVISION

A Reply by a Television Engineer to the Suggestion made in our July Issue

I HAVE read with interest the article in the July issue on Colour Television, by Mr. G. Keating, and I should like to make a few comments of my own on this problem.

In the first place I fully agree with the author that it will be some years before a public service of colour television will be generally available, and I also agree that the ideal system must be fully compatible, that is, the transmitted waveform could be received on a standard receiver and produce a monochrome picture, or on a colour receiver and produce a coloured picture. It would, of course, be completely impracticable to have two separate systems being broadcast, one for monochrome and one for colour, on economic considerations alone.

The question of compatibility immediately brings up the problem of bandwidth. It will be appreciated that there are, with certain exceptions which need not be dealt with here, only three ways of utilising a given bandwidth, and they are, of course, 1, limiting the horizontal definition; 2, limiting the number of lines per frame or in other words the scanning speed, and 3, limiting the number of pictures received per second. Now if one is to adopt for colour the existing 405 line interlaced system at present in use, the bandwidth would have to be either doubled or trebled depending on whether a two-colour or three-colour system was to be adopted. This, of course, assumes that the received picture is to be 405 lines with normal definition, and 25 complete interlaced pictures per second as is standard for monochrome.

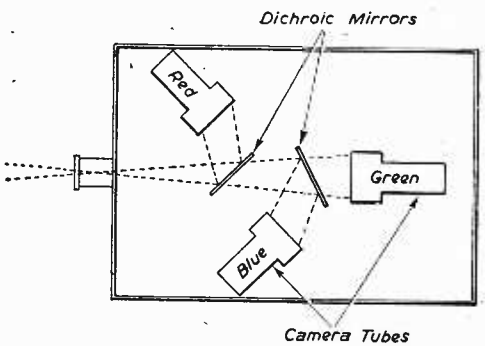
Two-colour

Now, as I understand Mr. Keating's proposals, he is suggesting a two-colour system and that one frame be used for the red/orange and the next frame be used for the blue/green colours.

It must, however, be realised that each picture element as viewed on the final screen must contain information from both colour filters in order to reproduce the intermediate colours on an additive basis. In any sequential system whether it be line sequential or frame sequential one relies on the persistence of vision to achieve this result. Therefore with this proposal the second frame raster would have to be superimposed on the first raster and this would obviously result in a 202½ line picture. In these days of screaming for more and more lines this would hardly be considered as acceptable.

With regard to the arguments for and against two-or three-colour technique, in my own opinion it is extremely unlikely that any service would ever be provided using two colours only. This technique was used in some of the early colour films and in certain colour printing processes, but the limitations to the colours that can be reproduced make it rather unsatisfactory.

Suggestions have been made that in view of the extra information obtained from a coloured picture, it might be possible somewhat to degrade the horizontal definition without seriously impairing the subjective quality of the picture. This, of course, would mean on the present standards, that a monochrome picture would be received with the full 2.76 megacycles definition, whereas the coloured picture, assuming three colours, would have one-third of this definition or approximately 1 megacycle. It was inferred in the article that the camera could consist of two camera tubes, presumably of the orthicon type, mounted side by side and at an angle so that each focused at a common point. This, of course, is not possible as each tube would be viewing the scene from a slightly different angle, and a distorted picture would result. As a point of interest this difficulty can be overcome by the use of dichroic mirrors. These are specially prepared glass which will reflect certain colours and transmit all others. This enables a single taking lens to be used so that each camera tube sees exactly the same scene. This method has been used in experimental colour television cameras, and is used in certain of the single shot colour film cameras with quite satisfactory results. A simplified arrangement is shown above.



This illustration shows the mirror arrangements.

Two Tubes

A more serious difficulty presents itself at the receiving equipment where it is suggested that two cathode-ray tubes with either filters in front or coloured phosphors be focused on to a screen by the usual projection methods. Here the problem is to arrange for the rasters from each C.R. tube to coincide accurately on the screen and this, remembering the degree of accuracy demanded, is extremely difficult to achieve and would make the cost of receivers almost prohibitive. This idea has been proposed before and it is now generally agreed to be impracticable. While on this point it might be as well to point out that any error in registration between rasters would result in serious colour fringing.

Successful results have been achieved using only one tube with a rotating coloured filter disc and this has been demonstrated both in this country and in America. The final answer to this problem will most probably be in the development of a single tube with three different coloured phosphors.

Some of the more recent developments by the R.C.A. on colour television appear to offer considerable advantages over existing methods, particularly on bandwidth saving considerations. Details of these developments, employing a system of dot sampling and a time multiplex transmission have recently been described in technical literature.

EARLY TELEVISION SYSTEMS

A Review of Some of the Apparatus which has been Used in the Past

By R. F. SCARISBRICK

MANY of the present-day television enthusiasts, particularly those who acquired their interest and knowledge as a result of war-time radio training, will have no recollections of the technical methods used in the days of the early B.B.C. experimental transmissions. It is interesting, in the light of the rapid progress made in recent years, to review some of the ingenious systems which were devised and employed in the quest for commercial television.

The earliest B.B.C. television programmes were of "low definition," employing only 30 scanning lines compared with the 405 now in use. Vertical scanning was adopted instead of horizontal, with a picture ratio of 7 : 3, the vertical dimension being the larger. The limitation on the number of lines was necessary because of the scanning problems arising from the mechanical methods then used, and because the picture frequencies generated by a 30-line system were about the maximum which could be accommodated in the 9 kc/s channel used for these transmissions. For the same reasons the picture frequency was restricted to 12½ per second, resulting in a slight noticeable flicker.

About the same period, French and German transmitters were working on 60- and 120-line systems, and at a later date the Baird company experimented with 240-line transmissions, but with the development of C.R. tubes for television these "low definition" standards were dropped in favour of the 405 lines now in use.

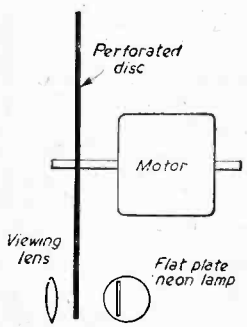


Fig. 1.—The simple disc apparatus.

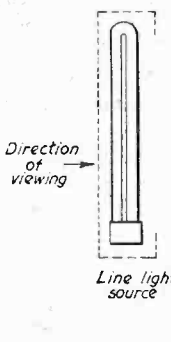


Fig. 2.—The mirror screw apparatus.

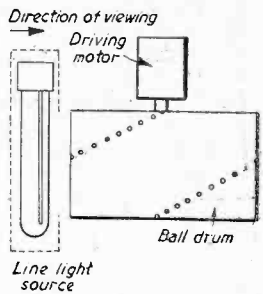


Fig. 3.—The ball drum scanner.

The Earliest Receivers

Many ingenious scanning devices, all mechanical, were devised, some being of the directly-viewed type and others for back-projection on to a semi-transparent screen. The earliest method was, of course, the well-known scanning disc, derived from the earlier Nipkow disc (Fig. 1). This disc had 30 small holes spaced radially around the circumference, each progressively displaced further from the centre. The light source used was either a neon type, or a mercury lamp giving blue/white light. The lamp was mounted behind the rotating disc, and was directly modulated by the application of the video picture impulses. Many thousands of these simple disc receivers were constructed by early experimenters, and their enthusiasm was in no wise damped by the fact that the resulting picture was about the size of a large postage stamp!

Another scanning device was the mirror screw, which was much more compact in construction (Fig. 2). The scanning unit was built up of 30 plated metal strips mounted in helical form on a centre spindle, each strip being angularly displaced 6 deg. from the next, and the exposed edges highly polished to a mirror finish. The light source was a special tubular type neon or mercury lamp, used in conjunction with a suitable slit-shaped mask. The picture was viewed by reflection of the light source from the polished surfaces of the rotating mirror screw. This method provided a fair-sized picture up to about 5in. long—a big improvement on the scanning disc.

The only other type of directly-viewed machine, and little used in this country, was the ball drum scanner (Fig. 3), which, however, was not very satisfactory owing to the poor light efficiency and small picture size. This was a rotating drum having a number of small polished metal balls arranged round the outer surface, each progressively displaced the width of a scanning line. The image was directly viewed on the drum, the scanning lines being produced by reflection of a strip light source as a spot on the surfaces of the metal balls.

Projection Receivers

It was not long before these directly-viewed machines were followed by various types of projection-scanning receivers, capable of giving a larger picture. The light source used with these was, of necessity, a small concentrated "point" source of light, generally in conjunction with a mask having an adjustable square aperture. The image of this aperture was projected by a rotating lens or mirror system on to the rear of the viewing screen. Two methods of light source were in general use, one being a modified form of mercury lamp

designed to give a small spot of intense light. This lamp, as with the earlier neon and mercury lamps, required a striking voltage of about 200 and was directly modulated by the picture impulse voltages.

The other method of illumination for projection receivers was the Kerr cell-Nicol prism combination (Fig. 4). The light source for this was a small projector-

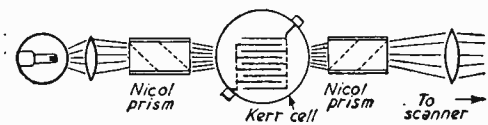


Fig. 4.—The Kerr cell-Nicol prism arrangement.

type lamp with small concentrated filament area and fitted with a square aperture mask. The light passed successively through a Nicol prism which plane-polarised the beam, the Kerr cell which modulated it, and a second Nicol prism arranged to polarise the light in a plane at 90 deg. to the first one. The usual form of Kerr cell construction consisted of two sets of closely spaced metal plates interleaved in condenser fashion, the unit being

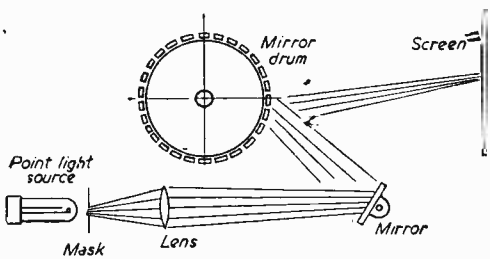


Fig. 5.—The mirror drum projection arrangement.

immersed in nitro-benzine in a small glass container. A polarising voltage of approximately 400 volts, modulated by the video impulses, was applied to the two electrodes. With no picture modulation, the polarising voltage "twists" the polarisation of the beam emerging from the first prism through an angle of 45 deg., thus permitting only 50 per cent. of the light to pass through the second prism. When the modulation voltages are applied they rotate the plane of the polarisation, thus varying the amount of light passing through the second prism. The beam is then passed to the scanning system by a suitable optical arrangement.

Although the optical losses inherent in this method of light source are considerable, with careful design it was capable of producing a black-and-white picture of good brilliance and contrast.

Projection Scanning Methods

The most widely used projection type scanner was undoubtedly the mirror drum, having 30 small mirrors each angularly and radially displaced from the next. Each mirror produced one line-scan by reflection of the image of the mask aperture on to the viewing screen (Fig. 5). The mirror drum scanner, in conjunction with a Kerr cell light modulator, was the basis of the first projection televisor marketed in this country.

Some time later a variation of the mirror drum idea was introduced on the Continent. In this case the rotating scanner employed only two small mirrors mounted back to back, and reflection from this rotor caused the beam to "scan" a ring of fixed mirrors, which in turn reflected the scanning spot to the screen. This method could certainly claim the advantages of lightness and simplicity, but little was heard of it afterwards.

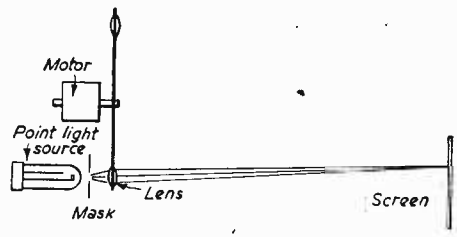


Fig. 6.—Another early projection idea.

Two other projection scanning methods of similar principle were the lens disc and the lens drum (Figs. 6 and 7). These employed a number of small lenses which projected an image of the point light source on to the viewing screen. However, they both suffered from the same disadvantages, the high cost of the number of projection lenses required, and the difficulty of mounting and adjusting the latter to provide accurate scanning.

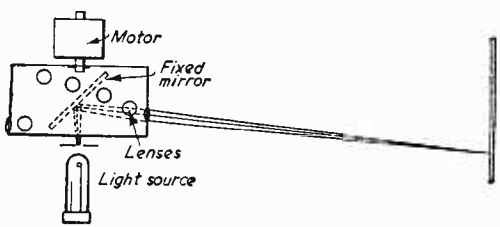


Fig. 7.—A lens-drum projector.

An interesting departure from the conventional scanning methods was the "Stixograph," introduced and developed by Scophony, Ltd. This consisted of a rotating "lens echelon"— a device which can best be described as a series of lenses mounted in close proximity in "step" formation. When used in conjunction with a suitable optical system, the effect was to displace the picture lines optically in a manner which enabled the whole picture to be scanned as one continuous strip. Because of the special optical system required, however, this device did not lend itself to adoption for general experimental use.

The foregoing were the chief methods used by the early television enthusiasts. There were, of course, many other ingenious ideas and devices such as oscillating mirror scanners, modulated arc light sources, etc., but most of these, although promising in theory, did not measure up to practical requirements and they never came into general use.

Synchronism of transmitter and receiver was achieved in those early days in a manner very similar to present-day practice, in that the transmitter scanner was arranged to scan a "dark" band at the bottom of the picture frame, producing a 375-cycle sync pulse. At the receiver this pulse was applied to energise an electromagnet, the latter being mounted so that the poles exerted influence on a 30-tooth steel wheel mounted on the main spindle.

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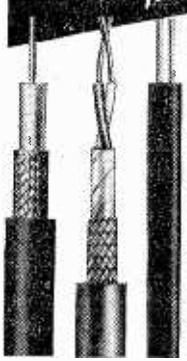

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The Gentle Art of Interviewing

By MARY MALCOLM

Lady Bartlett, better known to viewers as Mary Malcolm

ARE you an expert on something, a subject suitable for television? Can you talk about it? Of course you can. You have lectured frequently and are an experienced public speaker . . . That, my friend, will not help you much at Alexandra Palace.

I sometimes wonder which is the more difficult rôle, interviewer or interviewee. My job in television includes a certain amount of interviewing and, provided you have a sincere interest in other people's lives and jobs, it is fascinating work. I am still inclined to be nervous in front of the camera, but I find when interviewing someone that I lose my own nervousness in my effort to put the "victim" at ease and draw the best out of him.

"Victims" fall mostly into two categories. Those you cannot start talking and those you cannot stop. In most studio interviews the ground has already been prepared for you by a script writer who gives you a set of suggested questions, together with their answers and a brief biography of the person to whom you are going to talk. Some "victims" will have made an effort to memorise their answers in the right order before arriving for rehearsal. I have nearly always found that this is a bad idea as it does not allow for any juggling with the plan and the interview immediately assumes a "phoney" air which the viewer at home can detect instantly. There is a theory that top-flight interviewers—like Leslie Mitchell and Richard Dimbleby—are born and not made. I am not sure how true this is, but I do know that there are certain tricks of the trade which one can acquire. Most important of these is to keep a fluid mind throughout. You should have all the information which you hope to extract from your "victim" clearly in your head and then be prepared to follow him unobtrusively, jogging his memory or bringing him back to the main topic as the occasion demands. To do this without appearing to interrupt is not always easy. When being interviewed in television the "victim" is expected to talk with both the interviewer and the dead-eye of the camera behind which are hundreds of thousands of viewers. It is small wonder then that the majority of speakers, unnerved somewhat by the lights, the heat in the studio and the constant movement of the technicians on the floor, either address themselves confidentially to the interviewer—thus presenting an unvarying profile to the camera, or else—buoyed up by their lecturing experience, embark upon a flood of oratory which it is almost impossible to stem.

One of the great problems of the interviewer is when to feign surprise and when not. I think every television viewer appreciates that ninety-five per cent. of interviews are rehearsed beforehand, however roughly. Therefore, in the case of, let us say, Mr. Pickteeth, who has brought a collection of curios from Wizbang with him to show, one knows in advance what they are. The question then arises, does one say: "I see you have brought some exhibits with you, Mr. Pickteeth, what is this one?" Or does one adopt the more honest approach such as: "This is a very interesting old spear, isn't it?"

Keeping to Time

Viewers sometimes wonder why it is that discussion and interview programmes often overrun their allotted time. They argue, reasonably enough, that the interviewer or chairman can surely see a clock in the studio and should be able to terminate the interview or discussion more or less on time. In theory this is true but, like so many other things, in practice it does not always work out. It is a theory which does not take account of the animal which refuses to do its tricks, the invention which unaccountably jams, the man who suddenly remembers a lot of vitally important facts which he forgot at rehearsal and, most disconcerting of all, the man who, full of confidence before the camera, decides to tell you "a most amusing experience."

Interviews conducted entirely *ad lib.* are, of course, more hazardous. Approaching a mother pushing a pram by the Round Pond or a small child snow-balling in the grounds of Alexandra Palace one can lay oneself open to rebuffs, gracious and otherwise. It is difficult, too, to phrase everyday questions so that they require more than "yes," "no" or "that's right" in answer. Fortunately most of the off-the-cuff interviewing for Television is of film or theatre stars or other prominent people who are ever conscious of the unseen audience which is noting every detail of their appearance and devouring their every word. On these occasions the interviewer can, so to speak, sit back and relax knowing that no matter where he places the ball in the court it

will be returned to him. The atmosphere is not always conducive to intelligent conversation, however. An instance of this was the *Daily Mail* Film Award Ball at the Dorchester in 1949 when Richard Dimbleby and I interviewed the guests. We had previously ticked off on a list those stars, directors and producers whom we either knew personally or knew enough about to be able to interview them for three or four minutes. Each one of us was given an assistant (unseen by the viewers) whose job it was to find the people, prise them away from their friends and propel them in our direction. Richard was stationed in the ballroom and I was in the ante room. The interviews in my charge were conducted against a steady roar of conversation in a small oasis of space which we kept clear in front of the camera. My assistant had a pair of headphones through which he received instructions from the producer in the O.B. van parked in a side street. These were relayed to me by dumb-show. The signal that Richard had his next "victim" lined up was indicated by a thumbs-up; a request to cut an interview short by the simple if indelicate gesture of cutting your throat with your finger; to speed up a bit was indicated by drawing circles with a hand, and to prolong it by using the motorists' slow-up sign. These gestures were supposed to be seen only by me, but Stewart Granger noticed my assistant busily "cutting his throat" and observed to me (and the viewers) with a nod in his direction, "Is it really as dull as all that?" This took a little explaining away since the viewers at home had no idea to what he was referring.

At last year's Theatrical Garden Party I was winding up an afternoon of interviews from Roehampton by talking to Richard Murdoch and Kenneth Horne at a tea table with a microphone cunningly concealed in a bowl of flowers. I had been told that as this was the final interview I could say "good-bye" at my leisure and hand back to Alexandra Palace. The conversation, which was very gay and amusing and consisted mainly of cross-talk between them, came to its natural conclusion, I took a breath to thank them and say "goodbye" when, to our mutual horror, one of the O.B. assistants, wearing headphones and standing by the camera, held up a piece of paper on which was scribbled "KEEP GOING." I think all our jaws must have dropped simultaneously and it seemed minutes until I recovered sufficiently to say: "This, gentlemen, is where you sing, please." They complied instantly, sang two verses of Much Binding until we got a thumbs up and knew that we could safely sign off.

Oh, it's lots of fun. Why don't you come and be interviewed?

Radar Reporting Unit

A RADAR Unit of the Royal Auxiliary Air Force is to be formed in Central London with the title of No. 3700 (County of London) Radar Reporting Unit, and with its headquarters and social centre at 77, Hallam Street, London, W. Its first Commanding Officer is to be Group Captain E. Fennessy, O.B.E., a prominent member of the Radar Association and director of the Decca Navigator Co., Ltd., who will hold the Royal Auxiliary Air Force rank of Wing Commander.

The formation of the unit originates from discussion between the Air Ministry and representatives of the Radar Association. It is an important development designed to give new opportunities to members of the Association, as well as all those interested in radar, to take an active share in the radar defences and to use their knowledge and skill in the radar field for the security of the country.

No. 3700 R.R.U. is being raised as part of the R.A.F. Control and Reporting System like the existing Fighter Control Units of the Royal Auxiliary Air Force, which cater for all radio trades employed in the business of the early warning system as well as ground control interception duties.

No. 3700 R.R.U. will, however, be concerned exclusively with the reporting, rôle-manning, operating and servicing of "Chain-home" stations—and so appeal to men and women interested in radar in the London and Home Counties area, whose work and other activities will permit a few hours' attendance each week at headquarters. Facilities will be provided there for synthetic training on Type 11 trainers, which will help towards keeping experienced operators in practice and also introduce the system to the uninitiated. The unit will be provided with "live" training by manning operational stations at certain week-ends and by taking part in R.A.F. exercises and attendance at summer camps. Training arrangements are made as flexible as possible to suit the convenience of auxiliaries.

Headquarters, only a few minutes' walk from Oxford Circus, provides a first-class social centre with plenty of facilities for recreation.

Except for the adjutant and the instructional staff, the Radar Reporting Unit, like the P.C.U.s, will be manned by auxiliary personnel. Its structure will allow for a large establishment for commissioned and senior N.C.O. posts for men and women. Although there are certain fundamental principles common to all units of the Royal Auxiliary Air Force, the detailed organisation and planning are left, to a large extent, to individual commanding officers.

The usual Royal Auxiliary Air Force emoluments will be payable to members of No. 3700 R.R.U. These include pay and allowances for training carried out and annual tax-free bounties.

Group Captain Fennessy has been associated with radar during the past 12 years. Prior to the outbreak of war, he was one of the Air Ministry research team at Pawsey Manor engaged on the development of the Royal Air Force radar system. Between the "Munich crisis" and the outbreak of war, he was concerned largely with the problems of utilisation of radar information by Fighter Command, and on the formation of headquarters, No. 60 Group, he joined the staff as a specialist in the construction and maintenance of radar stations, shortly afterwards volunteering for the Royal Air Force Volunteer Reserve, and being appointed to the staff of headquarters, No. 60 Group.

During 1940-41 he was principally engaged on the problem of completing the construction of the coastal radar chains, including the "C.H.L." stations required for low-flying detection and some of the early "G.C.I." stations.

In March, 1942, he was put in charge of a new section within No. 60 Group concerned with the application of radar to navigation and blind bombing and was, thereafter, for the rest of the war, continuously engaged in developing the construction and operation of the Gee, Oboe, C.H., Loran and Sheran systems, serving the navigational and blind bombing requirements of Bomber Command, the American 8th Bomber Command, American 9th Bomber Command, and Second Tactical Air Force, the Royal Navy and other units.

At the end of the war he was holding the appointment of Group Captain, Radar Navigational Aids on the staff of No. 60 Group.

Hotel Television

Details of the Installation at a Big London Hotel—1,000 Rooms With a View

THE Cumberland Hotel, at Marble Arch, now offers television facilities in each of its thousand rooms. The service was officially switched on recently by Mr. MacDonald Hobley, the B.B.C. television announcer.

The Cumberland, which is Europe's largest hotel, already provides a four-programme relay radio service in every room, and this existing wiring has been utilised to carry the television signal from room to room. The work of installation was done by British Relay Wireless without disturbing a single resident and with no dislocation in the running of the hotel.

The signal is received on a Belling-Lee multirod array which has a high signal gain and narrow beam width. The latter characteristic is necessary to avoid diathermy and other forms of television interference.

Because of the high signal strength available direct off the aerial in the control room (70 mV), it is possible to feed via a standard 10 outlet pad to six operational and one spare television amplifiers. The eighth outlet is used to feed an aerial monitor point, while the other two outlets are artificially loaded.

Each amplifier has three stages (two EF80s and one EF55), giving a maximum gain over the band 41.5-46 Mc/s of 55 db, reducible to 35 db by means of a gain control. The maximum output signal level is two volts R.M.S. into a 75-ohm balanced load.

Since all the amplifiers are fed directly from the aerial, it is only necessary to switch the outputs in order to change from a main to the standby amplifier. Low-capacity telephone type keys are used to accomplish this, care being taken with the wiring. The extra capacities thrown across the amplifier output circuits are trimmed out and judicious use is made of $\frac{1}{4}$-wave and $\frac{1}{2}$-wave cable lengths for inter-panel connections.

A pattern generator is also installed on the rack and can be substituted for the aerial in order to allow maintenance to take place outside programme hours. Its level is approximately that of the B.B.C. signals.

Standard Wiring

The standard radio and audio wiring in the hotel is installed in 63 vertical ducts, which are completely accessible and carry the electric and plumbing services. These ducts run vertically between pairs of rooms on each floor; thus each duct feeds approximately 16 rooms via wiring buried in the wall between the duct and each room. The tops of the ducts are linked together with a main audio feeder.

Screened balanced 75-ohm pairs are run out from each television amplifier along the tops of convenient groups of ducts, so that each amplifier feeds between nine and 12 of them. 20 db "hold-off" pads are bridged across these six main television feeders at the top of each duct and the attenuated signal is then fed into the audio cable descending the duct. Naturally, suitable terminations are provided at the end of each of the six main television feeders.

The "hold-off" pads are designed to provide a bridging impedance of between 750 and 1,000 ohms across the main television cable, and feed out at 45 ohms into the audio cable, which is connected via .001 μF condensers as a quad phantom for the television signals, the physical pairs being used for two of the audio circuits.

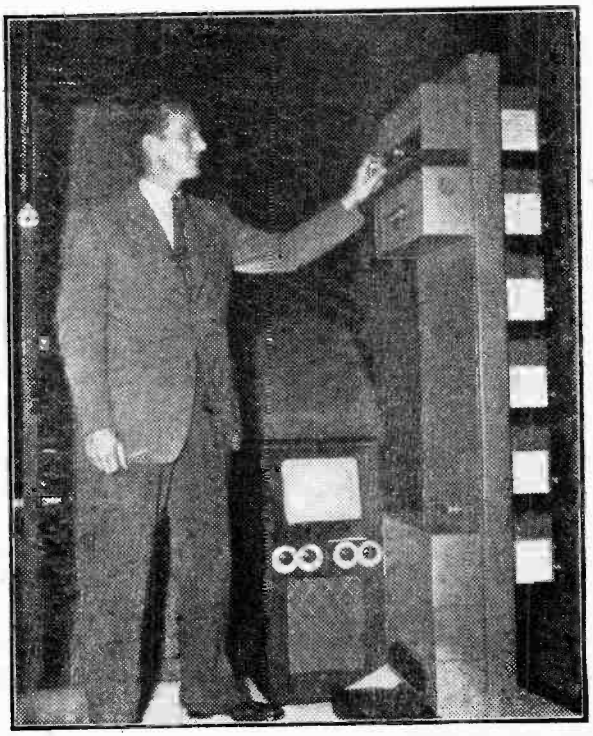
Since D.C. testing of the audio system is essential for efficient maintenance, 1,000 pF condensers are used wherever necessary to block off the television circuits.

In order to prevent the television signal going up the duct and into the main audio feeder, an open-circuited $\frac{1}{4}$-wave stub is connected $\frac{1}{4}$-wave back from the injection joint. The response of stub systems such as these is quite flat enough over the band 41.5-46 Mc/s, and no ill effects are noticeable on the pictures.

The audio cable at the bottom of each duct is terminated to prevent television reflections, and simple resistive "hold-off" pads are used to connect each room audio feed to the vertical audio feeder.

Reflections

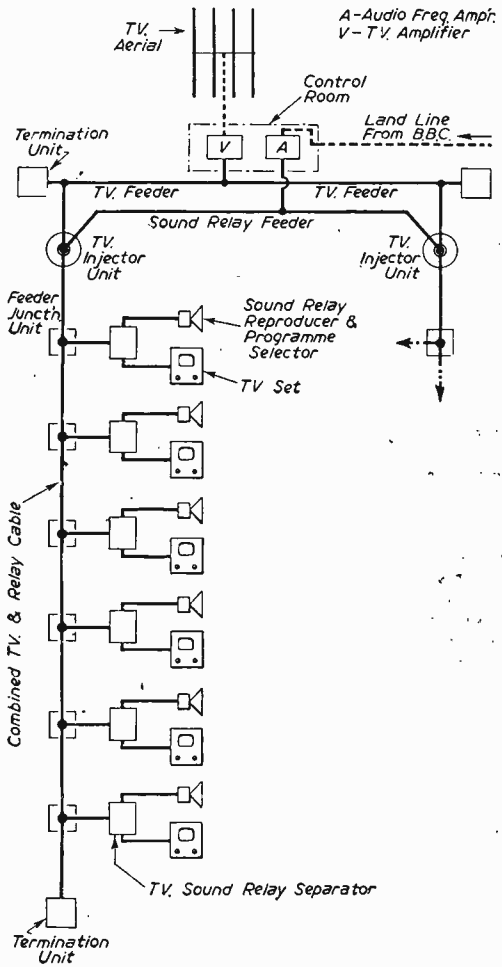
Inside the loudspeaker cabinets, which are mounted



MacDonald Hobley, popular announcer, switching on at the inauguration of the service.

complete with programme selector switches on the bedroom walls, stopper resistances keep the signal out of the loudspeaker enabling it to proceed through a resistive matching pad and blocking condensers, via a 75-ohm screened and balanced pair, to a suitably sited aerial socket on the skirting, alongside which is also placed the mains point.

Since the room cables are short, slight reflections,



Brief circuit details of the scheme.

produced by the receivers having varying input impedances, return to the set too quickly to produce noticeable effects on the pictures, while other slight reflections are adequately attenuated by the cable where the points between which the reflections take place are sufficiently far apart to cause a long enough time delay.

Interference

It has been found that interference picked up in the system is of a very small order, under normal working conditions, but if there is intense interference it is possible for this to be picked up directly by the receiver.

In particular, in the rooms on the lower floor facing Marble Arch, ignition interference is noticeable, but since its peak amplitude is approximately the same as the television signal peak amplitude, the effect is not at all serious, and is considerably less than that obtained with an average suburban domestic installation.

Unplugging the aerial in these rooms leaves the ignition interference at approximately the same level (2-3 mV), though, of course, the picture disappears.

The interference limiters on the sets, which are standard Philips' Model 683U, not being required, are turned to the minimum interference position, thus giving best picture quality.

Residents pay 3s. a night for the privilege of using the receivers, of which 100 have been supplied. On the opening night 100 residents were given the facility free.

Results Obtained

We were present at the inaugural ceremony and to demonstrate the system four of the receivers were installed in a room in the basement and fed from the standard installation. The picture was quite steady, and functioned exactly as one would expect in normal domestic circumstances. No visible interference was experienced for quite a time (presumably most of the vehicles passing during that time were suppressed), but when a bad case of "snow" arose, it was quickly demonstrated that it arose not through the aerial system but due to direct pick-up on the wiring inside the standard receiver, as removal of the aerial feeder removed the picture entirely, but left the miniature snowstorm on the screen. The input to the individual receiver is obviously clean and undistorted, as it was possible to adjust the normal "hold" controls over quite wide ranges without any risk of picture slip, in spite of the many feet of cable in use and the large quantity of electrical apparatus working in the building.

Electronic Scholarships

THE fulfilment of important development work and other long-term contracts by Electric & Musical Industries, Ltd., has raised a need for increasing numbers of highly-trained electronic engineers in their research and design companies.

To meet this growing need E.M.I. Institutes, Ltd., have devised a scholarship scheme for a special four-years' course in electronics.

Briefly, the scheme provides for a grant to each successful applicant of £50 per annum towards the fees of the course and in addition, in suitable cases, a maintenance grant of at least £50 per annum. In return, beneficiaries under the scheme are required to place their services at the disposal of the company for four years after the satisfactory completion of their course.

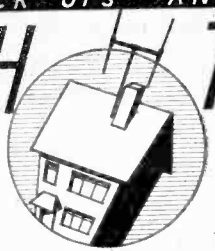
The course consists of three years' full-time study at E.M.I. Institutes—embracing the recognised examinations held by the City and Guilds of London Institute—together with a year's practical experience (coupled with further studies) in the factories and workshops of E.M.I. Engineering Development, Ltd.

Candidates should be in the age group of 16-18 years, preferably of Higher School Certificate standard in science.

Directors of education in the counties and county boroughs and the headmasters of some 1,500 schools are being advised of the scheme.

TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

405 LINES—A GOOD COMPROMISE

IT is now becoming clear that systems having a larger number of lines lack the flexibility of the 405-line system. Manufacturers in England and America can both offer equipment for 525 and even higher numbers of lines, giving much greater definition on " closed circuit " or on good TV receivers fairly close to the transmitter. But when the TV signal has to be relayed by radio link or coaxial cable over long distances, the slightly lower definition of 405 lines suffers much less degredation and gives a far better picture. Naturally, the radio links will be improved in the course of time, but the final result on these long-distance relays is the sum of so many factors for which a compromise has to be made, and the B.B.C. TV standard is in itself a very good compromise.

It is an astonishing fact that on this first transmission from France the TV production side of the affair was carried through with a smoothness not always attained in local relays. Long shots of the Place de l'Hotel de Ville were intercut with a variety of close-shots of notabilities and of individuals in the crowd. The surprising range of angles and views was a striking demonstration of the advantages of multi-lens turrets fitted to the the latest mobile TV camera equipment of the B.B.C.

TECHNICAL SURPRISES

THE Calais transmission was a technical and artistic tour de force. But this is only one of a number of technical developments which will, I think, put Britain well ahead in world TV again. The next " surprise " will, I think, be the British version of a little trick which has become popular on American sponsored TV programmes. There, by a " matte " process of forming one composite picture from two or more cameras, they are able to superimpose a sharp image of the advertiser's product (e.g. a mineral-water bottle or a tube of tooth-paste) on the opening and closing long shots of a programme. This should not be confused with the ordinary dissolve or mix, in which one picture is superimposed upon another in ghost-like relation. The outline of the soda-water bottle is scanned by secondary equipment and literally punches a hole in the main picture, leaving a blank which is the exact shape of that bottle. On a third channel, the image of the bottle is introduced and stands out quite plainly on the chosen background—usually a long-shot of a big orchestra.

The English version of this trick, to which I referred a month or so ago, is far more exciting and is now fairly advanced in its laboratory form. This new variation enables the matte to be " cut " by any figures in the foreground, moving or stationary. The actors play the scene out in front of a blue backing, and their shapes punch out black silhouettes on a picture of, say, Piccadilly at night. When the pictures are later combined, the figures of the actors appear to be integral with the background scene. The multitude of effects that become possible with this device should be never-ending. The passing scenery from train, car, or scenic railway; the spectacular backgrounds of a huge auditorium, a historic building or a foreign city, can be made composite with a studio close-up by this method, which is applicable to film backgrounds just as easily as to " live " ones.

Another variation of the trick enables a second picture to " wipe " across the screen and gradually obliterate the first. The device would also enable an actor to play dual roles, both appearing on the TV screen at the same time. In this case, one " character " in the picture would be filmed and the other would be picked up direct, the two images being joined in the new box of tricks.

TRAVELLING MATTE SNAGS

THERE is one disadvantage of this " travelling matte " system which is hard to overcome. When the foreground camera panorams, say, from one actor to another, the background view should also be subject to the same " panning " movement. So that, when first introduced, the system will necessarily be confined to static views, with little or no camera movement. To get over this problem requires somewhat complicated apparatus, whereby the movement of the " foreground " camera is automatically repeated by some form of selsyn control of the movement of the second camera,

PROFESSOR BOFFIN

" Now that you've found Projection TV, where do we go from here ? "

which is picking up the background. The problem becomes even more tricky when applied to a tele-film background. Experience will undoubtedly reveal certain types of camera movement or tracking on the foreground actors which can be tolerated without having to make elaborate "slave" movements on the secondary camera, picking up the background.

A.P. SETTLES DOWN

I MUST say that on a recent visit to the Alexandra Palace I was impressed by the comparative smoothness of the working of the plant compared with a year or so ago. It seemed to have settled down to a routine which obviously works well, in spite of the limited stage space. Some of the new equipment recently installed is really most impressive. The tele-film receiver, in which a wobble is superimposed upon the raster in order to lose the lines, is quite amazing. This enables improved good photographic recordings to be made, and is a valuable addition to the Mechan tele-film assembly mentioned recently in this column.

INTERMEDIATE FILM FOR BIG SCREEN TV

WHEN the B.B.C. first opened the television studios and transmitter at the Alexandra Palace, one of the systems (by Baird) utilised film as an intermediate medium. A film picture (on 16 mm.) was taken, developed and fixed, and the negative scanned about two minutes later, when it was radiated together with its equally delayed associated sound. This method has been re-introduced by one or two manufacturers as a means of projecting television on the big screen of a cinema. The incoming TV signal on a CR tube is photographed on 16 mm. film, which travels through developing and fixing solutions at a high speed, and then continues through a projector with a special gate which will deal with wet film. A powerful arc light puts a picture on the normal cinema screen. The French have recently demonstrated a high-speed developing plant specially designed for this purpose. The time taken for processing has now been reduced to 65 seconds.

ALEXANDRA PALACE VISCISSITUDES

AS I left the Alexandra Palace I paused to look at its ugly silhouette, which is now a mixture of mid-Victorian solidity and modern aerial-arrays. It is now just about a hundred years since someone thought of putting that giant building on the hill above Hornsey. Since that time it has had a chequered career, which is not without interest. After over 10 years of standing incomplete, it was opened to the public on May 24th, 1873. The new Palace and Park was a great success. But on Whit Monday, June 2nd, 1873, when it was visited by over 60,000 people, there was a sudden cry of "Fire!" Travelling swiftly downwards from the roof and increasing in fury, the flames reached highly-flammable decorations and exhibits and soon the whole building was ablaze. Fire engines arrived, first by rail, having been sent from King's Cross Station in response to a telegram! Six more fire engines, horse-drawn, toiled up the hill soon afterwards. But the destruction of the proud new building was already virtually complete and little could be done. In any case, the management had neglected to provide local water supplies in a quantity sufficient to deal with fire, and the reservoirs at the foot of the hill were too far away to be dealt with by the primitive fire appliances of the day. And so, after 16 glorious summer days, the Palace became little more than a monument to the careless workmen whose brazier started the fire.

It was repaired and reopened in 1875, and study of the plans and layout of the premises at that time discloses the pains taken to ensure that visitors were not in danger of fire, hunger or thirst. There were many ancient and modern fire engines on the premises. But never at any time was a visitor many paces away from a refreshment room or bar, and the huge vats of beer in cellars all over the place were a testimony to the healthy thirst induced by the stiff walk up the hill.

From time to time the Trustees, appointed by adjacent councils, have re-planned and re-organised the premises. The great open-air concerts at the Grove were inaugurated; there were seasons of circus, organ and classical concerts in the Central Hall. But successes were not maintained, and parts of the building were let off to various commercial undertakings.

In the course of time the Alexandra Palace housed a printing plant, a photographic works, an ice-cream manufactory, a theatrical stores and a film studio. But all had to be cleared out in 1914, when the Palace was first occupied by Belgian refugees and later by German civilian prisoners. It was the German prisoners who laid out the bowling green and other parkland features.

The Alexandra Palace building was erected on the highest ground in Greater London. It seemed natural that it should be selected as the site for the London broadcasting station, 2LO, when that had to be moved from the roof of a West-end department store. But, for various reasons, Brookmans Park was selected instead, and it was not until the coming of television that the A.P.'s Trustees received further overtures from the B.B.C.

And now the B.B.C. has about six years in which to think about finding another site for the London Television Station. The Trustees, probably with good reason, want to re-occupy their premises as a whole and rebuild on a big scale. The B.B.C. face the possibility of eviction in 1956, and are already making preparations for an alternative site for the London TV transmitter on very high ground "somewhere in Kent."

It is a pity that TV has to move from the Alexandra Palace. I would have thought that a great Eiffel-like tower might have formed part of the design of an entirely new building on the same ground. The tower would have been an international attraction, and, at the same time, a site for the London television transmitter. However, the threat of 1956 is still far away—but it is of sufficient danger to discourage the B.B.C. from erecting at the A.P. a higher aerial tower than the present one. A tower 1,000ft. high on that particular site could have made a fine-looking job, of sufficient magnitude for a Festival of Britain.

FOR THE CHILDREN

The first Saturday children's programme opens on November 25 with a children's television magazine, "Whirligig," which will alternate on Saturdays with another magazine programme, "Telescope," which begins on December 2. "Whirligig," produced by Michael Westmore, will invoke active co-operation from young viewers, for one of the regular "spots" will be "Write It Yourself." Adult viewers will remember "Passed to You," which invited them to continue a play, the first episode of which had already been performed on television. Frank Coven, who devised "Passed to You," has now prepared "Write It Yourself," a feature on similar lines, but especially for children.

T.V. COMPONENTS.—An exceptional opportunity to secure high quality Television components guaranteed in perfect working order at very moderate prices. Heavy duty T.V. Mains Transformer, **60/-**. Specification, Primary 210, 230 250v., 58 cycles. Secondaries, 350-0-350 at 175 ma.; 2 volt 1 amp; 4 volt, 3 amp; 6.3 volt. 8 amp., R.F./E.H.T. Unit. 5.5kV., complete, **55/-**. Smoothing Choke. 3.3 hy., 175ma.. **12/-**. Focusing and deflecting equipment, comprising line and frame oscillator transformers, line and frame O/p transformers, scanning coils and P.M. focusing unit, **72/6** for the 6 items. Smoothing capacitors, 60 mfd. 450v, working plus 100 mfd., 350v. working, **6/-**. Transparent Tube Guard, cream surround, for 12in. c.r.t., **18/-**. Resistance Panels with six pre-set resistors. **12/-**. Coaxial Plugs or Sockets, **1/-** each. All goods sent carriage paid on seven days' approval, cash with order (refund in full if goods not acceptable). Post Orders only. SCOTSMAN SALES, 13, Queensway, Bayswater, London, W.2.

"VIEWMASTER" Valves, complete to specification; all guaranteed brand new and boxed; comprising 5 EF50, 2 6K25, 2 KT61, 1 6P28, 1 EBC33, 1 EB91; set of 12, **97/-**. New boxed EF50 (VR91), **7/-** each. 6AL5 (EB91), **7/-**. EF91 **16/6**. EY51 **18/6**. Miniature all dry battery types, 3S4, 1S5, 1T4, 1R5, **6/6** each, set of 4 **25/-**. EBC33, EF39, 6V6G, 6X5G, **5/6** each. Condensers, 32 mfd 350v, **3/3** each, new stock. P.M. Speakers, 5in, **9/9**, 6½in, **10/9**, 8in, **12/-**. C.W.O. Post paid 20/-. READERS RADIO, 24, Colberg Place, Stamford Hill, London, N.16.

SALE, London Viewmaster Kit, new components, **£10**. Details, Box No. 103, c/o PRACTICAL TELEVISION.

TELEVISION AERIAL COMPONENTS. Alloy Tube drawn in A.W.10.C.; Mast-head Brackets alloy and wood masts, Chimney Brackets, Corner Plates and Lashing Cable, J. Strainer Bolts, U Bolts, etc. WALTER CRANE, Electrical Engineers, Wakefield. (Telephone: 2172.)

VIEWMASTER and EE Televisors. All parts in stock. Model on show. H.G. RADIO, 1350, Stratford Rd., Birmingham, 28. (SPR 2369.)

SU.2150.A., **3/-**, **30/-** doz.; CV.73, CV.72, **2/6**, **24/-** doz.; CV.63, **1/-**, **10/-** doz. 4P, 2W, Switches, **6d.**, **5/-** doz. SW, USW, Coils, **3d.** S.A.E. lists. Post extra; no C.O.D. ANNAKIN, 25, Ashfield Place, Otley, Yorks.

RATES

3/- per line or part thereof, average five words to line, minimum 2 lines. Box No. 6d. extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Television," Tower House, Southampton St., Strand, London, W.C.2

"A PORTABLE TELEVISOR," the first ever designed for the home constructor, would make the family an ideal Christmas present, and is easily and quickly built. The 56-page, fully illustrated book at only **3/2**, post paid, shows how only 14 valves (sound and vision complete) operate either a 3in. or 6in. tube for either TV area. "Personal Portables," our first book, is more popular than ever. It gives the full details for building 5 midget (loudspeaker) personals, both TRF and superhet, 3 and 4 valve types, and is great value at **2/8**, post paid. Both from BRADBOOKS, Sennen, Penzance, Cornwall.

T.V. VALVES, boxed, guar.: EF50, EF54, EF55, 5Z4, 5U4, **5/6**, 4 for **£1**; EBC33, 6V6, 6K7, 6J7, **5/-**; EF50, soiled: **3/6**, 6 for **£1**; SP61, SP41, **3/-**; EA50, **2/6**, 5 for **10/-**; 6H6, **1/6**; 807, **6/-**; HVR2A, **7/6**. Spkrs., 8in. P.M., **11/9**; 10in. ELIP M/E 720 ohms, **14/9**. £1 orders post free. T.R.S., 71, Meadvale Rd., E. Croydon.

TELEVISION, Bel chassis sets for the PW TRF set, fully drilled and punched, all screens and tube support, **50/-**. Coils for the above, L or M, **18/6**, inc. video. Block trans. 15/PM focus rings, a very superior part, **25/-**, triode. BEL, Marlborough Yard, Archway, London, N.19. (ARC. 5078.)

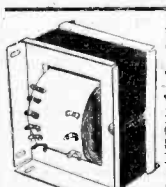
PRACTICAL WIRELESS Televisor, Aladdin Formers, **10d.** each; Tag Ring, **2½d.**; Set of Coils, London or Birmingham, **16/6**; Chassis, **70/-**; Mains Transformer, 350-0-350v., 250ma, 5v., 2a., 6.3v., 4a., 6.3v., 4a., **68/6**. S.A.E. List. R. F. SHILTON, 19, Clarendon Road, Salisbury, Wilts.

T.V. D1-POLE INSULATORS, in moulded bakelite, fit ¼in. elements and 1in. boom, **5/-** each. C.W.O. M. & B. RADIO, 120, Holt Rd., Liverpool, 7.

MAINS Transformer Rewinds, Field Coils, etc. ERIC GILES, Dept. pt/w, 43, Montgomery Rd., Longsight, Manchester, 13.

8IN. ELECTROSTATIC Cossor Tube, new, black and white, **£3/10/-** or near. GRIFFIN, 19, Carrington Rd., High Wycombe (or London).

LARGE Mahogany Cabinet, gram or television, £7. Offers. (BAT. 8048.)



Mains Transformers UPRIGHT—DROP THROUGH AS ILLUSTRATED Two Types Only. Guaranteed. No. 1: 250-0-250v., 80 mA., 0-4-6.3v., 5 amp. 0-4-5v., 2 amp. No. 2: Same, but 350v. Both 14/6, post 1/- for 1 to 3. **HILLFIELDS RADIO, 8, Burnham Road, Whitley, Coventry**

VALVES, VALVES, return-of-post service. List available 1d. stamp. Condensers, fresh stock, 8 mfd 2/6, 8x8 3/-, 16 mfd 3/-, 8x16 3/6, 16x16 3/9, 32 mfd 3/9, 32x32 4/6, all 450v. L/weight P.M. Speakers, anti/mag field, 5in. 11/-, 6½in. 11/6, 10in. 17/6. Pentode Output Trans. 4/6. Chokes, 7H, 80 m/a, 6/6. Co-ax Cable, 80 ohm, 10/- doz. yds. Tested EF50 Valves, 6/6, boxed Rogers, 8/3. V/holders, int octal (amph), 6d., EF50 6d. Large range instrument wire, nuts, bolts, etc. VCR97 mag lens 25/-. Complete set Viewmaster Valves in stock. Immediate dispatch. RADIO UNLIMITED, Elm Rd., London, E.17. (Telephone: KEY 4813.)

SUPERHET, £5, complete with cabinet, all valves, etc., 3 WB AC/DC, can be made by all with our concise instructions; all parts in stock. TRF 2WB AC/DC, **£4/10/-**. Send stamp for further particulars. Other bargains include "P" type Coils, complete range, **2/3** each; 3WB LMS 465Kc Coil Pack Kit, **9/6**; 8 mfd, 450v., **21/-** doz.; 01 mfd, 1,000v., 3/- doz.; .1 mfd, 500v., **3/6 doz.**; 12in. TV Masks, **7/6**; Console TV Cabinets, **£10**; large assortment of ex-Govt. Valves at lowest prices; assorted Eyelets, **1/-** gross; Sleeving, **6d.** doz yds.; 465Kc IFT's, **6/-** pr.; 6½in. Speakers, **10/-**; ½-meg Pot 1in. Spindle with double pole switch, **3/6**; Knobs, **2½d.**; Mic. Trans., **6d.**; ex-RAF Output Trans., **9d.** All items plus post and packing. Send stamp for latest "cheapest list in England." SUSSEX ELECTRONICS LTD. (T), Princes St., Brighton, 1.

PREMIER Console Televisor, 9in, efficient working order, **£17/10/-** or offer. Box No. 105, c/o PRACTICAL TELEVISION.

LATEST 9in. Premier Televisor, Midland. Expert made, tested at L.R., less tube, £21. Box No. 104, c/o PRACTICAL TELEVISION.

EDUCATIONAL

"TELEVISION".—The only school in Great Britain devoted solely to training in television. Postal course prospectus. SECRETARY, Gothic Television School, 13, North Avenue, London, W.13.

TELEVISION Servicing and Theoretical (postal) Courses at extremely moderate fees are available from the Institute of Practical Radio Engineers, either for study or as reading matter only. Syllabus post free from the Secretary, I.P.R.E., 20, Fairfield Road, London, N.8.

TRADE TOPICS

Plessey Television Component Brochure

THE Plessey Co., Ltd., Ilford, Essex, fully describe their recently introduced range of television components in a 24-page catalogue, available to manufacturers, containing much information of particular interest to designers.

Each component in the range is designed to permit maximum advantage to be taken of contemporary receiver circuit simplification. Standard radio components have, in some instances, been adapted by appropriate modification, and basic components are individually designed to be as flexible as possible to suit the many alternative combinations of circuit, valve range and cathode ray tube type, as well as various electrical operating conditions.

Several of the scanning and output transformers are based on the Company's special television grade of " Caslam " moulded core material, which is claimed to be eminently suitable for television applications by virtue of its low losses at higher audio and ultra-sonic frequencies and freedom from objectionable noise-producing magneto-striction effects.

Plessey Co., Ltd., Ilford, Essex.

I.P.R.E. Party Visits Valve Factory

DEALERS from as far distant as Devonshire and Scotland were among the council members of the Institute of Practical Radio Engineers who visited the Mullard Valve and Cathode-Ray Tube Factory at Mitcham recently.

Included in the party were Mr C. H. Gardner, this year's president of the Institute, and the Hon. Secretary, Mr. W. E. Edwards.

The party was conducted round the factory by Mr. E. C. Greaves, head of the Valve Technical Department at Mitcham.

The visitors were particularly interested in the intricate manufacturing techniques employed in the production of modern, all-glass miniature valves. They were also impressed by the mass-production methods involved in the manufacture of television tubes.

Mullard Ltd., London, W.C.2

Goodwood Viewing Furniture

WITH reference to the specially-designed chairs and settees produced for television viewing, the makers are now able to supply a 10-page illustrated catalogue giving designs and prices.

Goodwood Upholstery & Furniture, Ronald Street, Nottingham.

Valradio Projection Television Receivers

Four new receivers are announced by Valradio Ltd.,

Model : TVA for A.C. mains.
TVDA for D.C. and A.C. mains.
TVD110 for 110 v. D.C. supplies.
TVD50 for 50 v. D.C. supplies.

Descriptions :

Picture size 19in. x 14¼in. on Plastic Screen.

21 valve superhet receivers using lower side band.

Valves EF80 (8), EB91 (3), EL38 (2), EL33 (1), ECC34 (2), EBC33 (1), EY51 (3), GZ32 (1).

Power supplies for D.C. models by means of a built-in Vibrator unit.

Walnut Cabinet 42in. x 20in. x 26in. wide.

Cathode-Ray Tube MULLARD MW6-2 2½ dia.

Controls : Volume, Contrast, Focus and Brilliance in front of cabinet ; Line hold, Line Amplitude, Frame Hold and Frame Amplitude, at side of cabinet.

Sound and Vision interference suppression.

Prices :

A.C. model **£148.0.0,** plus **£34.10.8** Purchase Tax.

D.C. model **£156.0.0,** plus **£36.8.0** Purchase Tax.

Purchase Tax is subject to confirmation by Customs and Excise authorities.

Release :

A.C. model end of October.
D.C. model end of November.

Valradio Ltd., 57 Fortess Road, Kentish Town, London, N.W.5

G.E.C. TV. Repeaters

AN extension of the regular television service is going ahead for the Manchester area and the vision signals will be transmitted from Birmingham to Holme Moss by ordinary co-axial cables. These cables require a wide frequency band extending up to 4.4 Mc/s, for the transmission of high-grade pictures and because the attenuation is very high in the upper frequencies of the band, special high-grade amplifiers are necessary, at six-mile intervals along the cable route.

Nineteen repeater stations will be required, each with a gain of 52 db (at 4.4 Mc/s), or nearly 160,000 : 1 in power.

Manufacture of the amplifiers, to the requirements of the British Post Office, has been entrusted to The General Electric Co., Ltd.

Two amplifiers, one working and one standby, will be provided for each direction of transmission, so that Northern programmes can be sent South simultaneously with inter-

The new Valradio television receiver

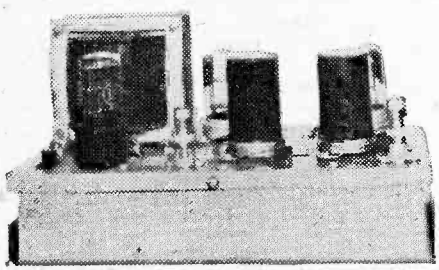
change in the opposite direction. Each amplifier is divided into two main parts, coupled in tandem, with negative feedback applied separately over each part.

Special low-capacitance valves (CV408), are used in the input stages, followed by two Osram type Z77 valves in the first part and one Z77 and one CV173 in the second part of each amplifier.

Connections to the valves are welded directly to the valve pins to reduce capacitance and to eliminate contact resistance.

Improved designs for the input and output circuits enable a high degree of impedance matching between the amplifiers and the cables to be obtained, which minimises echo and phase-correction problems.

Owing to the use of negative feedback the amplifiers have highly linear characteristics over their specified frequency band (60 Kc/s to 4.34 Mc/s), and the amount of harmonic distortion is negligible.



A converter for London receivers, produced by Spencer-West.

Equalisation for the cable-attenuation/frequency characteristics is performed by the amplifiers themselves and enables excellent values of signal/noise ratio to be obtained over the lower part of the video frequency range.

The standby equipments at each repeater station have automatic changeover facilities, and elaborate supervisory systems will allow unattended stations to be controlled from either of the terminal stations. For those stations which have no local power supply, 50 c/s power will be supplied from other stations over the co-axial cables.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Aerialite Aerials

TWO interesting television aerials are to be found in the Aerialite range :

Model 63 *High-Gain Aerial.* It is reported that one of these aerials is receiving a first-class picture in Calais from the London station, and excellent results have been obtained in certain difficult areas in the South of England where previously great difficulty has been experienced in obtaining a picture of first-class entertainment value. It has a very broad band width and high gain.

Model 64*A*. This is an entirely novel construction and has an exceedingly high gain. The forward gain is 10.6 db. Front/back ratio, 16.9 db. Acceptance Angle 76 deg.

As far as we are aware this Model 64A aerial has the highest gain of any aerial so far produced in this country to date. Excellent reception has been received on this aerial in places where previously no reception has been possible on ordinary standard aerials. The aerial is capable of receiving satisfactory sound and vision over long distances, previously considered outside the reception area.

The novel strutting arrangement has made it possible to lengthen the boom beyond the normal. This strutting arrangement gives the aerial exceptional mechanical strength to withstand wind resistance.

Aerialite, Ltd., Castle Works, Stalybridge, Cheshire.

Birmingham/London Convertor, Type AC/A

A UNIT is announced by Spencer-West which permits the reception of the Sutton Coldfield transmitter on a London type receiver. No alterations of any sort are required.

Five valves are employed, one of which is concerned with the provision of high-tension supply. Of the remaining four valves, one is employed as a low "noise" preamplifying stage ensuring that the frequency convertor and second channel interference is minimal. As Sutton Coldfield operates as a single side-band transmitter, to employ a single frequency convertor will result in poor picture definition and for this reason the remaining three valves operate as a double frequency mixer stage. Additional advantages are thereby secured; for example, second channel interference will only occur for frequencies above approximately 100 Mc/s, which is most unlikely.

The unit is completely self contained and is available for immediate delivery. The price is 15 gns. complete.

Spencer-West, Quay Works, North Quay, Great Yarmouth.

Sphere Radio, Ltd.

THREE types of half-wave dipoles for indoor use are announced by the above company. There is one for each of the existing stations plus one for the Holme Moss area, and they are recommended for use in locations within a radius of 30 miles from the transmitter. They are cut and matched to resonate at the required frequencies and consist of two collapsible and adjustable aluminium alloy elements fixed into a rigid fibre junction piece. To facilitate fixing, insulated pads are supplied and these have eyelet holes by means of which the aerial may be mounted in a number of different ways, some of which are illustrated in a leaflet which is supplied by the makers. Some methods are, of course, directional, and therefore the aerial may be mounted to suit many different reception conditions.

Sphere Radio, Ltd., Heath Lane, West Bromwich.

W. B. Speakers

IT is well known that the quality of reproduction which is broadcast on the television frequencies is of a much higher order than that obtainable on the normal medium-wave broadcast band. The constructor of a television receiver is, therefore, in the advantageous position of being able to make full use of the better musical quality by building or using a special loudspeaker and the new W.B. products are worthy of note in this connection. The duplex cone may, of course, be mounted in a cabinet with the existing receiver, but for maximum results some form of properly-designed baffle is essential. The latest is a corner reflex console, and it houses the concentric duplex speaker. It is neatly designed, has a large aperture at the upper part and a "vent" at the lower front, both being neatly covered with material. The appearance is very pleasing and the quality of reproduction of a high order. The price of this model is £13 5s. 0d.

Whiteley Electrical Radio Co., Ltd., Mansfield, Notts.

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).

THE CASCODE PREAMPLIFIER

SIR,—My thanks are due to Mr. West for pointing out a small error which crept into my "Extreme Ranges" article. The preamplifier described is, indeed, the "Cascode," though, to be perfectly precise, it should be called the "Wallman" amplifier. The term "Cascode" strictly applies to the low-frequency form of the circuit.

With reference to the modifications mentioned by Mr. West, I quite agree that neutralisation of the grid-anode capacitance of the first valve is a useful change. This was covered very adequately in a recent article (Electronics, November, 1949) which Mr. West has, no doubt, read. The neutralisation is obtained by connecting a small variable inductance between the anode and grid of the first valve. A good mica blocking capacitor of about 0.001/μF. should be connected in series with the inductance, and the coil itself may consist of about 30 turns on a $\frac{1}{4}$in. former with dust core. The actual number of turns will depend on the valve.

I cannot agree with Mr. West's other suggestions as readily. In tuning the cathode of the second valve, he upsets the performance of that valve rather than improves it. More seriously, there are now three tuned circuits in series, and the adjustment of each of these will affect the other two. No wonder Mr. West comments on the difficulties of alignment! The extra tuned circuit also tends to reduce the bandwidth, which is not desirable.

If the second cathode is not to be tuned, however, it is rather difficult to parallel-feed the valves in a practical manner. The advantages of parallel feed stated by Mr. West are not enough to make this serious, however. The H.T. required for the series-feed circuit is not excessive, 200 volts being ample. Nor is it important to be able to earth the second grid directly—there are, in fact, advantages in earthing this grid via a moderate resistance. The result is an improvement in the input impedance of the second valve, but the best value must be found by experiment.

I am aware that Mr. West has had a lot of experience with the Cascode—or Wallman—amplifier, but I am not convinced that he has found the best possible circuit. Nor do I claim any such distinction for the circuit given in my article, which was intended to indicate the general form of the Cascode stage, rather than any one of the special forms which have developed out of it. Much work remains to be done before this stage can be designed for the utmost possible performance, but it is already the most useful weapon against first stage valve noise.—D. W. THOMASSON (Exeter).

TELEVISION INTERFERENCE

SIR,—I should like to criticise certain comments made in an article on "Television Interference" in your August issue, the author being Mr. S. A. Knight.

The comments concern the cause of the elongation of the spot under interference conditions.

Mr. Knight suggests that the increased beam density causes defocusing due to mutual repulsion of the constituent electrons. I would point out that in no case does the beam density in a C.R.T. attain a sufficient level to give rise to appreciable space charge effects; but even if it did, one would expect the defocusing to occur in both planes, giving a larger, but not elongated spot. The latter criticism incidentally would also apply to the suggestion involving E.H.T. supply variation. The other proposed explanation concerning variations in electron velocity is even more incomprehensible. In the first place, electron velocity is determined almost entirely by the E.H.T. supply and not by signal variations, so the suggestion then reduces to that above. Secondly, the statement that the deflection depends on beam velocity is not true for magnetic tubes which comprise the majority of tubes in use!

I suggest the explanation is much simpler: that the high modulation intensity makes a great "splash" which appears as an elongated spot because of the movement of the time base, the "splash" being of finite duration. Such "splashes" are recognised as decreasing definition in radar P.P.I.'s and signals are therefore limited *before* they reach the required level. This is not possible within the signal range in television, since "shades" of intensity must be reproduced. However, if a sufficiently large signal is applied, overloading, etc., will limit it at the C.R.T. grid or cathode, giving apparently constant brilliance as observed.—L. C. WALTERS (Peckham, S.E.15).

LONG-RANGE RECEPTION

SIR,—In Rhondda Valley, some ninety-four miles south-west of Sutton Coldfield, we are regarded as being outside the TV service area.

Dwelling on the western slope of a 1,750-foot mountain I am completely screened from the TV broadcast. Nevertheless there seemed a possibility that reception would be better on the other side of our valley.

This theory proved correct, for a converted B.C.624 service sound receiver connected to an ordinary car aerial showed that sound could be obtained at several points clear of buildings. On this same side is a well-known mountain road which reaches an altitude of some 1,700 feet.

Ascending the road by car, the signal strength so increased that it eventually became necessary to turn down the volume control. There was no fading and the quality compared favourably with the West Region broadcast.

A Heath Robinson arrangement employing another B.C.624 and time bases of the Miller Integrator type with push-pull deflection was set up to work a V.C.R.97. This tube was "lit up" by seven 150-volt dry H.T. batteries, while the time bases operated on one 150-volt dry H.T. battery. The vision receiver was supplied with 250 volts from a six-volt vibrator pack. Separate accumulators delivered low tension to the cathode tube, time bases and set.

In spite of the crudeness of my apparatus, a steady picture (Adventure Story) appeared on the screen and remained there for the full period without fading. Naturally the detail was not all that could be desired, but this was probably due to the narrow band width of the B.C.624 I.F. circuit.—M. MORRIS (Rhondda).

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