AERIALS FOR WENVOE

PRACTICAL TELEVISION
AND TELEVISION TIMES

1/-

EDITOR F. J. CAMM

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FEATURED IN THIS ISSUE

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Contrast Adjustment
Television in France
Economical Television
An H.T. Boost Unit
A.V.C. and Television

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Televiews

The National Radio Show

THE National Radio Show at Earls Court took place during a period of greater depression than it did last year, and it is all the more pleasing to be able to record that, in spite of this, attendances were higher every day. It would be equally pleasant to be able to record that the business done was commensurately greater, but such did not prove to be the case. Whilst the public evinced great interest in the exhibits, there was not that spontaneous buying which has characterised earlier shows, no doubt due to lower spending power of the public, who are now giving longer consideration to their purchases than hitherto. It would not, therefore, be true to say that the show has not brought results, and we must await the results of any delayed action due to this public caution.

Television, of course, was the main attraction among the manufacturers' exhibits, but we wonder whether attendances would have been so high had there not been the BBC and other side-shows.

There were complaints that it was these counter-attractions which brought the public to the show and then spirited them away into the side-shows and thus away from the stands, which after all are the *raison d'être* of the exhibition. We think this is a mistaken argument. Everything should be done to present under one roof every facet of the industry both on the manufacturing and the entertainment side. There would equally be complaints if the side-shows were abolished and, as a result, the public did not turn up in sufficiently large numbers.

The publicity arrangements, as usual, were excellent, and the national newspapers, as well as the periodical press, devoted considerable space to the exhibition both before and during the run of the show.

This was surprising in view of the fact that there was an almost complete lack of novelty among the exhibits, and certainly no surprises. There was a noticeable and welcome drop in prices, and one manufacturer was able to exhibit a nine-inch receiver at the price of £45 tax paid. This, perhaps, received more publicity in the daily papers than it deserved. Another feature of the show which impressed us was the tendency of manufacturers to concentrate on tubes of twelves inches and over, and our enquiries gave us the impression that within a short time the nine-inch tube will be obsolete. The new wide-angle tubes of correspondingly shorter length, enabling the receiver to be housed in a more compact cabinet is now used by practically all manufacturers. Trade orders were poor, but this is understandable because the trade has been passing through a slump period and shops are well stocked; but now that about 70 per cent. of the population are covered by the BBC TV service the slump cannot be of long duration and, indeed, there are distinct signs of change towards improved sales. As eventually there will be, in this country, at least twelve million owners of television sets and over ten million people, therefore, are waiting the time when they can afford it, it is plain that any slump during the next ten years will be of but a temporary nature.

The Wenvoe station is in operation and now we have the biggest television public of any nation in the world. Technical developments during the next five years will be rapid, although we think it will be at least that time before colour television is with us. We do not think the present colour television systems will provide the solution to the problem and any such system which makes use of rotating discs is doomed to the failure which attended the attempts to market the Nipkow disc as a television receiver. Colour television must inevitably be provided by a combined optical and prismatic system. It was noted this year that there was no demonstration of colour television and that another novelty demonstration in the form of the TV telephone took its place. This, however, was merely intended to indicate a vague possibility of the dim future. It is by no means a practical possibility. In general, we do not favour the public demonstration of imperfect scientific developments of which nothing more may be heard. It may achieve its intended result of providing publicity, but the public tends to grow tired when they hear nothing further about it. This may harm some future development which has greater practical possibilities.

The air conditioning of Earls Court leaves much to be desired and it certainly does not maintain the air at that comfortable temperature which will keep people walking round the stands.—F. J. C.

Transmission Lines—1

PRINCIPLES AND PRACTICE

By B. L. Morley

AN expensive television receiver costing up to £100 can have its performance ruined by incorrect choice and installation of the transmission line connecting the aerial to the televisor ; this part of the installation is too often taken for granted, yet the quality of the received picture is very dependent upon it and every constructor should make himself acquainted with its theoretical and practical characteristics.

Transmission lines used for television work fall into two categories :

(a) Balanced twin cable.
(b) Coaxial cable.

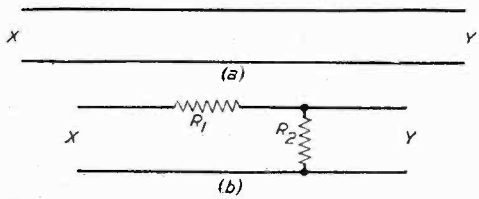


Fig. 1.—Diagram illustrating characteristic resistance of lines.

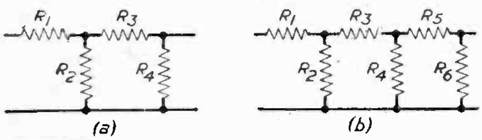


Fig. 2.—Rearrangement of line characteristic resistances.

Whatever its type, the fundamental principles underlying its functions are the same.

Now a conductor which carries current from an aerial to the receiver will radiate power. In other words the energy picked up by the aerial is partially lost by re-radiation from the conductor, so that the power injected into the receiver will be less than the power picked up by the aerial.

These losses increase with increasing frequency, and while the effect may not be very noticeable at 30 kc/s, it begins to become serious at 30 Mc/s.

Radiation losses can be prevented by so arranging the conductors between aerial and receiver that the electromagnetic field generated by one is balanced by an equal and opposite field generated by the other. This is accomplished by running the two wires parallel with each other and separated by only a small fraction of the wavelength of the current in the line. The maximum distance between the wires should not exceed 1 per cent. of the wavelength and while the external fields do not fully cancel each other the resultant field is of negligible value.

The currents in the two lines, therefore, balance each other, and this type of line is referred to as *Balanced Twin*.

The same effect is produced in coaxial cables. RF currents tend to flow in the "skin" of the conductor and in coaxial cable the currents in the *outer skin* of the *inner conductor* are balanced by the currents in the *inner skin* of the *outside conductor*.

Characteristic Resistance

It will be appreciated that every line has a certain amount of resistance ; it also has a certain amount of "leakance" between the conductors. If we have a long line between two points "X" and "Y" (Fig. 1a), the total current at "Y" will be restricted by the series resistance of the line R1 and the leakance R2, and this can be represented in the equivalent circuit in Fig. 1b. (The series resistance is shown in one side of the line merely for convenience.)

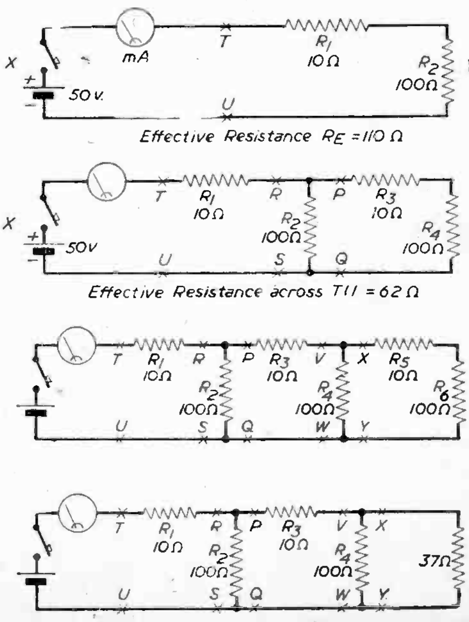
Suppose we had a line which was similar in every respect but which was twice as long, then we could represent it as in Fig. 2a, because the series and shunt resistances are progressive along the line. A line three times as long could be represented as in Fig. 2b. Continuing this reasoning, a line extended to infinity could be represented as a number of series and shunt resistances R1R2—R3R4—R5R6—R7R8 . . . RnRn.

Coming back to Fig. 1b, let us assume that R1 is 10 Ω and R2 is 100 Ω. If a battery of 50 v. is applied to the line we shall have a certain amount of current flowing from the battery (Fig. 3). This current will be

$$I = \frac{E}{R} = \frac{50}{R1 + R2} = \frac{50}{110} = 454 \text{ mA}$$

and the overall resistance looking at it from "X" end (i.e., across TU, is 110 Ω).

If the line is doubled in length then we shall have the condition shown in Fig. 4. To find the current flowing we must first find the *Effective Resistance* across TU. An easy method of doing this is to take point PQ on the line.



Figs. 3, 4, 5 and 6.—Circuits showing the effect of various resistances, and the voltage and current distribution round the network.

From this point looking towards "Y" we have a resistance of $R3 + R4 = 10 + 100 = 110\,\Omega$. This resistance is directly across R2 (i.e., across RS), therefore, across RS we shall have a resistance of

$$\frac{110 \times 100}{110 + 100} = \frac{11000}{210} = 52\,\Omega \text{ (approx.)}$$

The resistance across TU will, therefore be $R1 + 52 = 62\,\Omega$. (Note : we shall take all calculations to the nearest whole number for ease of illustration.)

Let us now take a line 3 times as long. This is shown in Fig. 5. By working out the resistances across xy, vw, PQ and back to TU we shall find that the effective resistance across TU is $48\,\Omega$.

A line 4 times as long will give us an effective resistance of $42\,\Omega$. Do you notice how the *difference* in values across TU is becoming less? The stages have been 110, 62, 48, 42. The jumps between successive calculations is being continually reduced.

Let us pursue this point a little further. Another section of line will give us an effective resistance of $38\,\Omega$, the next addition will give us $37.5\,\Omega$, and a further stage gives us $37\,\Omega$ across TU. Adding yet another stage gives us $37\,\Omega$!

At this point we could add on stages without making any difference to the resistance across TU. Furthermore *we could short-circuit the "Y" end and still the resistance across TU would remain* $37\,\Omega$.

You can prove this yourself by continuing the calculations.

We have now arrived at a point where short-circuiting or disconnecting the far end of the very long line makes no difference to the effective resistance across TU or the input end. This resistance value we have obtained is termed the *characteristic resistance* of the line.

In the particular line which we have under discussion the characteristic resistance is $37\,\Omega$.

Now have a look at Fig. 6. Here we have disconnected the line at "x y", and inserted a load resistance the same value as the characteristic resistance. Let us now calculate the value of the resistance which will appear across TU.

Across "v w" (ignoring the rest of the circuit back to the battery), we shall have a value of

$$\frac{R4 \times 37}{R4 + 37} = \frac{100 \times 37}{100 + 37} = 27\ \Omega.$$

Therefore, across PQ we have a resistance of

$$R3 + 27 = 10 + 27 = 37\ \Omega.$$

Therefore, across R S we shall have a resistance of

$$\frac{R2 \times 37}{R2 + 37} = \frac{100 \times 37}{100 + 37} = 27\ \Omega.$$

Therefore, across TU we have a resistance of

$$R1 + 27 = 10 + 27 = 37\ \Omega.$$

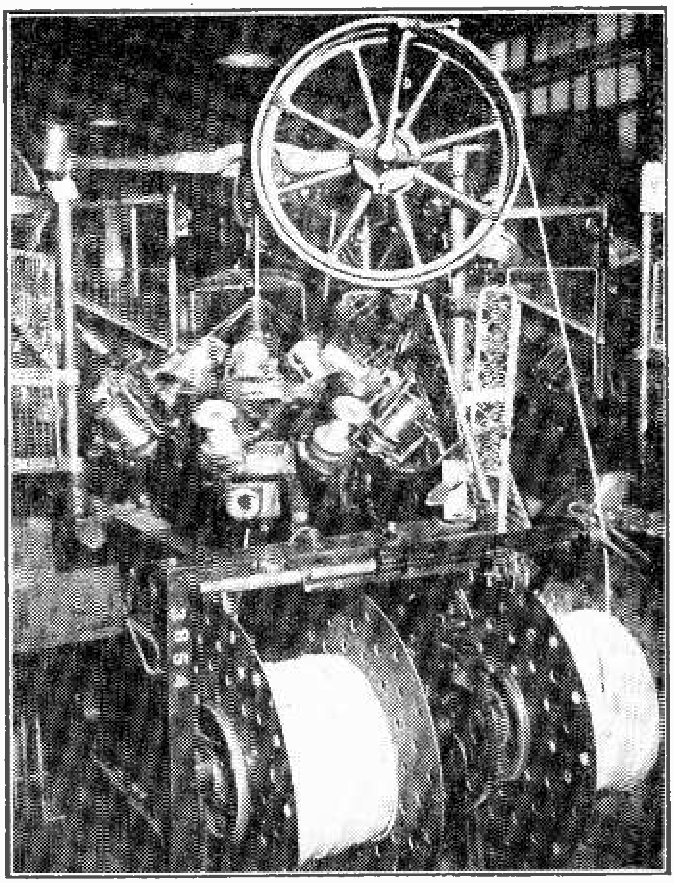
This means that if we disconnect the line at any point and insert across it at that point its characteristic resistance, the characteristic resistance will appear at the input end.

It will be remembered that an infinitely long line will produce its characteristic resistance at the input terminals, and it does not matter if the far end of the line is short-circuited or left open, the input resistance across the line remains unchanged. In other words if a line is extended towards infinity there will be a certain critical length beyond which no additional lengthening will alter the input resistance.

There is, therefore, a certain maximum amount of current which will flow in the line, and as power is the product of resistance times current squared ($W = R \times I^2$), there is a limit to the maximum amount of power which the line can handle.

Now maximum power is transferred from one circuit to another when the resistances of the two circuits are equal ; for example, the maximum power is obtained from a battery when the load resistance is equal to the internal resistance of the battery. The same principle holds good for a D.C. generator.

If it is desired to transfer the maximum amount of power from a D.C. generator to a line, then the characteristic resistance of the line should equal the internal resistance of the generator. If the line is not infinitely long it should be made to appear so by making the load across the output terminals equal the characteristic resistance of the line, and this, as we have seen, makes the characteristic resistance appear across the input terminals of the line.



A modern braiding machine.

Characteristic Impedance

When dealing with A.C., several other factors have to be considered. The line contains series inductance and resistance, with parallel capacitance and leakance. Fig. 7a shows the effect.

In practice the leakance is so small that it can be neglected and to simplify the diagram the constants (inductance, series resistance and capacitance) are shown in one side of the line (Fig. 7b).

It will be observed that at the input end we have A.C. resistance (or impedance), instead of pure resistance. However, the same principles obtain in this case and a line extended to infinity will have a certain *characteristic impedance*.

It must be remembered that the constants which determine the characteristic impedance, are themselves determined by the physical make-up of the line.

A line which is not infinitely long can be made to simulate infinity conditions by terminating it with its characteristic impedance, as in the D.C. case.

Fig. 8 shows the scheme where we have an A.C. generator (A) with its internal impedance (Zi), feeding into a line which is terminated with its characteristic impedance (Zo). Under these conditions, maximum power will be transferred from the generator into the load.

If the load is any other value than Zo maximum, transference of power will not take place. Zo can take any form such as a pure resistance, or lumped inductance and capacitance.

In television we make use of a matched transmission line to obtain the transfer of the maximum amount of power from the aerial into the receiver. The aerial has A.C. induced into it by the incoming signal and can, therefore, be likened to a generator. It has its own internal impedance (about 72 ohms at the centre of a normal dipole). Therefore, a cable having this value as its characteristic impedance, is used to obtain the maximum transfer of power from dipole to the cable. Fig. 9 shows the scheme.

At the receiver end we must terminate the line with its characteristic impedance and here is a snag. The input impedance of the first stage is somewhat larger than the impedance of the line.

How then can we effect a match ?

The answer lies in the transformer. It is well known that a transformer will convert low voltages into higher voltages. This is accomplished by making the secondary winding have more turns than the primary winding. If the ratio of primary to secondary turns is 1 : 2, then double the voltage that is put into the primary will be obtained from the secondary. If 100 v. is applied to the primary then 200 v. will appear at the secondary.

Not only does the transformer transform voltage,

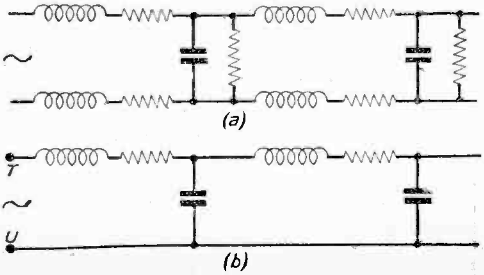


Fig. 7.—Circuits illustrating the characteristic impedance of lines.

but it will also transform impedance. The voltage ratio of a transformer is equal to the turns ratio.

The *impedance ratio* of a transformer is equal to the *square of the turns ratio.*

A transformer which has a turns ratio of 1 : 2 will, therefore, have an impedance ratio of $1 : 2^2 = 1 : 4$.

The condition is shown in Fig. 10. Zb is an impedance of 400 ohms ; Za is an impedance of 100 ohms. Now, if we look into the input circuit of Zb (i.e., towards CD) we shall see an impedance of 100 ohms stepped up four times, i.e., 400 ohms.

If we look into the circuit from Za (via AB) we see an impedance of 400 ohms stepped down four times, i.e., 100 ohms. Za is therefore exactly matched to Zb and vice-versa.

In practice we use a simple transformer in the input

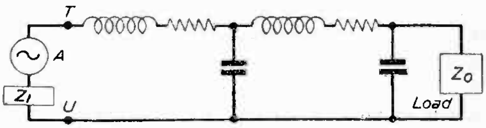


Fig. 8.—Diagram illustrating the effect of the impedance on the load.

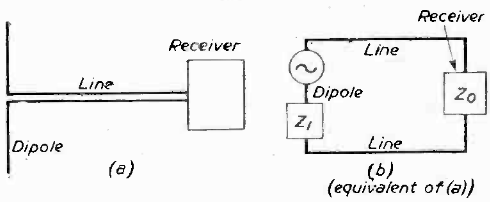


Fig. 9.—Normal television aerial feed and its equivalent circuit.

circuit of the televisor, either by tapping the tuning coil or by using a separate winding.

We have now a matched dipole to line, and line to load, and maximum transference of power will take place from the aerial to the televisor.

Standing Waves

Having dealt with the maximum transference of power, there is another very important reason for correctly matching the aerial, line and receiver input. It is that if a line is not terminated with its characteristic impedance, reflections will occur and *standing waves* will exist along the length of the line.

The net result is the appearance of " ghost " pictures.

There are three cases to consider : (a) a line which is open-circuited at its distant end ; (b) a line which is short-circuited at its distant end ; (c) a line which is terminated with an impedance other than its characteristic impedance.

Case (a)

Imagine energy applied at the generator end of a line which is open-circuited at the far end. A certain amount of time will elapse before the energy applied at one end appears at the other. The voltage and current travel down the line together, but when they come to the open circuit the current will collapse to zero, as there is no path for it.

Now energy cannot just disappear ; the collapsing current and consequent collapsing field generates fresh currents and voltages which immediately begin to travel back to the beginning of the line. In other words, the current and voltage are reflected back to their source, and return like an echo. The current at the distant end, due to the open circuit, is at zero ; the voltage, however, is at maximum and the reflected voltages and currents will therefore be 90 deg. out of phase with each other (90 deg. equals one-quarter of a wavelength). Fig. 11 shows the conditions.

When current and voltage are reflected back to the load the result is the appearance of standing waves of current and voltage displaced from each other by $\frac{\lambda}{4}$ along the whole length of the line. At points where the standing voltage wave is at zero it is termed a voltage

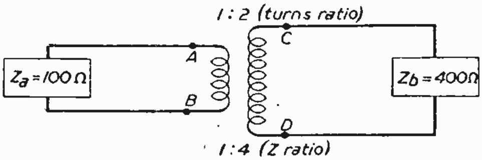
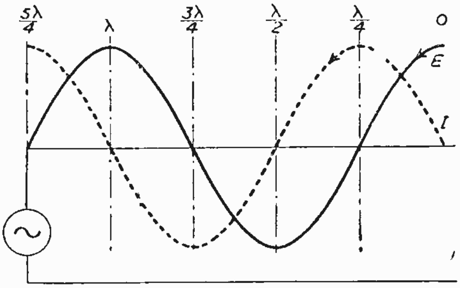


Fig. 10.—Effect of a transformer on the total impedance of a circuit.



Reflected voltage and current from open circuited line
Note: Current and voltage waves shown in one line only for clarity

Fig. 11.—Voltage and current distribution on a line.

node, and where it is at maximum it is termed a voltage *antinode*.

The same terminology is applied to standing waves of current, though in this case the points are termed current nodes and antinodes (Fig. 12).

Case (b)

When the line at the distant end is short-circuited, then when the voltage and current wave, travelling from the generator, meet the short-circuit the voltage will collapse to zero and the current will be at a maximum. The result is similar to that in case (a), i.e., current and voltage waves are reflected back to the source, and standing waves will exist along the line.

There is, however, an important difference : the phase relationship between voltage and current will be reversed. This time the voltage starts the return journey at zero and the current at maximum. This condition is shown in Fig. 13.

It should be noted that at the generator end the phase relationship between reflected voltage and current for open-circuited lines is opposite to that for short-circuited lines.

Case (c)

Where the line is neither open-circuited nor short-circuited and yet is not terminated with its characteristic impedance, a certain amount of current and voltage will be reflected according to the value of the terminating impedance, and the phase relationship between the two will also be determined by this value.

The reflected currents and voltages arriving back at the generator can be reflected once again and travel back to the load. If both generator and load are badly matched to line (such as can be caused by a high-resistance joint at some critical point), then a series of reflections will take place, each reflection being attenuated to some degree on each journey.

The practical result of these reflections is the appearance of "ghost" images on the picture tube. A "ghost" image is a second picture on the tube slightly displaced to the right of the main picture.

It is important not to confuse ghost images caused by aerial reflection with those due to mismatched transmission line. Aerial reflections can occur when the signal is "bounced" back on to the aerial by some nearby object such as a hill or large metal surface such as a gasometer. The cure for this trouble is to re-orient the aerial.

The importance of the production of ghost images cannot be over-emphasised where first-quality pictures is the aim. It is quite easy to have slight reflection where the reflected image comes almost on top of the existing image. The result is an out-of-focus effect which cannot be overcome by adjustment of the focus control.

Standing Wave Ratio (SWR)

The "goodness" of a line can be measured by taking the ratio of maximum to minimum current at both ends of the line. This is called the *Standing Wave Ratio* (SWR).

If the line is perfectly matched, then the current absorbed by the load (the televisor) will be equal to the current transmitted by the generator (the aerial), and the ratio will therefore be unity. ("Aerial Matching," by E. R. G., PRACTICAL TELEVISION, April, 1952.)

(To be continued)

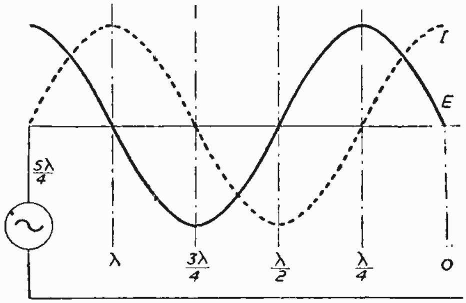


Fig. 13.—Reflected voltage and current from short-circuited line.

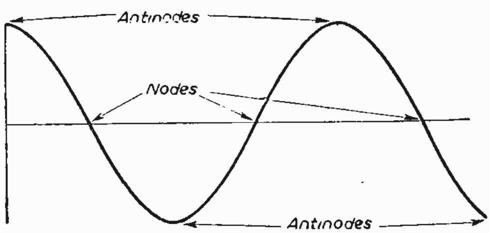


Fig. 12.—Nodes and antinodes in a standing wave.

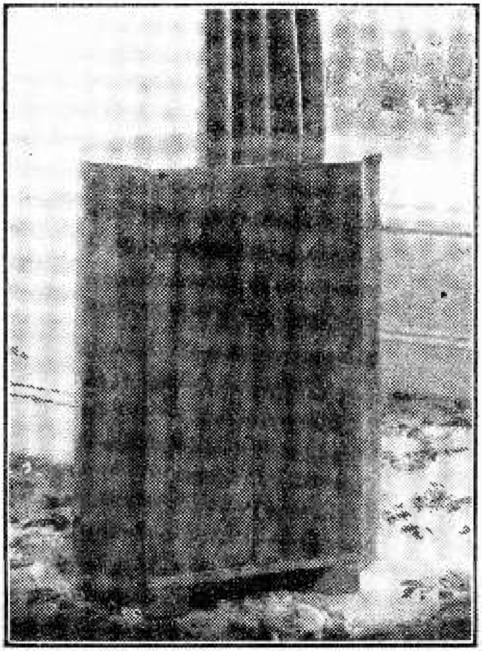
THE NATIONAL RADIO SHOW

A REVIEW OF SOME OF THE PRINCIPAL EXHIBITS AT THIS YEAR'S EARLS COURT EXHIBITION.

As was to be expected, there were no startling surprises at this year's show. With one or two small exceptions in the way of "novelties" design followed more or less standard lines. The old battle between "projection or direct" was fought again, and it was interesting to hear the views of the non-technical visitors who were viewing in the demonstration avenue. Very strong views were expressed here and there concerning one or the other system, and it is clear that as yet the public in general have not made a definite decision as to which is going eventually to be the most popular. Some of the projection models demonstrated were certainly very bright, but the aluminised direct-view tube end is certainly brighter, but again, arguments were heard that they were too bright. However, it is now certain that in general the 12in. tube is regarded as the minimum by the majority and, although there were two or three 9in. models on view, the majority of manufacturers do not now make a 9in. model. In view of the economic position this is rather difficult to understand, as the magnifier seems to have a big popularity and one would have thought that many viewers would have preferred a small tube with magnifier where the cost of replacement was a consideration.

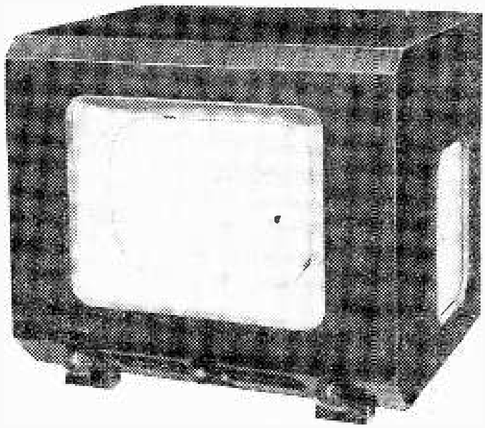
Table Models

Cabinet size was an important point, and a number of table models incorporating the new all-metal 16in. tubes were seen.



Ambassador Model TV5 which can be placed out in the centre of the room.

The small cabinet has been rendered possible by the use of the wide-angle deflection used on the modern tube, plus the fact that the tubes are now being manufactured in the rectangular shape, which not only avoids wasted space on the tube end, with a consequent reduc-



McMichael Model TM52

tion in the area of cabinet which is wasted, but also permits of a very much simpler mounting system. The round-ended tube is not simple to mount, and in the all-metal type there are a number of technical difficulties in the mounting. One particular table model using the large tube was found, in fact, to be smaller in overall dimensions than a cabinet seen at last year's show with a 10in. tube. A further point concerning the large tubes is the flatter surface which is now obtained.

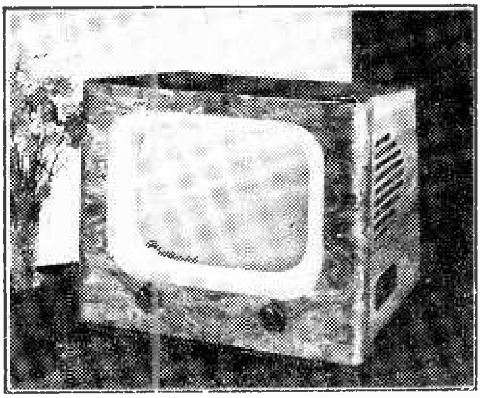
Visitors to previous shows will remember that the G.E.C. used to make a big feature of the "flat-ended" tube, a feature which they obtained by having the tube end made separately and welded to the main "funnel." The all-metal tube, by permitting the end plate also to be made separately, carries on with this idea, and as a result the majority of to-day's big tubes are reasonably flat. This means that a larger number of people may view a receiver without the awkward bending of uprights which was so noticeable on some of the earlier small tubes.

Tube Protection

The difficulties of masking the tube end, and of providing some protection against damage, have been overcome in various ways. Some makers still employ the plate-glass or armoured glass plate mounted behind the cabinet with a plastic mask between it and the tube face, whilst others utilise a specially manufactured plastic protective cover and mask, all moulded in one. These combined protectors are neat and available in different colours to provide "daylight" viewing and avoid awkward reflections, whilst at the same time, by darkening the actual white of the tube face, they increase the apparent contrast.

New Protective Filter

In connection with these protective colours the Triplex company were showing a new laminated filter-glass screen, for which claims of sharper pictures were made. The glass, produced in a neutral tint, has light-filtering properties and in addition it is scratchproof and non-electrostatic, a very important point. As a matter of interest it has been found that by placing the back of the hand close to the protective cover of some of the sets utilising large tubes, the hairs on the hand are attracted to the tube and stand erect, and this electrostatic effect also results in dust and fine hairs floating about in a room (from carpet sweeping, etc.) being attracted to the screen. Although some models have the tube face so mounted that it is totally enclosed and thus claimed to be dust-proof, we would have liked to see more receivers with provision for opening the front or removing the cover so that the inside of the glass and the tube face could be dusted. So far as we could see no single firm made a feature of this particular idea, and one has only to remove the glass from a receiver which has been in service for a month or two to see what a thick film actually does form between the tube and cover.



This is a Pilot table model with 14in. tube.

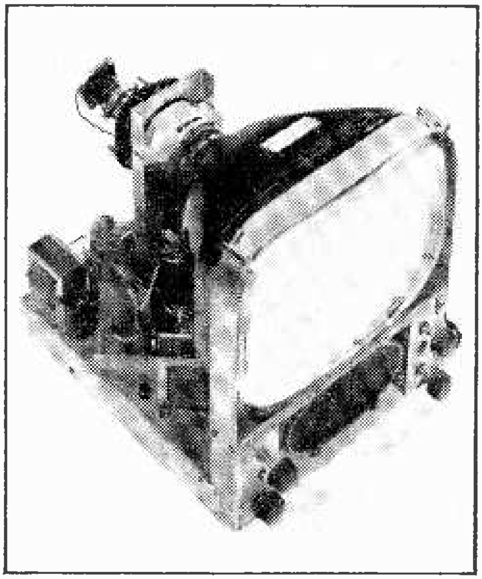
For the Deaf

One development which has been a long time in arriving on the market although featured in the past in articles in this and other technical papers, is the separate amplifier or hearing aid device for the use of those who are hard of hearing. Masteradio were showing such a device which in their case could be used with either the radio or television receiver, and it provided the individual listener with a separate control so that he could adjust the volume to suit his own particular needs without in any way affecting the volume from the main receiver, and in this way the set could be kept turned down to a suitable level for normal listening without depriving the hard of hearing of their pleasure also. Incidentally, why do not more manufacturers provide a small socket strip on the rear of the chassis so that 'phones could be used? In the case of the A.C./D.C. receiver there is, of course, the complication of the "live" chassis, but this can be overcome without much difficulty, and we would have thought that such a provision would have made quite a good selling point.

Accessories

So far as accessories were concerned these were apparent merely as aerials. There were few accessories for the viewer and, of course, viewing does not lend itself to "gadgets" as does ordinary sound radio. Aerials were to be seen of all kinds, and some interesting developments were noted. Many local councils have regulations prohibiting the use o outside aerials and on enquiries it is generally found that the prohibition is not on aesthetic grounds, but from the point of view of damage to the property or danger to the public. In the past it is true some aerial arrays have been immense and supported very flimsily on thin wooden posts, but the majority of commercial aerials to-day appear to be sound engineering jobs with modern lightweight metals and the overall dimensions kept down in the case of multiple arrays by the use of folded elements. There were some new ideas for the indoor aerial, one of the most novel probably being the Wolsey "Switched All-Ways." This consists of a horizontal element mounted with a central bakelite housing from which projects a vertical element. The three arms may be clamped in any desired position to make a T, L, V or dipole, and the bakelite housing is mounted on a metal plate so that it may be fixed to a loft rafter or on a roof, floor or wall, and then rotated and adjusted to find the best arrangement and position or direction.

The same firm also showed a very old idea in new form, namely, the "invisible" lead-in. Hitherto it has been necessary to drill a hole in the window frame or glass through which to take the aerial feeder, and to meet the wishes of certain landlords who object to this damaging of property, and also for those who are afraid of lightning Wolsey have produced a split unit the two halves of which are attached to opposite sides of the glass window by means of suction cups, the aerial going to one side and the receiver to the other. Older experimenters will recall the use of two sheets of metal foil used in a similar way many years ago, but this use for television is a new development.



The use of eliptical speaker and rectangular tube enables the overall size of the receiver to be kept down.

Contrast Adjustment

CIRCUIT DETAILS OF VARIOUS TYPES FOR PICTURE BALANCE

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

IT is common knowledge that the picture contrast ratio between peak-white and black is rendered adjustable by embodying a means of controlling the video drive to the modulation electrode of the picture-tube. Such a device usually takes the form of a gain control suitably positioned somewhere in the video channel of the television receiver. This control may be considered analogous to the volume control of the sound-channel as both controls perform the similar function of providing variable attenuation to the vision or sound modulation.

At one time, in vintage broadcast receiver design, control of volume was invariably achieved by including a variable resistor in series with the cathode circuit —thereby creating a form of variable bias control— the valves controlled were usually associated with the R.F. and/or I.F. stages, so that an increase in cathode resistance resulted in reduced gain. The evolution of the variable-mu type valve assisted such a scheme by making the control of volume less erratic and by also extending the control ratio.

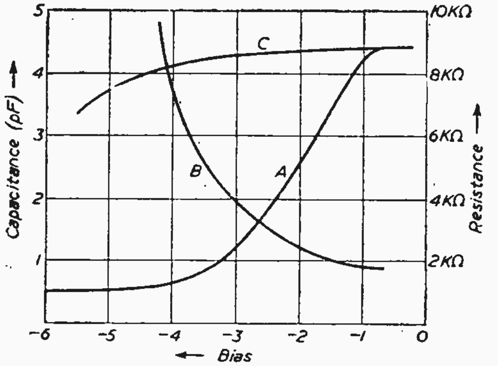


Fig. 1.—Curve A shows the change of control-grid capacitance and curve B the change of input resistance with bias. Curve C shows how the change in capacitance is reduced when both control and suppressor grids are biased.

When the variable-mu valve became more popular, however, such a method of volume control was abandoned in favour of automatic R.F./I.F. gain control (A.G.C.), while the addition of a manual audio-frequency control allowed adjustment of the rectified signal so that any desired percentage of it could be tapped off and fed to the output valve. This is, in fact, the present mode of volume control and it is extremely efficient, but unfortunately effective only for sound reception.

From the Vision Aspect

It must be remembered that owing to the unsteady state of the D.C. component of the vision carrier the application of A.G.C.—as we know it from sound broadcast practice—would be useless; for obviously a reduction in mean picture brightness—originating from the studio and not only from the effect of signal fading —would tend to increase the gain of the controlled stages and so counteract the desired studio effect.

It should be mentioned here, however, that in America A.G.C. of the video channel is frequently employed. This is made possible by the fact that the American signal is brought to a *constant* hundred per cent. level to form the synchronising pulses, whereas peak-white is represented by zero carrier—a reverse of our system.

Although from time to time various designs have been suggested for A.G.C. of the British system, they all need the employment of complex circuitry, coupled with the additional expense of four or five extra valves. To date in this country the added expense is hardly justified for in any case we are able only to receive just the one programme, whereas in America the extra advantage is gained by not having to reset the manual contrast control when changing to another channel.

Furthermore, if we ignore the A.G.C. network and employ a contrast control in the vision detector circuit —the same as the sound counterpart, our wiring capacitances become very important owing, of course, to the very much higher modulation frequencies employed. In any case a form of R.F. gain control would be needed also to prevent the pre-detector stages from being grossly overloaded should the receiver be operated in a location of high signal strength. Nevertheless, as we shall see later, such a design is in use commercially.

Special Precautions

The usual method, however, is to make use of valve biasing arrangements. With vision, more than medium-frequency sound, special precautions must be taken when employing this style of gain (contrast) control, for a variation in control grid potential results also in a variation of input capacitance and resistance. These two effects must be taken into consideration in the design of the contrast circuit. The input capacitance of an

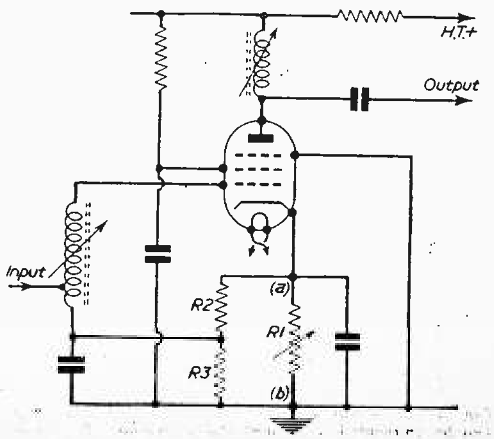


Fig. 2.—A typical contrast control circuit.

R.F. or I.F. amplifier valve, for instance, represents a large proportion of the grid-circuit tuning capacitance, which, if altered while making adjustments to picture contrast, would obviously present a very undesirable feature.

The same reasoning applies to the valve's input resistance, which is usually a contributory factor to the tuned-circuit damping and controls the band-width of the circuit associated with the valve. The curves of Fig. 1 illustrate this effect. At A the change of input capacitance is seen to be very sharp up to about minus four volts, while curve B shows how the input resistance increases very rapidly with bias.

One way of reducing these undesirable effects to negligible proportions is to arrange the contrast control so that it biases negative both the control and suppressor grids. This will not modify extensively the desirable change in mutual conductance, but it will reduce drastically the change in input capacitance as shown by curve C (Fig. 1). The ratio of bias between control and suppressor grids depends, of course, to a large extent on the type of valve employed, but as a rough guide it can generally be considered that the suppressor grid bias is approximately 12 times that of the control grid.

A Typical Contrast Circuit

The way in which the bias ratio is held constant over the entire range of contrast control is shown by the typical contrast circuit of Fig. 2. Here R1 in the cathode circuit constitutes the gain/contrast control, and since the suppressor grid is in direct connection with the earth line, it follows that the full potential between points (a) and (b), as determined by the setting of R1, exists on this grid at a polarity negative to cathode.

Now the control grid, instead of being returned to the earth line direct, is taken to the junction of two resistors R2 and R3, acting as a fixed potentiometer across the actual contrast control. This means that the control grid is less negative than the suppressor grid by an amount depending on the ratio of $\frac{R2}{R3}$, or the control grid bias equals $\frac{R3 \times Ec}{R3 \times R2}$, where Ec equals the voltage developed across R1.

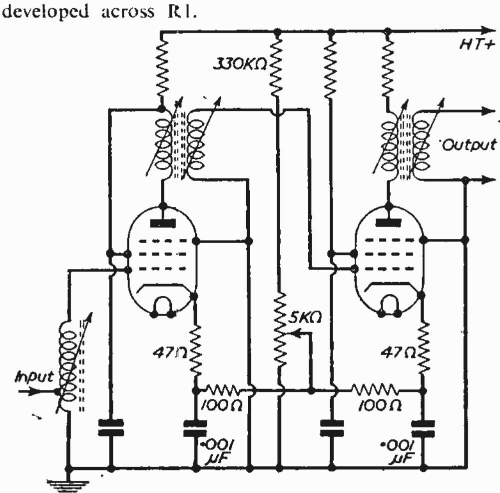


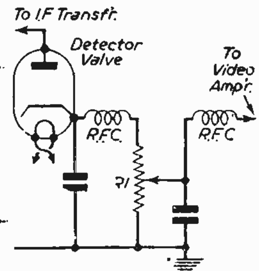
Fig. 3.—A circuit by G.E.C. showing how two stages can be controlled by a single potentiometer. The valves used are Z77's.

The control of contrast is sometimes linearised by the inclusion of a resistor from the cathode to the H.T. line, although, in any case, it will be appreciated that the effect is the same.

The Attenuation Factor

Because television valves—the type employed in the video circuits—are not variable-mu they do not permit a very wide range of contrast control to be effected if it is desired to maintain a fairly steady input reactance, and for this reason it is often necessary to control more than a single stage. Usually two, or sometimes three, stages are controlled, but even then the attenuation factor from maximum to minimum contrast is not very large—not normally any more than about 25 times. Thus, in locations of high signal strength it may be found that even at minimum contrast setting, the first stages are

Fig. 4.—A rather unusual contrast control circuit by G.E.C. This resembles the ordinary A.F. volume control.



severely overloaded. It is, therefore, necessary to provide facilities for the inclusion of fixed attenuators between the aerial and the aerial input terminals, although an additional sensitivity control associated with the first valve may be employed for this purpose.

An Alternative Method

An alternative method of preventing a large change of input reactance with grid bias is by including a fixed resistor in series with the cathode circuit of the controlled valve. This resistor should be unbypassed and possess a value of between 33 to 100 ohms. Being unbypassed it means, therefore, that the stage is subject to negative feed-back, but although this reduces slightly the stage gain—the lower the resistor value the smaller the feed-back factor—it is more than compensated for by the resulting constant input reactance over a wide range of contrast settings.

This idea is illustrated by the circuit of Fig. 3, which depicts two stages controllable by a single variable potentiometer. Actually, this circuit is employed in certain G.E.C. receivers and the control is not primarily for contrast, but for adjustment of overall sensitivity.

An Unusual Contrast Control

The contrast control in the same receiver follows very closely a normal sound volume control system and is depicted by Fig. 4. A valve diode is shown as the detector valve, although more frequently a crystal diode is used. The detector load resistor is formed by the whole of the variable potentiometer (R1), which constitutes the contrast control. Thus, any desired portion of the rectified video signal, as determined by the setting of R1, may be tapped off and conveyed to the control grid of the video output valve.

Because it is necessary to retain the very high video frequencies the value of R1 is much lower than the value of its sound counterpart. Furthermore, stray capacities are very important in this part of the circuit, for even very small values will tend to attenuate the higher frequency video components with a consequent loss of picture definition. For this reason, therefore, it is usual to include peaking inductors in the detector circuit, and it should be ensured that the contrast control potentiometer has a very low self capacitance to the chassis. (See "The Video Detector," PRACTICAL TELEVISION, February, 1952.)

External Contrast Control

It is sometimes desirable to have the contrast control external from the receiver and within comfortable reach of the favourite armchair. This is especially so on the fringe areas where the signal is frequently subject to slow fading. The writer has, on one or two occasions, successfully modified the receiver to take such an external control, although really very little modification is necessary. A jack-socket wired directly across the contrast control has been mounted on the back of the receiver, making sure that the outer connection of the socket is connected to the chassis side of the contrast control. A variable resistor of similar value to the main contrast control has been installed in a small box with facilities to mount it on the arm of the chair used for viewing. This control has been connected to a suitable length of co-axial cable terminated by a jack-plug, which in use is plugged into the jack-socket, and the main contrast control fully retarded.

Although such an arrangement reduces the overall contrast resistance by 50 per cent., it is of no consequence, for in fringe areas it is usually necessary to set the contrast control to, at least, two-thirds of its maximum rotation anyway. Should, however, the lower resulting resistance have any adverse effect, a switched jack-socket can be employed, and so wired that on inserting the plug the main contrast control is automatically taken out of circuit.

In Conclusion

Faults developing in the contrast stage are usually very few—for in any case there is not a lot to go wrong! Any decoupling capacitors becoming open circuit will result, as is usual, in a loss of gain, or the development of varying degrees of instability in both sound and vision channels as the contrast control is rotated. An open circuited control will be immediately apparent, while an open circuit in the resistor between the cathode and the H.T. line will affect the control of contrast, as it will not be possible to reduce it to a minimum setting; the control will, therefore, lose its linear effect and will become very sharp in operation.

Although the contrast circuit is only a diminutive portion of a complete receiver the role it plays is very important, and it is therefore hoped that this article will enlighten experimenters as to the design problems of a section which is so often just taken for granted.

Demonstrations at Earls Court

THERE were a number of interesting demonstrations on certain stands which attracted considerable interest. For the television enthusiast there was the underwater demonstration, for instance, on Stand No. 31.

This was the first time ever that underwater television had been demonstrated to the public in this country.

The stand was built in the form of a tunnel in which was a water-filled tank, seven monitors and a control room. As they entered visitors saw, through the glass windows of the tank (11ft. 1½in. long x 6ft. 8in. wide x 8ft. 6in. high), a model of the stern of a sunken ship amid weed, gravel and fish, approximating as near as possible conditions on the ocean bed.

Two working model divers, quarter-size, ascended and descended, and the camera recorded operations. Eight lights were fitted to the camera casing, which was without gantry, and there were further underwater lighting arrangements.

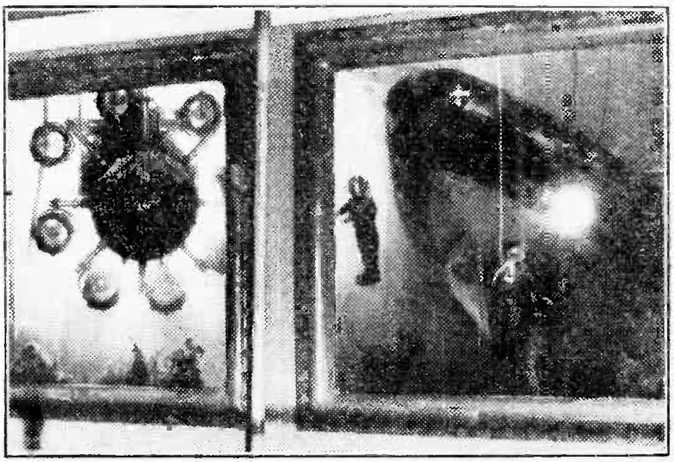
The interior of the tunnel was darkened, the only illumination being from the tank windows, monitors displaying the picture from the camera, and a bright light over the control desk. The desk was visible both from inside and outside the stand.

Demonstrations were given four times each day, and appeared to be greatly appreciated.

On the T.C.C. stand was a machine known to T.C.C. operatives as the "Cake-Walk," because of its unique feeding action which removes all personal risk from the individual. The machine tests condensers by remote control for all possible errors in assembly, high power-factor and leakage currents, finally graduating capacity values to pre-set standards.

Other machines demonstrated on this stand included an automatic electronic paper condenser tester which tests for over-voltage proofing, insulation-resistance on the internal element and between terminals and case. In the event of a condenser failure in any of these tests a coloured signal flag is thrown up to indicate the type of fault to the operator at the unloading end.

Yet another large machine which visitors saw was a fully automatic and electronic tester designed for testing Ceramic condensers at the rate of 2,000 per hour, rejecting any condenser failing to comply with the over-voltage and insulation-resistance requirements and grading the remainder to appropriate capacity tolerances.



The underwater camera seen photographing the "doll" divers in the tank at the Radio Show.

Aerials for Wenvoe

DETAILS OF TYPES REQUIRED IN THE AREA COVERED BY THE NEW STATION

By "Erg"

ALTHOUGH the details given in this article are mainly for those who now come within the range of the new station at Wenvoe, the principles are applicable to all channels now used by the BBC.

The complete range of the transmitter will not be known until it is working on full power and the field strengths have actually been measured. However, it is possible to make a close estimate of the type of aerial required in certain localities from experience gained of the capabilities of the other stations.

It should be borne in mind that the station is, at the moment, transmitting on low power and while it does not mean that when the station is working at 10 times its present strength the received signal will be 10 times as strong, some improvement in the present reception conditions will naturally follow.

The position of our new Welsh viewers will be particularly problematical due to the reflections which are liable to occur from their mountains, and no accurate forecast can be made of reception conditions.

While many viewers who have been relying upon fringe reception of Sutton Coldfield will be in the happy position of at last coming within the normal service area, there will be many new fringe viewers to take their place. Reports are already coming in from as far south-west as Falmouth and it is known that there are quite a few potential Irish viewers who have been waiting for Wenvoe to open.

The map in Fig. 1 shows the various areas served by Wenvoe. The broad line shows the boundary where anticipated signal strength at full power is 500 microvolts per metre. Good quality pictures should be obtained within this area.

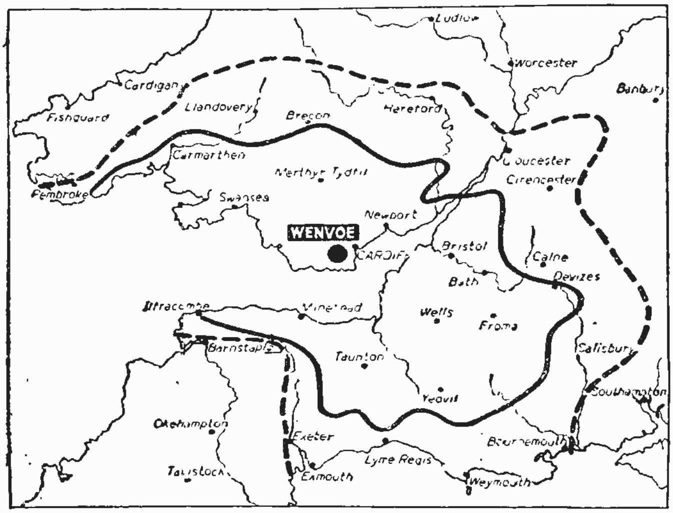


Fig. 1.—The Service area as plotted by the BBC. It may, of course, subsequently be found that results will differ slightly in certain districts, but the map may be taken as a reliable guide in planning the type of aerial which may be required.

The second dotted line shows the boundary where the signal strength is anticipated to be 100 micro-volts per metre. Fading is liable to occur from this boundary outward and will be more severe as the distance from Wenvoe is increased.

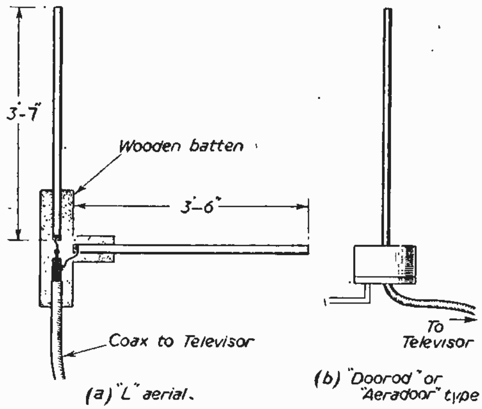


Fig. 2.—Two very simple forms of indoor aerial for areas close to the transmitter.

It will be noted that the boundaries do not form a perfect circle around the central point—the transmitter. This is due to the varying contours of the country.

In the following paragraphs the country served by the new station has been divided into five parts, using Wenvoe as the centre of a circle. The actual boundaries of the areas will not, in actual practice, be truly circular but will follow approximately the outlines given in Fig. 1. The reader should bear this in mind when judging the type of aerial most suited for his district.

Area 1. (Up to 15 miles from the transmitter.)

The potential viewer in this area should not be led astray by his close proximity to the transmitter and be content with a makeshift aerial. One of correct design is necessary in order to obtain the greatest benefit from the nearness of the station and to maintain the widest bandwidth necessary for first-class reception.

Unless one is unduly bothered by nearby traffic an aerial of the "Doorod" or "Aeradoor" should be perfectly satisfactory (Fig. 2b).

The enthusiast who requires to obtain the widest bandwidth possible for absolute quality reception could make himself a cage dipole. This is quite easy to construct and can be mounted in an attic or even suspended from wall brackets provided it is kept well clear of surrounding objects. Fig. 3 shows this aerial.

Where the televisor is situated in a locality which suffers from severe interference then it would be better to use an aerial of the type for Area 2, fitted with attenuators to prevent overloading of the receiver. Fig. 4 shows the circuit of a simple attenuator. For further information, see PRACTICAL TELEVISION, Jan., 1952, "Aerial Attenuators."

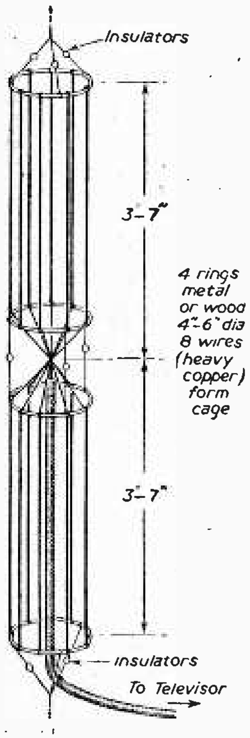


Fig. 3.—A home-made aerial which may be used indoors or outdoors.

It is quite easy to make aerials of this type and details of an "L" shaped aerial are given in Fig. 2a. It is made from duralumin rod, ⅜in. minimum diameter and can be mounted in any convenient position.

Area 2. (15-25 miles from the transmitter.)

It will be found possible in many cases to use an aerial of the type recommended for Area 1, but better results may be obtained by using a simple dipole. The dipole can be fixed to an outside wall, or, if there is room, in the attic. The inverted "V" is very convenient for attic fitting. (Fig. 5).

In this area it will be possible in certain cases to use the cage-type aerial; it is certainly worth experimenting with.

One point to bear in mind is that it will be found in some cases that an horizontally-mounted dipole will produce a better signal than one placed in the usual vertical position. This has been proved by actual experiment. A good idea is to test this while watching the televisor and to swing the dipole both in the vertical and horizontal direction until the best position is found. It will be noted that if the aerial is moved only a few feet in the same room a difference can be seen in the strength of the picture.

If it is found that pictures of equal strength are obtained with the dipole horizontal or vertical, then leave it in the horizontal position because such an aerial will be found to be less susceptible to ignition interference than the vertically mounted dipole.

Where the receiving point is masked from the transmitter by high hills then an aerial of the type required in Area 3 will be of value, and if this position is accompanied by traffic interference then an "X" aerial is recommended.

For those who wish to make their own dipole, Fig. 6 gives the details. The material should be duralumin tubing of ⅜in. minimum diameter.

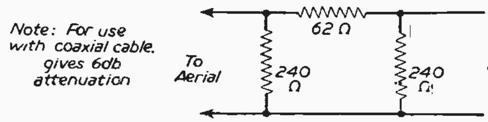


Fig. 4.—A simple attenuator circuit which may be made up with ordinary half-watt resistors.

If reception is spoiled by "ghost" pictures, i.e., where a second image is seen on the screen close to the main image, then it will be found that the actual position of the dipole will materially affect the ghost and a point can usually be found where the ghost can be eliminated.

Eighty ohm coaxial cable is recommended in each case; where constructional details are given, for connecting aerial to televisor.

Area 3. (25 to 40 miles from the transmitter.)

Generally speaking an "H"-type of aerial will be required in this area. (Fig. 7.) On the higher ground it may be possible to erect an aerial of a simpler type, while in difficult localities an aerial of the type used in Area 4 may be required.

The home constructor will be well advised to try one of the simpler type first, and then alter it by the addition of a reflector so as to form an "H" aerial, if found necessary. Constructional details of "H" aerials were given in the June, 1952, issue of PRACTICAL TELEVISION.

It will be found that the signal strength from an "H" aerial varies very little over an arc of about plus or minus 30 deg. This makes it eminently suitable for counteracting interference by placing it so that the reflector points towards the interference source. It is often better to lose some of the signal if the interference can be reduced, as it is not so much the strength of the signal, as the strength of the signal compared with the strength of the interference which counts.

Area 4. (40 to 60 miles from the transmitter.)

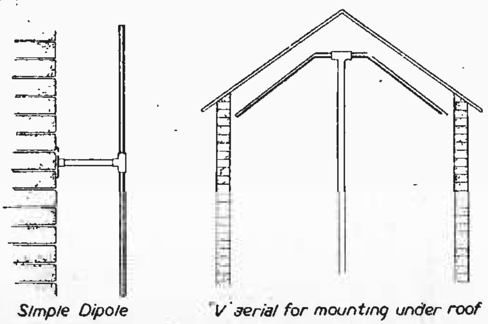


Fig. 5.—A simple outdoor aerial and a loft-type aerial.

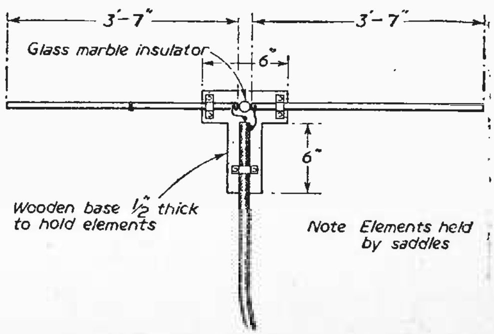


Fig. 6.—Constructional details of a dipole.

In these areas something more elaborate than an " H " will be required. Generally, except where conditions are really favourable, an " H " aerial with an added director should be used.

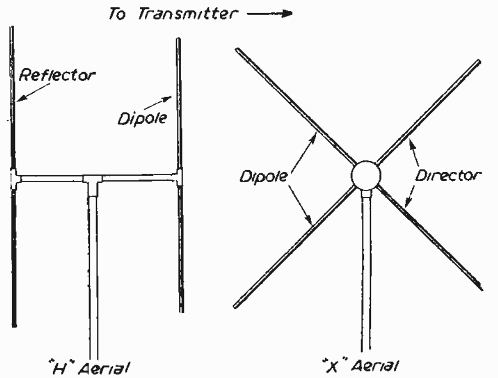


Fig. 7.—The simple " H " and the " X " type aerial, the latter having very good anti-interference properties.

Such an array is quite light and can be fitted to a chimney-stack with every degree of confidence. This aerial is more directional than the simple " H," and the arc over which it can be rotated without losing signal strength is consequently smaller (about plus or minus 20 degs.). However, the same principle applies here as for the " H " and it is better to sacrifice some signal strength in order to reduce interference (Fig. 8).

An aerial of this type is also useful in reducing ghosts which may be found in the very hilly districts, the aerial being rotated until the interfering reflections are eliminated from the screen.

Some of the towns in this area are receiving quite good signals from Sutton Coldfield and will not, therefore, desire to make any change.

When using directors and reflectors the centre impedance of the dipole becomes very low, and to avoid losses some form of matching device must be employed to match the aerial to the transmission line. The three types in general use are the matching stub (a ¼λ section of cable inserted between the dipole and the transmission line), the folded dipole, and the " T " match. Examples are given in Fig. 8.

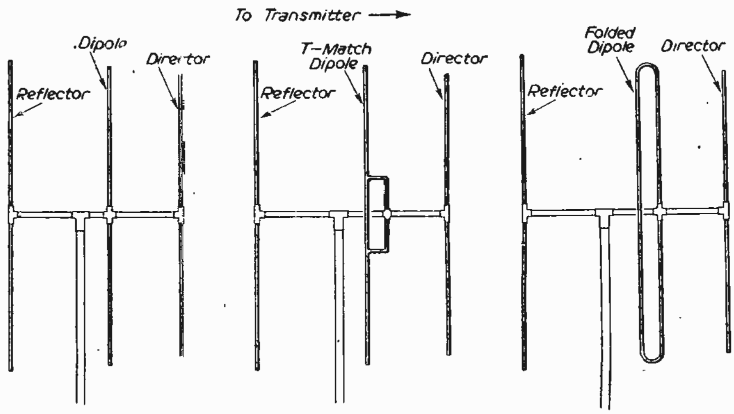


Fig. 8.—Three different forms of multi-array aerial for remoter districts.

For difficult districts in this area an aerial of the type used in Area 5 may be required.

Area 5. (60 miles and over from the transmitter.)

In this area we begin to come up against real difficulties. It is possible that the increased power which will eventually be radiated from Wenvoe will help to overcome them, but the main point to bear in mind is that a really good aerial is a necessity.

Up to about 80 miles it may be possible to use the simple director, dipole, reflector array as for the previous area. There is much to be said for an aerial of this type as it is not unduly costly and is fairly light in weight. Such aerials are being used very successfully at this distance from Sutton Coldfield.

Places like Torquay and possibly Pembroke will find such an aerial quite suitable but when we come to real long-distance reception such as at Plymouth and Falmouth, then a more elaborate array must be erected.

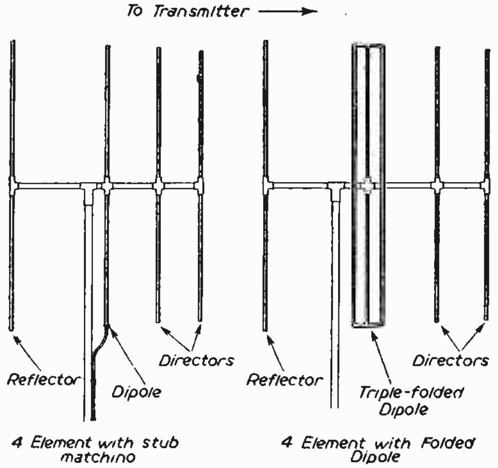


Fig. 9.—For fringe area reception aerials of this type are necessary.

Unfortunately, it is not merely signal gain which must be considered, but also the weight of the array and the strength of its attachment point. A four-element array, consisting of two directors, dipole and reflector is about as much as the average chimney can handle under gale conditions, and it is a wise precaution to stay the array against the prevailing winds. (Note, if this is done then care should be taken to avoid lengths of staywire which would resonate at the same frequency as the aerial. Insulators should be used to split the staywire into short lengths of about 6ft.)

Fig. 9 shows four element arrays.

It is in these areas that the use of low-loss coaxial feeders are of real benefit especially where the aerial has been erected at a good height in order to obtain as much signal strength as possible.

Those who are attempting real television DX, are advised to instal a double array. This consists of two complete arrays comprising one or two directors, dipole and reflector, both arrays mounted quarter wavelength from each other at the same height. Two coaxial cables can be run from each aerial to the televisor, both cables being *exactly* the same length. (Fig. 10.)

Preamplifiers will be found very useful in Area 5, but there is a limit to the amount of amplification which can be gained in this way. A one-valve amplifier will be found useful in Area 4, but in Area 5 a two-valve unit is about the maximum which can be used. The reason for this is that trouble with valve noise is experienced when the amplification is at too high a level ; this shows itself on the screen as " snow " and as a hissing sound on the loudspeaker.

In very remote areas the use of grounded grid pre-amplifiers employing triodes should be considered, as although the overall gain may not be so high as with normal pentodes, the signal-to-noise ratio is improved.

If you are purchasing an aerial and there is some doubt as to which Area you are in then it is best to buy an aerial for the next area away from the transmitter. Although the cost is a little higher, it is better to have the possibility of more gain than is required, rather than to find your aerial is giving too little a gain.

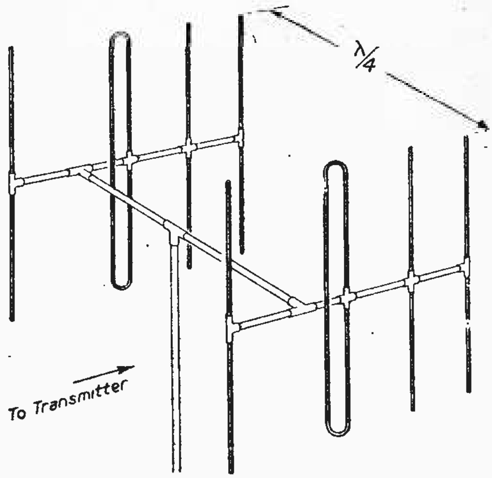


Fig. 10.—For areas of very weak signal strength an elaborate array of this type is not only desirable, but in many cases essential.

NEW AMERICAN VALVES

FOUR new valve types have recently been announced from the U.S.A., three being of R.C.A. manufacture and the fourth a Silvania product. All are applicable to television, three of them actually being produced specifically for television receivers, although, of course, they may be used in other circuits. The R.C.A. valves are a Hydrogen thyratron (3C45), a Video Power Pentode (6CL6) and a half-wave rectifier (12AX4-GT).

The 3C45 is a hot-cathode, three electrode, hydrogen thyratron designed for pulsing service involving high repetition rates, high peak currents, and low average currents in low-impedance circuits. It is especially useful for pulsing magnetron oscillators and other oscillators having a power output up to 50 kW.

Features of the 3C45 include its very short deionisation time, low voltage drop, high peak anode current capability, ambient temperature operating range of – 50 deg. to + 90 deg. C., and positive control characteristic which permits zero-bias operation utilising positive triggering pulses. In addition, the 3C45 is constructed and processed to meet rigid military requirements.

The 6CL6 is a 9-pin miniature type designed especially for use in the final video amplifier stage of a television receiver. Designed as the equivalent of the metal type 6AG7, the 6CL6 has very high transconductance, low interelectrode capacitances, and high output-current capability. These features make possible the design of wide-band video circuits having a voltage gain of 40 to 45. Providing high plate current at low plate voltages, the 6CL6 can supply sufficient peak-to-peak output voltage to drive large picture tubes with high efficiency and low amplitude distortion.

Separate base-pin connections for grid No. 3 and cathode permit the use of an unbypassed cathode resistor to provide degeneration without encountering parasitic oscillations which would otherwise occur if grid No. 3 were connected to the cathode within the tube.

The 12AX4-GT is a half-wave vacuum rectifier tube of the heater-cathode type. It is intended particularly for use as a damper tube in horizontal deflection circuits of television receivers utilising series-heater strings.

Designed to withstand negative peal pulses between heater and cathode of as much as 4,000 volts with a D.C. component up to 900 volts the 12AX4-GT provides flexibility in choice of deflection circuits.

The 6X8, by Silvania, is a miniature 9-pin medium-mu triode and sharp cut-off pentode contained in one envelope.

The tube is designed as a combined mixer and oscillator in television receivers using an intermediate frequency of approximately 40 M/cs. Characteristics of the pentode section of the 6X8 are similar to the Type 6AG5. The triode section is comparable to one section of the Type 6J6. Except for a common cathode, application of the 6X8 is similar to the 6U8.

The pentode mixer section of the 6X8 provides low grid No. 1-to-plate capacitance as compared with a triode mixer. This low grid No. 1-to-plate capacitance reduces feedback problems often encountered in mixers when using an I-F in the vicinity of 40 Mc/s. The low output capacitance enables the tube to work into a high-impedance plate circuit resulting in higher mixer gain.

The type 6X8 is also well suited for use as a mixer in A.M.-F.M. receivers. The pentode may be used as a pentode or triode connected mixer depending on the desired signal to noise ratio.

MAIN CHARACTERISTICS

	Triode Section	Pentode Section
Plate Voltage ...	100	250 volts
Suppressor... ...	—	Connected to to Cathode at Socket
Screen Voltage ...	—	150 volts
Cathode Bias Resistor	100	200 ohms
Amplification Factor	40	—
Plate Resistance (approx.) ...	6,900	750,000 ohms

A.V.C. AND TELEVISION

SOME CIRCUITS FOR OVERCOMING FADING

By E. W. Holt

A NUMBER of queries in the past have asked, why is not A.V.C., or to give it its correct name, A.G.S. (automatic gain stabilisation), fitted to British sets when it is so popular in the U.S.A. The reason is, in the majority of cases, it is quite unnecessary, as we have only one programme, and it is only on the fringe areas where fading is experienced. In the U.S.A. automatic gain stabilisation is very necessary owing to the different signal strength of each station received and the distances involved make fading a problem. It is the fringe area viewers and the connoisseurs who try to combat aircraft flutter, that the following will interest.

The first requirement is a receiver capable of ample signal strength even on weakest received signals (this may necessitate pre-amplifiers), for no receiver can be stabilised on maximum gain: a loss of 30 to 50 per cent. can be expected. With normal A.V.C. in radio it is the practice to tap off part of the R.F. carrier through a diode to give a D.C. bias to the R.F. and I.F. valves dependent on the signal strength of the carrier. We cannot do this with television for the carrier varies with brightness of the scene being transmitted; therefore we must use for our bias part of the signal that does not vary with the picture content. The only part that satisfies this condition is the sync pulse; we can then tap off our A.G.S. bias from the sync separator or any part of the circuit that draws its energy from the sync pulses such as D.C. restorers.

Typical Circuit

Fig. 1 shows a conventional circuit for a diode sync separator. The signal is passed through the .1μF condenser to the diode anode, where the negative signal cuts off diode current but the positive-going sync pulses bring the diode into conduction, causing the right-hand plate of C1 to become negatively charged, the size of this charge being dependent on the size of the received sync pulses, which in turn is dependent on the signal strength received. Thus, by tapping a 100KΩ resistor to the diode anode we have derived a source of bias for our R.F. amplifiers, which is dependent on signal strength and not signal content. C2 is the smoothing condenser to remove any ripple in the bias.

Fig. 2 shows how the saturated pentode sync separator can be modified to give A.G.S. bias. Here diode action

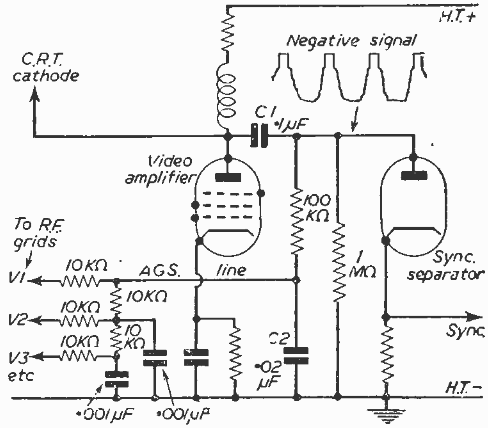


Fig. 1.—Conventional diode sync separator.

between grid and cathode causes C1 to become charged giving a negative bias on the grid, which is tapped off the same way as was the diode anode. Fig. 3 and Fig. 5 show how an A.G.S. bias can be derived from a negative or positive D.C. restorer diode, and it will be noticed that the procedure is a little different on a positive D.C. restorer.

Concluding, I would add the amount of A.G.S. bias developed is dependent on from which part of the circuit the sync separator or D.C. restorer is being driven. If driven from the output of the signal diode the resultant bias will be much less than if driven from the video

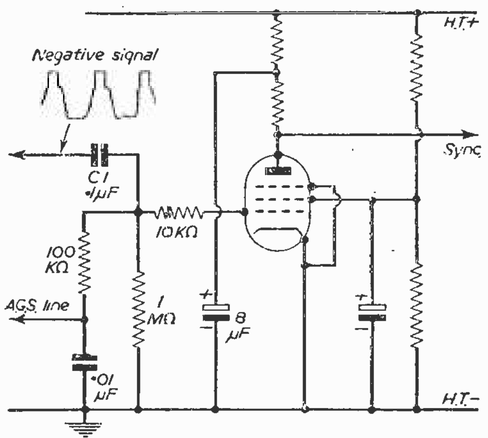


Fig. 2.—Modified saturated pentode sync separator.

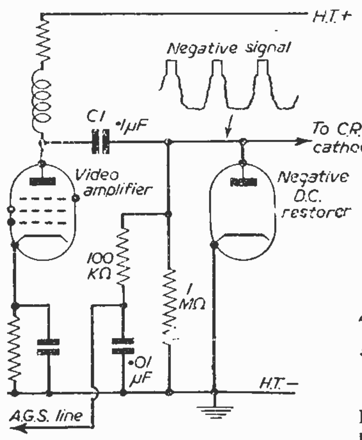


Fig. 3.—One method of obtaining A.V.C. from a restorer diode.

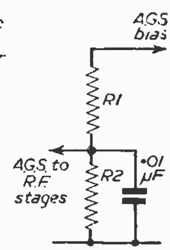


Fig. 4.—A fixed potential divider to give correct bias.

amplifier. In using steep-slope high-gain R.F. valves in the receiver, only a small change of bias is necessary to make a large change in gain ; it will probably be necessary, therefore, to use only part of the bias developed to supply the R.F. valves. In this case a simple potential divider can be included, viz., Fig. 4, where the ratio of R1 to R2 is adjusted to give correct amount of bias ; this can be in the form of a potentiometer which will act like a contrast control.

Application

Although the details given in this article are for the provision of a suitable D.C. voltage which may be used as an automatic gain voltage for the control of H.F. stages, there are a number of points which must be considered in the circuits of the actual controlled valves. The question of the variation of the valve's input impedance changing with change of applied bias and consequent variation in frequency response with resultant picture distortion must be borne in mind, and the reader is referred to the article on "Contrast Adjustment," on page 202 of this issue.

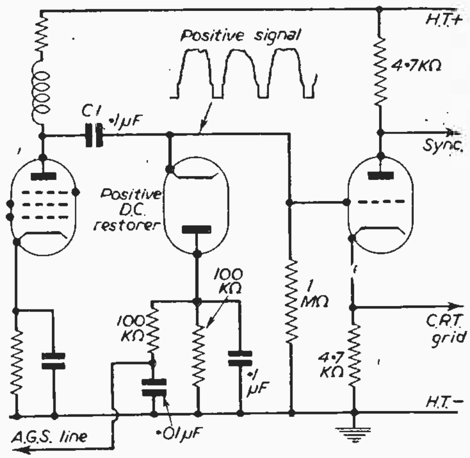


Fig. 5.—Another method of using the restorer diode.

THE WENVOE TRANSMITTING STATION

THE new Wenvoe station is situated on a site of approximately 30 acres close to the Cardiff-Swansea road some five miles to the west of Cardiff. It is 400ft. above sea-level, and the transmitting aerials are located on the top of a 750ft. mast which brings the total height to over 1,100ft. This is an important factor in securing the greatest possible service area, particularly in the hilly country of South Wales.

The vision transmitter operates on a frequency of 66.75 Mc/s (4.495 metres) and the sound transmitter on 63.25 Mc/s (4.745 metres). The medium-power transmitters, built to BBC specification by Marconi's Wireless Telegraph Co., Ltd., will ultimately be held in reserve in case of a breakdown of the high-power transmitters. They are housed in the annexe building and form a completely separate installation. A description of the high-power vision and sound transmitters built by Electric & Musical Industries, Ltd., and Standard Telephones & Cables, Ltd., respectively, will be given later when they are brought into service.

The medium-power vision transmitter is of the low-level modulated type with a peak white output power of 5 kW. Modulation is carried out at the 500-watt level and the signals are then amplified by two class "B" wide-band linear R.F. amplifiers each using a pair of English Electric Co. type BR.191 forced-aircooled triodes. The appropriate shaping of vestigial side-band signals radiated by the vision transmitter is carried out in its own circuits, and not by a separate vestigial side-band filter as in the case of the high-power transmitter. The valve filaments are A.C. heated, with the exception of those in the modulated amplifier and the linear amplifiers which derive their supply from metal rectifiers. The transmitter H.V. supplies are obtained from hot-cathode mercury-vapour rectifiers which provide a maximum of 3,000 volts for the anodes of the linear class "B" amplifier stages.

The sound transmitter has an output power of 2 kW and is of the conventional class "B" modulated type. All valve filaments are A.C. heated. As in the case of the vision transmitter, the crystal controlled drive and the power conversion equipment are built as an integral part of the transmitter.

Both transmitters are contained in similar sheet steel cubicles mounted side by side and so present a single continuous front in the transmitter hall.

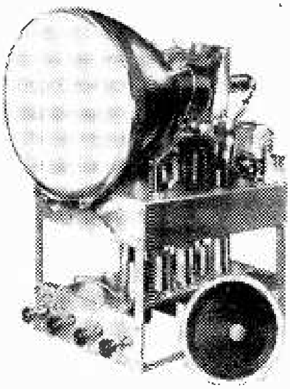
The air blast cooling equipment and combining filter are mounted behind the transmitter cubicles, which are built into a soundproof partition wall, so as to isolate the noise of the air blowers from the control desk situated immediately in front of the transmitters.

The two transmitters are controlled and monitored from this desk which incorporates a built-in waveform monitor and two picture monitors in addition to the conventional controls and meters. The provision of the two picture monitors enables the incoming signals to be compared with those radiated. Programme switching for both sound and vision circuits is accomplished at this desk. The controls of each transmitter are sequence-interlocked to ensure that the various supplies are applied in the correct order and, where necessary, with the appropriate time interval between each. Adjacent to the control desk are the vision and sound programme input equipment bays and the test waveform generating equipment.

The Wenvoe station will ultimately receive its vision programme over a coaxial cable from London via Bristol and Cardiff, which is rented from the G.P.O. as part of their national distribution system for television. Until this cable is completed programmes will leave London on a cable circuit as far as the G.P.O. research station at Dollis Hill. From there to Cardiff they will travel over an experimental radio link installed by the Post Office, completing their journey to Wenvoe by cable. The sound programme will reach Wenvoe over specially equalised G.P.O. telephone circuits similar to those used for other BBC transmitting stations.

The mast, which is built to the BBC's detailed specification of structural requirements, carries an aerial system designed to accept the full power from the main transmitters. Both the mast and aerial system are generally similar to those already in use at Sutton Coldfield, Holme Moss and Kirk o' Shotts. The supporting lattice-steel mast is 600ft. high and is triangular in section, each face being 9ft. across. This is surmounted by a cylindrical section, 110ft. high, having slots cut in its surface which may eventually form a V.H.F. aerial for sound broadcasting.

THE VIEWMASTER



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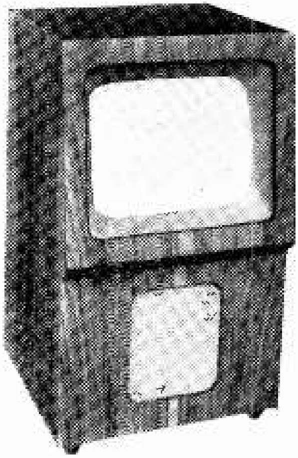

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Economical Television

CHOOSING A RECEIVER DESIGN, AND DETAILS OF LOW-COST CONVERSIONS

By W. J. Delaney (G2FMY)

MANY readers and potential viewers are seriously concerned with the financial aspect of television, and although interested in the subject have refrained from commencing construction in view of the possible expense. We are often asked whether such-and-such a receiver could be built with a view to it being modified at a later date; whether sets using ex-Service tubes may one day be changed to utilise standard tubes; what is the cheapest set which can be built to provide family entertainment, etc. It is often difficult to make direct answers to some of these questions, as so many factors have to be considered. For instance, the cheapest receiver we have described, which may be said to provide family entertainment, costs only £9. But some viewers will say that such a receiver is not suitable for domestic use, but only for experimental use, because the picture is so small and is green in colour. But there are hundreds of such receivers in use, and a magnifier is available to make the picture comparable with that provided with a normal 9in. tube. However, let us take the points stage by stage and see what can be done by those who are not in a position to make considerable outlays.

Ex-Service Conversions

First, there are the conversions of ex-Service equipment. Certain items may be used complete with the tubes which are fitted, or normal short-wave receivers of Service design may be converted into vision and sound receivers, and separate ex-radar units converted into the timebase and tube units, the combination then providing a complete receiver. But in all these cases the tube will generally be of the 6in. green type. The unit may not be found too cheap, and there are probably many who will be unable to afford such outlays, and for them probably the most inexpensive way of tackling the job is to build by sections, using ex-government components as distinct from complete units, and making the equipment in such a way that as time goes on sections may be replaced by those employing standard components; but there are certain points which must be borne in mind in this connection.

Vision Section

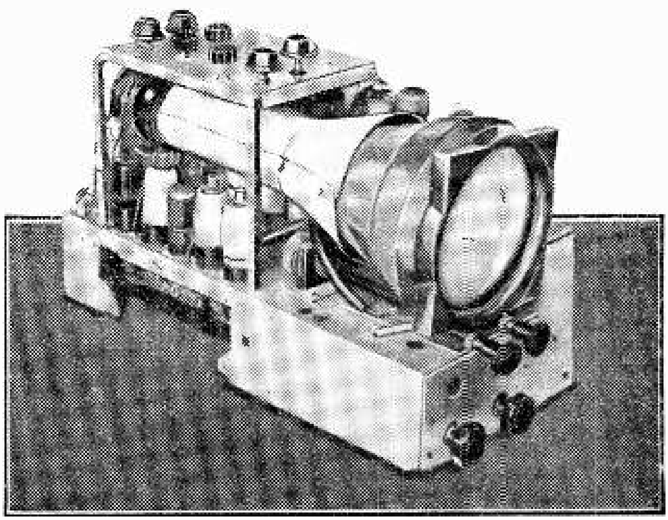
No matter what type of tube is used, the vision section of the receiver will be of a "standard" type. Therefore the potential constructor may put down his choice of this particular type with a view to making this a permanency. There is, of course, the choice of straight or superhet. circuit, the former being slightly cheaper on account of the valve types which are employed, but both may be built round surplus valves, and again it is desirable to use those which may later be replaced by standard valves without having to change valveholders. The sound section also will be the same for any type of tube, so again the prospective builder may prepare his design. In this connection expense may be saved by making the sound section only as far as the detector, arranging for the signal at this point to be fed into the normal domestic broadcast receiver—usually carried out by plugging-in to the pick-up sockets and fitting a suitable switch.

Experience shows that probably it is best to start with the sound section. In this way one is able to listen to some of the programmes and this will provide the necessary incentive to proceed with the rest of the work as quickly as possible. Use a small chassis, and the number of stages will depend upon the locality and the type of aerial which is to be used. Enquiry among local amateurs or viewers will elicit the type of signal received in the locality and assist in making the choice of circuit. Make the sound unit complete, as this may be permanent and will not require alteration, no matter what type of complete receiver is eventually made.

Similarly, the vision section may be made once and for all. The only point to consider here is the method of taking out the sync. pulses, and if it is considered that the ultimate aim is a really good receiver, it will be preferable to arrange that the sync. may be taken out at the detector stage so that it may be kept quite separate from the vision signal, and in this way a vision stage may be arranged which will suffice with small tubes but which may later be improved to give a signal suitable for the largest tubes without modifying the sync. arrangements.

Timebases

From what has been said it is obvious that the best method of approach is to make the receiver in unit form, and there remain now only the timebases and power



A typical converted ex-service unit complete with tube. This is the £9 televisor using a Type 62 unit.

supply, in addition to the tube, and it is here where the question of expense is most important. For the ex-Service small tubes the timebase requirements are much simpler than with modern electro-magnetic picture tubes. Similarly, the H.T. voltage required is much less, and therefore if one starts with this type of tube and eventually changes to the standard type of tube, practically everything but the vision and sound sections will have to be rebuilt. It is therefore necessary to consider carefully the *total* outlay. Many ex-Service items may, of course, be used in the construction of the electrostatic or small tube equipment, and still are serving in many homes. Unfortunately, it is not possible to use standard electro-magnetic circuits with the small tube, so there is little which may be built to start with and eventually rebuilt for the standard type of tube. It is a case of being prepared at a later date to build fresh timebases and power pack.

For those, however, who are prepared to start with the standard type of picture tube, but may later wish to use the large metal tubes which are now growing in popularity, there is also a question of expense. As most readers know, the big tubes have a different deflection angle, and consequently scanning coils, focus units and timebase circuits designed for these differ from those used in standard equipment. Here, however, the prospective viewer is on fairly safe ground, for the components so far available to him for wide-angle equipment may be used with normal tubes—but not vice versa. Therefore, in the case of a reader who wishes to start on construction but has an eye to the future, the wide-angle scanning coils and timebase components should be obtained and, although only a 9in. tube may be purchased for the time being, it will not be difficult to change at a later date to the big tube, with very little alteration to the timebases—and then usually only insofar as concerns small items like resistors and fixed condensers. When using the small tubes the difference in diameter may be taken up by wrapping ordinary paper round the tube until the larger diameter scanning coils fit.

Power Packs

The final point concerns the power pack. For ordinary types of receiver it is found that an initial H.T. rail of about 350 volts is customary, mainly because it enables standard Octal types of valve to be used, with adequate decoupling values—still permitting the valves to receive 200 volts or so at the anode. This means that a mains transformer with adequate current rating (150 mA and upwards) is fairly expensive. If a standard transformer with combined heater winding is employed any modification to the number of valves will have to be carefully considered in order to keep within the current rating of the heater winding. If the receiver is to be used on A.C. only, however, there is an alternative in which the heaters may be operated from a separate heater transformer (which will only cost a small sum). and the H.T. may be provided by an auto-transformer with associated metal half-wave rectifier. This will be cheaper and by suitable choice of rectifier will cover any possible improvements and increased current loading, using the miniature type valves which operate at lower voltages. For initial work, and to keep down expense, the mains transformer may be dispensed with, the rectifier being connected direct to the mains, but in such a case the usual precautions must be taken to avoid risk of shocks as with standard A.C./D.C. apparatus. It is not advised that expense be saved by trying series-fed heaters, as changes in the network which may take place will lead to all kinds of trouble in changing dropping resistors, etc., and the complications are hardly worth while. It is hoped that sufficient data has been given to enable readers to decide what steps to take to commence construction where expense is an important point.

News from the Trade

New G.E.C. Tube

A NEW cathode-ray tube manufactured by The General Electric Co., Ltd., has a 16in. diameter circular all-glass tube with a virtually flat face, and an aluminised screen. It incorporates a triode gun. The recommended E.H.T. voltage is 12 kV, the heater being rated at 6.3 volts 0.3 amp. The tube, which is designed for wide-angle scanning, has a neck diameter of 38 mm. and an overall length of 460 mm. A B12A duo-decal base is used, the anode connection being made by flush side-contact.

The new tube, catalogue number 6901A, is priced at £16 15s., plus £8 14s. 3d. purchase tax.

"Tyana" Soldering Iron

A NOVEL new soldering iron is announced by Kenroy, Ltd., of 152/297, Upper Street, London, N.1. Known as the "Tyana" this is a very lightweight small iron, utilising paxolin tubing for the handle, and a wrapped strip idea for the main body, thus resulting in a very light overall structure with adequate strength. The bit, which is adjustable for length, is very small, approximately 3/16in. in diameter and 1in. long. The total weight is approximately 4oz. and the iron reaches maximum temperature in about 3 minutes, with a loading of 40 watts. Replacement elements and bits are available and a standard 3-core cable is fitted. We have had one of these irons in use for some time in our laboratory and found it extremely useful for radio and television receiver construction.

Black Screen Conversion

A NOVEL black screen conversion kit has been introduced by Douglas Storrie, Ltd., of 19, Queen Street, Blackpool. It consists of a sheet of plastic material which is self-adhesive, enabling it to be used without screws, suckers, etc. It is merely placed against the tube protective glass and rubbed into contact where it adheres perfectly by means of the vacuum caused between the two surfaces. The material is darkly tinted and thus reduces glare, improves contrast and enables a receiver to be used without unduly reducing the normal room lighting. It may be cut easily with scissors or knife and thereby cut to fit exactly in the front of the tube opening without having to interfere with the receiver in any way, and the appearance of the set is not spoiled by any unsightly attachments. At the moment there are two sizes of these "Kits," one for tubes 12in. and smaller (measuring 13in. by 12in.), priced at 9s. 6d., and one for 16in. tubes (17in. by 14in.), priced at 12s. 8d. We have tested the material and it functions very well, but when attaching it to the glass it should be fixed at one corner first and then very carefully rubbed down, working from the corner outwards to ensure that it is stuck evenly all over, as any imprisoned air will leave a slightly lighter patch which will show up on a bright picture.

The "View Master" With Wide-angle Tubes

DETAILS OF MODIFICATION FOR VARIOUS LARGE TUBES

THERE are at present available several types of large screen cathode ray tubes, viz., 14in., 16in., 17in., round and rectangular, whose overall length is not appreciably greater than the 12in. and 15in. tubes, which have so far been used. This increase in screen diameter, without at the same time a proportionate increase in tube length, has brought about an increase in the deflection angle, this being illustrated in Fig. 1, the purpose being to increase picture size without also increasing the cabinet area and, of course, its cost.

Very many enquiries have been received asking for information as to the use of these tubes in the "View Master," but it has not previously been possible to publish details as suitable scanning components were not available, but with the release of components especially designed for wide-angle deflection, experiments have been carried out and instructions are now given for the necessary modifications to be made to the "View Master."

Before proceeding further, it will be of interest to appreciate why changes involving new components have become necessary when using these tubes, and it will, therefore, be necessary to consider the differences between scanning wide-angle tubes, i.e., having a scanning angle of 70 deg. and the current types with a scanning angle of only 50 deg. to 55 deg.

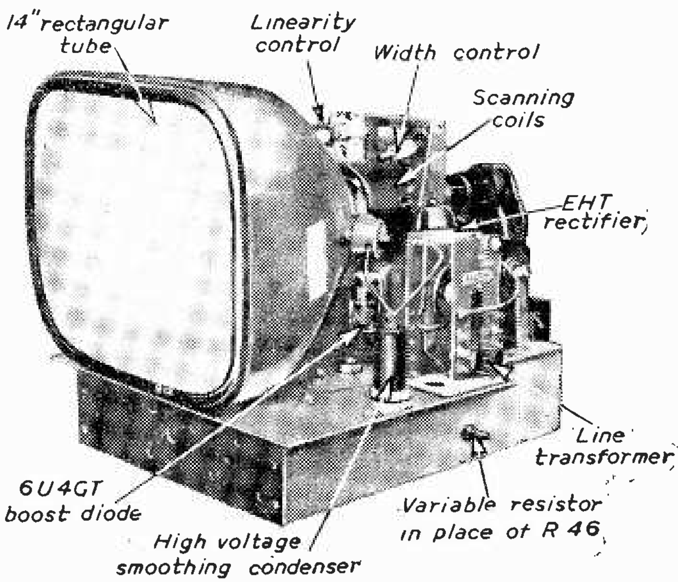
From Fig. 1 it will be seen that due to the increased scanning angle it has become necessary to reduce the length of the scanning coils and to increase the diameter of the neck so as to maintain a reasonable efficiency in the coils yet bring the deflection centre nearer the screen and so prevent shadowing at the corners. Each of these changes would normally have the effect of reducing the size of the picture, and it becomes necessary, therefore, to increase very appreciably the scanning power for full deflection of the beam so as completely to fill the screen ; in addition, to obtain a bright picture suitable for viewing in daylight on a screen having an appreciably greater area, the E.H.T. must be increased to between 12 kV and 14 kV as compared to a figure of 9 kV considered satisfactory for 12in. tubes. This means that even more scanning power is required, since the scanning amplitude is proportional to the square of the anode voltage.

Fortunately, by the use of new materials and improved circuit techniques, it is possible to obtain the increased scanning power with only a small increase in the power fed to the timebases.

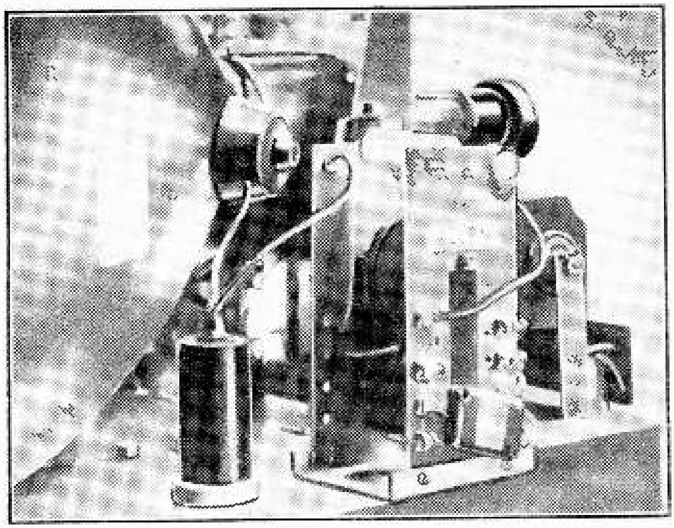
Line Transformer

In the first place, as has already been explained in these pages, the losses in the line transformer and scanning coils have been reduced to an extremely low figure by the use of a Ferroxcube core and yoke instead of Stalloy laminations. The saving of power in the case of the line timebase alone is approximately 6 watts. Ferroxcube is a Mullard trade name for a Ferro-ceramic material having exceptionally low-loss characteristics when used as a core material. In the case of the line timebase it has also been found possible to improve the efficiency of the line transformer by using it as an autocoupled transformer instead of having separate primary and secondary windings, the result of this arrangement being to increase the coupling efficiency between primary and secondary since, of course, in an auto-transformer the secondary is a part of the primary winding and, furthermore, since one winding is omitted, the losses normally encountered in the extra winding are eliminated.

This arrangement requires that the efficiency diode must operate at a peak voltage considerably greater than when it is connected to a secondary winding such as the scanning coil winding and, furthermore, it must also operate at a higher voltage above chassis. With the losses in the transformer reduced, and a higher peak voltage available, the boost voltage is now around 150 to 170 as against the old figure of 38 volts, permitting the line output valve to operate from a boosted H.T. line of approximately 380 to 400 volts. The



Details of the modified "View Master" chassis.



Close-up of the line transformer.

efficiency diode used is a Brimar 6U4GT valve which requires a heater supply voltage of 6.3 at 1.2 amp.

A new line amplifier valve must a so be used, since it must be capable of an increased peak output. The valve now specified was specially developed for line scanning circuits and is a Brimar 6CD6G ; in operation it is used in a self-bias circuit and gives ample scan for 70 deg. tubes.

Separate inductor type linearity and width controls are incorporated which together give exceptionally good linearity with sufficient adjustment of amplitude. The E.H.T. available when operating under the conditions to give full scan is between 12 and 14 kV, depending on the H.T. feed to the line timebase, and will give a brilliant picture under daylight conditions. The E.H.T. rectifier may be a Brimar R16, or an Osram U37, a suitable heater winding being available on the line transformer or, if preferred, two Westinghouse 36 E.H.T. 100 rectifiers may be connected in series, one of these already being used in the " View Master."

Modifications

From the above description it will be apparent that so far as the line timebase is concerned, the only changes involved are to the line amplifier stage, scanning circuit and E.H.T. supply circuit, the line oscillator remaining as previously, no changes being necessary here except for an adjustment to the drive by varying R46, which is reduced in value to 33 kΩ and has a 100 kΩ variable resistor connected in series with it.

We can now deal in greater detail with the line timebase circuitry. The output from the line thyratron is taken to the grid of the line amplifier valve, with the cathode of this valve taken direct to chassis, bias being developed in the grid circuit automatically so long as a sawtooth input is fed to it ; this arrangement enables the line-amplifier valve automatically to operate on the straightest part of its characteristic and a more linear scan is thereby obtained. A disadvantage of the arrangement is, however, that if at any time the drive to the valve fails, then bias is removed and the valve can pass a heavy current with possible damage. In practice, with the value of screen resistor used, the current is limited and the arrangement is reliable and safe.

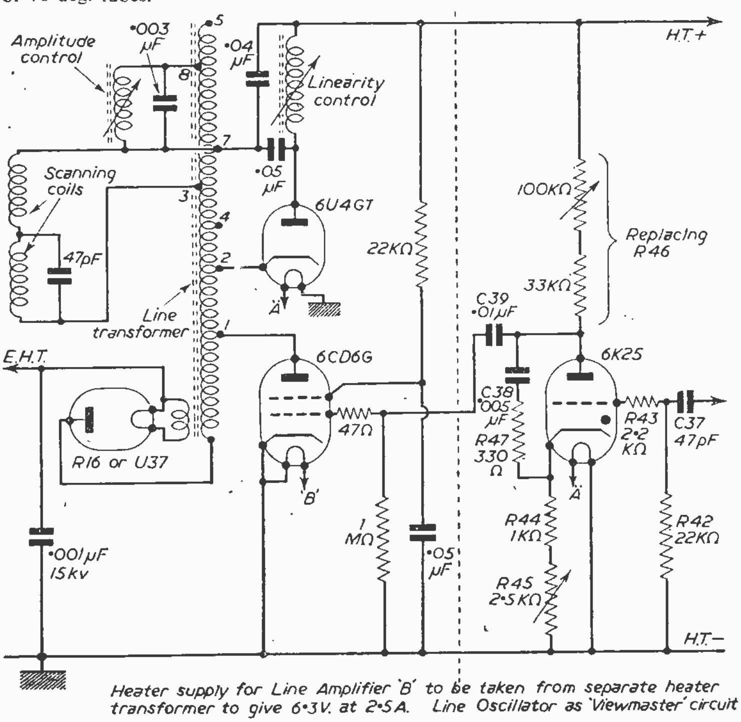


Fig. 2.—Circuit of the line timebase.

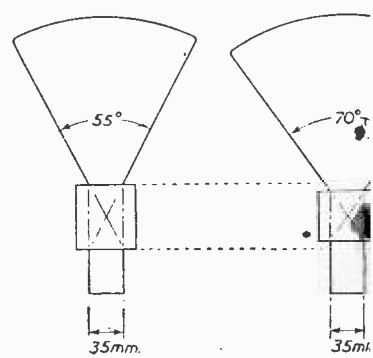
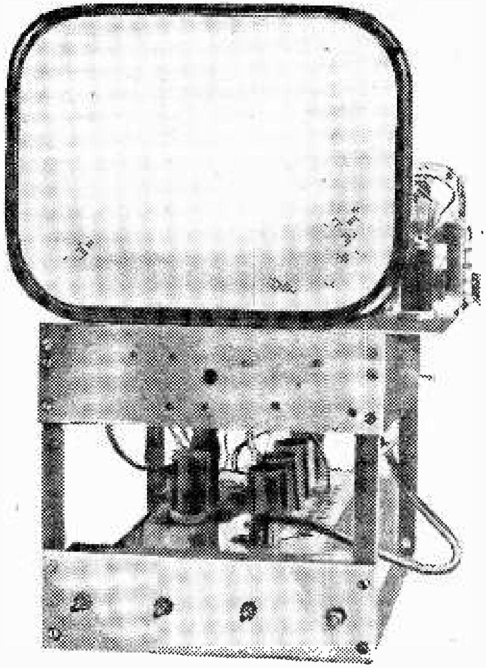


Fig. 1.—Differences in the r

The efficiency diode cathode is connected to terminal No. 2 on the line transformer and the anode is taken to H.T.+ via the linearity control which has condensers of critical value connected to either side of it. The boosted H.T. supply may be measured from terminal No. 7 to chassis and can be used to supply the A1 electrode of a tetrode C.R.T.

Amplitude control is by means of a variable inductor connected across terminals 7 and 8 of the line transformer, the effect being to give minimum amplitude when its impedance is lowest and its shunting effect therefore greatest, i.e., iron-dust core out of coil. The scanning coils are taken to terminals 7 and 3 of the line transformer and have a 47 pF ceramic condenser connected across one coil only (tags 7-3 of the scanning coil) so as to reduce the effects of ringing on the left side of the picture.

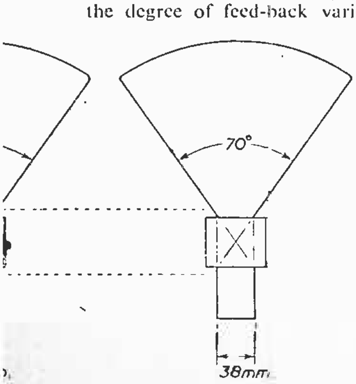
The E.H.T. is developed across a normal type of overwind, the high-potential end of the winding being taken to a large anti-corona eyelet, with the rectifier heater winding being taken to two smaller eyelets of similar design. The rectified D.C. volts when using a valve rectifier may be taken from either heater terminal, a lead being taken to the .001 μF 15 kV smoothing condenser. When Westinghouse metal rectifiers are used the heater winding will, of course, not be used, and the negative end of the rectifier must then be taken to the high potential A.C. terminal, whilst the positive end of the rectifier is taken direct to the .001 μF condenser.



Another view of the converted receiver.

Frame Timebase

Turning now to the frame timebase, the only changes involved are to the amplifier stage, with some modification to the intervalve coupling, the same output valve being used though now it is connected as a pentode and not a triode; a new output transformer is, of course, necessary. From the circuit diagram it will be seen that a 1 μF condenser is arranged to feed the output of the frame thyratron to the amplifier valve, a 1 MΩ variable resistor acting as the amplitude control. Linearity is controlled by means of a negative feedback circuit, a voltage being fed back from the anode of the amplifier valve to the grid circuit. Adjustment of the resistor across which the feedback voltage is developed, connected in series with the amplitude control, opens or closes the bottom of the picture (lower values expand bottom, higher values compress bottom), whilst the series variable control which adjusts the degree of feed-back varies the extreme top of the picture (increase in resistance opens top). In this way it is possible to adjust the scan at its extremes and thereby obtain exceptionally good linearity, yet withal the adjustment is simple and straightforward; the value of 330 KΩ specified for the shunt feedback resistor has been found to give best linearity, though it is possible that individual receivers may require some slight re-adjustment. The 47 KΩ resistor connected across the primary of the output transformer introduces some damping and prevents



ormal and wide-angle tubes.

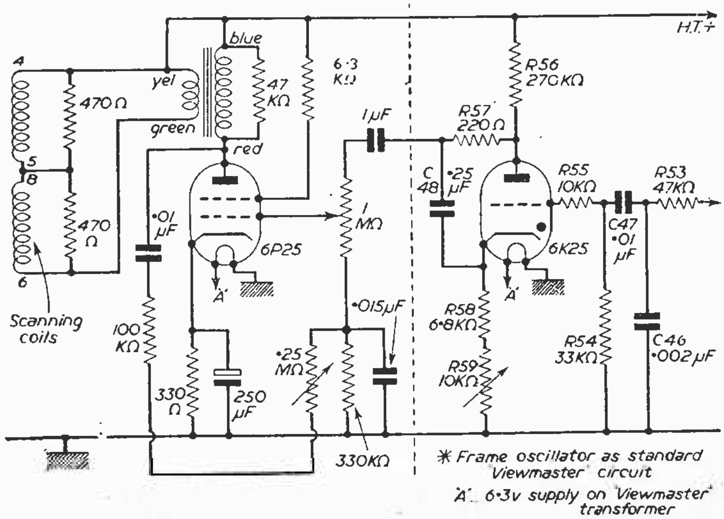


Fig. 4.—Circuit of the frame timebase.

excessive peaks occurring which might otherwise damage it, whilst the 470Ω resistors connected across each half of the frame scanning coil prevents coupling with the line coils and thereby eliminates distortion which might otherwise occur.

Focusing

With the increase in the diameter of the tube neck it also, of course, becomes necessary to use a larger diameter focus magnet and both P.M. and E.M. types are available. The P.M. focus ring is made by Elac and

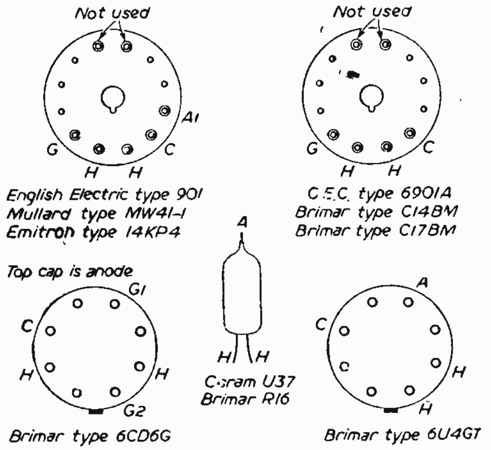


Fig. 3.—Valve base connections.

has separate focus and shift controls, whilst the E.M. focus coil, which is series connected in the timebase H.T. supply, is manufactured by Allen Components, and is mounted on three 2 B.A. studs 120 deg. apart, which also control the picture shift. It may be necessary to fit an extra support for the focus ring or coil as the three support studs are intended to be at the rear of the coil, i.e., with the gap nearest the scanning coils. The studs will then point towards the tube socket; alternatively the studs may be reversed and the coil mounted on the main tube support, care being taken to ensure that the studs will not come into contact with the scanning coil.

An important point to bear in mind when using the E.M. focus ring is that since it must be series connected, the voltage drop across it will reduce the available H.T. supply. As the line timebase power will fall at the reduced H.T., and thereby reduce the E.H.T., causing the picture to suffer, it becomes necessary to reduce the value of the screen resistor by connecting in parallel with it an additional resistor of 47 kΩ so raising the screen voltage to 120.

A smaller focus current is required when using a tetrode tube such as the English Electric T901, as compared to triode tubes such as the Brimar and G.E.C. types, hence the voltage drop across the coil will be smaller with the tetrode tube.

The P.M. focus ring Type W22/MK11 has sufficient range of control to enable it to be used with both English Electric tetrode and G.E.C. triode tubes, though when using the tetrode tube it is advisable to mount the focus ring ½in. further back from the rear of the scanning coils

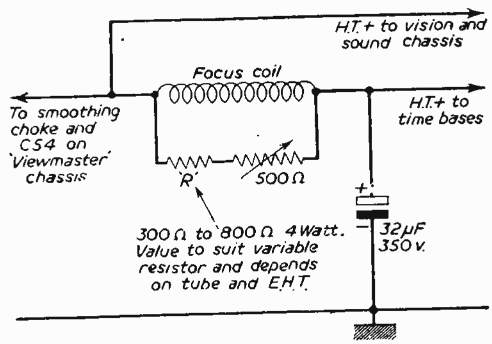


Fig. 5.—Details of the electromagnetic focus circuit.

by means of suitable spacers. When using Brimar tubes Type W25/MK11 focus ring is required.

Assembly

In modifying the receiver mechanically, certain points will have to be taken care of by the constructor concerned, such as the tube mounting, dimensions and shape which will be controlled by the particular tube used. One common feature, however, is the fact that the rear tube mounting support must now have an increased diameter hole, a convenient size being 43 mm. with separate felt ring washers and a bakelite or hardboard clamp. A new support will be required also for the focus ring or coil. The front support, if for an all-glass tube, will be relatively easy to construct, particularly for the rectangular tubes, as this support need only consist of a

TABLE OF VOLTAGES

Line Amplifier

	Screen volts		Boost volts measured between Chassis and Terminal No. 7 on line tran.	E.H.T.
H.T. line 280v	130		460v	14.5kV
,, 260v	120		430v	14kV
,, 240v	110		410v	13.5kV
,, 240v	120	47k Ω resistor in parallel	400v	13.8kV
,, 228v	120	with screen resistor.	400v	13.5kV

Frame Amplifier

	Anode	Screen	Cathode
H.T. line 280v	250v	240v	9.2v
,, 228v	210v	195v	7.5v

padded platform with a retaining band made of rubber or P.V.C. If a metal tube is to be used however, then it is essential that the front support should be insulated to withstand a voltage of 14 kV and for safety purposes should be capable of withstanding a voltage of 20 kV. A convenient form of construction for this type of support is to form up a piece of aluminium having a lip at the front end, this being supported on high quality ceramic insulators or, if available, insulators made of polythene. If possible a complete polythene envelope fitting completely over the tube and having a very thick outer ring may be used, in which case a metal support may be adopted without the necessity of using insulators. There will probably, however, be difficulty in obtaining this type of polythene cover as these are normally only supplied to manufacturers.

The mounting of the line transformer may cause a little difficulty in the case of the table model as it is slightly larger than the old type, but for the console it is relatively easy by arranging for a small platform to be fitted so that the transformer may slightly overlap the side of the chassis. The additional 36 E.H.T. 100 rectifier which must be connected in series with the one already used should be mounted in such a way that the junction of the two rectifiers is supported on an insulator, the ends of the rectifiers respectively being attached to the E.H.T. terminal on the line transformer and on the 0.001 μF T.C.C. 15 kV cathode ray condenser.

The valve efficiency diode which is used can be mounted immediately below the scanning coils, care being taken to use a well-insulated valve-holder. A convenient arrangement is to mount the valve-holder on a piece of bakelite board, which is then mounted on the chassis, thereby increasing the spacing between the high potential points on the valve-holder and chassis. A small transformer giving 6.3 volts at 2.5 amps will also be required to supply the line amplifier valve; the efficiency diode may, however, obtain its heater current from the "View Master" transformer which will still be kept within its rated load since it will not now have to supply the heater of the line amplifier valve.

The line amplitude and width controls may be mounted on the tube support as was done previously with the width control, the space for the additional linearity control being available on the removal of the variable damping resistor not now required. The mounting of the P.M. focus ring or E.M. focus coil should not cause difficulty as in both cases they require standard methods of mounting, the fixing centres being slightly larger than for focus rings intended for 35 mm. tubes.

Apart from these points which relate mainly to the physical layout and construction, no difficulty should be encountered in operating the receiver, but it cannot be stressed too strongly that all soldered joints which are made in any of the circuits where high voltages appear, whether these are at line frequency, or rectified D.C. must be made with the greatest care to eliminate any

(*Concluded on page 236*)

LIST OF COMPONENTS

Frame Timebase Oscillator

*1 47K Ω —Resistor Morgan Type T
*1 33K Ω — ,, ,, ,,
*1 10K Ω — ,, ,, ,,
*1 270K Ω — ,, ,, ,,
*1 220 Ω — ,, ,, ,,
*1 6.8K Ω — ,, ,, ,,
*1 10K Ω —Variable Wire Wound. Colvern
*1 .002 μF —T.C.C. Type CP30S
*1 .01 μF — ,, ,, CP33S
*1 .25 μF — ,, ,, CP48N
*1 6K25 —Mazda

Frame Amplfier

2 470 Ω —Morgan Type T.
1 47K Ω ,, ,, ,,
1 100K Ω ,, ,, ,,
1 330 Ω ,, ,, ,,
1 330K Ω ,, ,, ,,
1 6.8K Ω ,, ,, R
1 .25M Ω Morgan Variable (linear)
1 1M Ω ,, ,, ,,
1 1 μF T.C.C. Type 345
*1 .015 μF ,, ,, CP33N
1 .01 μF ,, ,, CP33S
*1 250 μF ,, ,, CE24B
Type CE10DA, specified for the "View Master," may be used
*1 6P25 Mazda
1 Frame Transformer. Allen Components Type FO305

Line Oscillator

*1 22K Ω Resistor Morgan Type T
*1 2.2K Ω ,, ,, ,,
*1 33K Ω ,, ,, ,,
*1 1K Ω ,, ,, ,,
*1 330 Ω ,, ,, ,,
*1 2.5K Ω ,, Variable. Colvern
*1 100K ,, Morgan Variable (linear)
*1 47pF Ceramic T.C.C. Type SCT1
*1 .005 μF T.C.C. Type CP32S
*1 .01 μF ,, ,, CP33S
*1 6K25 Mazda

Line Amplifier

1 47 Ω Resistor Morgan Type T
1 1M Ω ,, ,, ,,
1 22K Ω ,, ,, ,, R
1 .05 μF T.C.C. Type CP37S
1 .04 μF, consisting of:
2 off .02 μF Type CP34S in parallel
1 .003 μF Mica Type M3N
1 47pF T.C.C. SCT1
1 .001 μF 15kV. D.C. T.C.C. Cathode Ray Type CP56W.O.
1 6CD6G Valve Brimar
1 6U4GT ,, ,,
1 R16 ,, ,,
or U37 ,, Osram
or 2 off 36 E.H.T. 100 Rect. Westinghouse
1 Line Transformer. Allen Components Type L.O.308
1 Linearity Control. Allen Components Type GL16
1 Width Control. Allen Components Type GL18

Focus

P.M. Focus Ring. Elac. Type W22/Mk. I for English Electric. and G.E.C. tubes.
P.M. Focus Ring. Elac. Type W25/Mk. II, for Brimar tubes,
or if E.M. focusing is used then Allen Components Focus coil Type FC302.
1 500 Ω Variable Resistor 4 watts. Colvern.
1 300-800 Ω Resistor to suit. See text.
1 32 μF/350 v. Electrolytic T.C.C. Type CE19LE.

Those components marked with an asterisk are already in use in the "View Master."

An H.T. Boost Unit

AN INTERESTING IDEA FOR OBTAINING INCREASED POWER

By R. J. Talbot

SOME time ago, whilst experimenting with higher than normal E.H.T. on surplus electrostatic tubes of the VCR97 type, in an endeavour to produce a brighter picture with improved resolution, the writer came up against the problem that 350 volts H.T. on the anodes of a 6SN7GT push-pull line-scan output stage gave nothing like enough width of scan, without causing serious non-linearity.

Some means of boosting the H.T. to the line-scan amplifier was essential, so after recourse to the spares box this unit was made up as a temporary measure. The unit was, however, so compact and reliable in operation that it was retained for permanent use and mounted in available space in the power pack, where it has been giving trouble-free service for the past year. The action of the unit is self-explanatory, consisting merely of a half-wave rectifier circuit in series with the main H.T. supply.

The Transformer

The transformer used is an ordinary radio output transformer of the 40 mA type connected as a " step-up " transformer with its primary connected across the rectifier heater circuit. The output voltage developed across the secondary is rectified by a small surplus metal rectifier MR1 and smoothed by C1, L2 and C2. C1 and C2 being 8 μF 350 volts midget tubular electrolytic condensers and L2 being a small choke originally used in the smoothing circuit of an aircraft unit operating from " high cycle " supply.

Although this method of connecting the transformer is unconventional, it has the advantage that no potential exists between the two windings and, providing the transformer is mounted on a piece of paxolin to isolate it from the chassis, no trouble from insulation breakdown should be experienced even if a component of doubtful vintage is employed. The usual precautions regarding insulation of bare or open contacts should, of course, be taken.

Load

On load the primary circuit takes about .25 amp from the rectifier heater winding, representing an overload which most rectifier windings can easily cope with. The available rectified output will depend upon the ratio of the transformer, the current taken, the resistance of L2, etc., but in the original unit employing an Elstone MR/T multi-match transformer at maximum ratio (112-1), an output of 230 volts at 9 mA was obtained which added to the 350 volts H.T. gave the very useful voltage of 580 volts with surprisingly good regulation.

Connections

The line timebase should be disconnected from the main H.T. wire and reconnected to the 580 volts tap. Generally, there should be no need for higher voltage on the frame timebase.

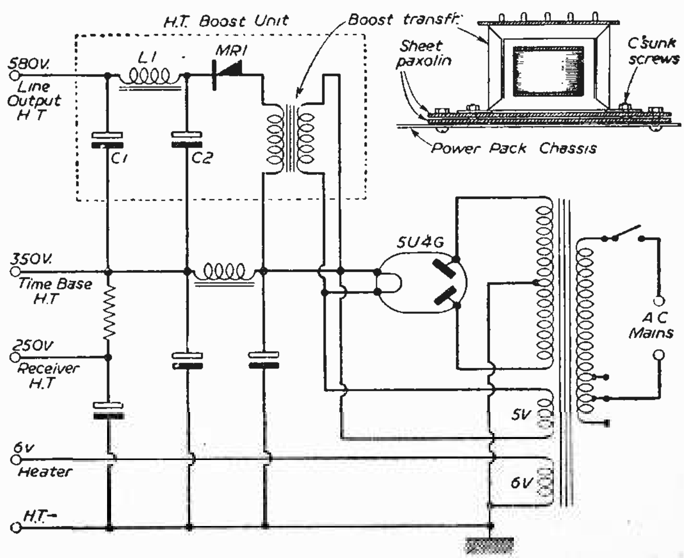
No detailed constructional data is given because obviously the choice of components and available space will govern each individual case, the components probably being mounted piecemeal into any odd corner in the power pack where space can be found.

In the writer's experience the use of higher E.H.T. (3.5 kV) on the VCR97 does give very much improved results. The picture is brighter, the resolution far better, and any tendency to static charge on the screen disappears.

E.H.T.

There are many simple and reliable circuits including triplers, R.F. oscillators, etc., previously detailed in these pages for providing the required E.H.T. The writer favours the R.F. oscillator type of supply because of its inherent safety, ease of smoothing, and the ease with which the output voltage can be varied by tuning the oscillator anode circuit.

A point which is often overlooked in the E.H.T. supply circuit, however, is the fitting of a bleeder network in order to assist in the rapid discharge of the smoothing condenser which is placed across the output. From 50-100 megohms should be used and the resistors should be arranged to provide the longest possible leakage path.



The circuit recommended by Mr. Talbot.

TELEVISION IN FRANCE

A BRIEF REVIEW OF THE PRESENT-DAY POSITION

By James N. Roe, M.I.R.E., F.R.S.A.

RADIODIFFUSION and Télévision Françaises is responsible for the French television service and is a State-controlled organisation attached to the Ministry of Information.

Programmes are televised in the studios situated in Cognacq-Jay, Paris, and are carried via cable to the transmitters and aerial systems located in the Eiffel Tower. Two studios are in regular use with a third available for repeat transmissions, etc. A special mobile unit is also attached to the Télévision Françaises service.

The Eiffel Tower was built at the time of the Paris Exhibition in 1899. At that time, the designers of this magnificent structure could hardly have known of their contribution toward the present-day television service in Paris ! Nevertheless, Eiffel Tower, rising as it does to a height of 985ft., affords a perfect mounting for the aerial systems.

The first regular French television transmissions commenced in 1937, when a temporary transmitter was installed in the Eiffel Tower, this being replaced by a permanent installation in 1938. At that time the picture definition was of 455 lines. (The BBC definition is 405 lines.)

In common with our own television service, programmes were discontinued during the war years and regular transmissions commenced again on October 1st, 1944, using the original 455 lines definition.

In 1948 the French authorities decided to transmit pictures having a much higher definition and in May, 1951, transmissions commenced, having a picture definition of 819 lines. Such a change called for new television receivers as the new system could not be satisfactorily received with low-definition sets. In fairness to viewers the Government decided to continue transmitting at the old 455 lines simultaneously with the new system of 819 lines for a period of ten years. This meant that viewers already having sets could continue as before, but those buying new sets would benefit by receiving the higher definition pictures.

In addition to the transmitter installed at the top of Eiffel Tower, another 819-line transmitter has been in operation in Lille since September, 1950.

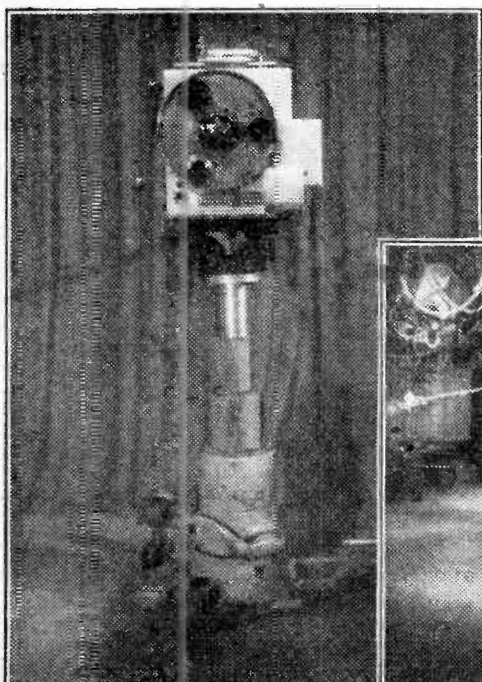
Exact figures relating to the number of viewers in France are not available, but a rough estimate given in 1951 puts the number at around 25,000.

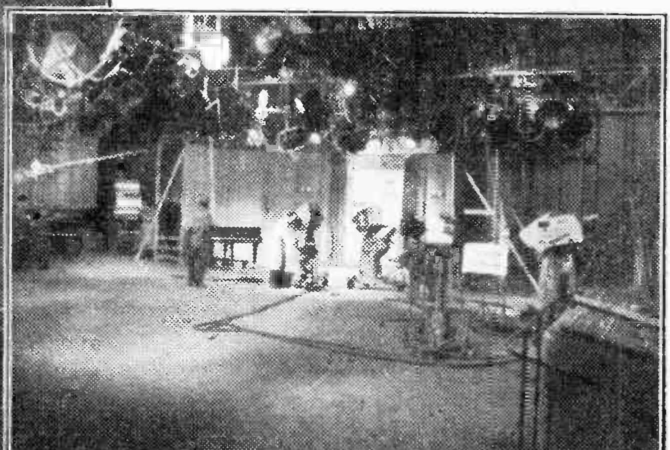
The range of the Eiffel Tower transmitter is given as 80 kilometers, but reports have been received on pictures viewed in England, Belgium and Italy.

For those who are interested in the more technical aspects of the two French television systems the following brief details are given.

The low-definition system (changed from 455 to 441 lines in 1949) employs 25 frames per second with a 3 × 4 picture aspect ratio. Order of interlacing 2, positive picture modulation. Vision frequency 46 Mc/s, power 30 kW. Sound frequency 42 Mc/s, power 5 kW., using amplitude modulation. Aerial system vertically polarised.

The two high-definition transmitters have similar characteristics to the low-definition system, but radiate





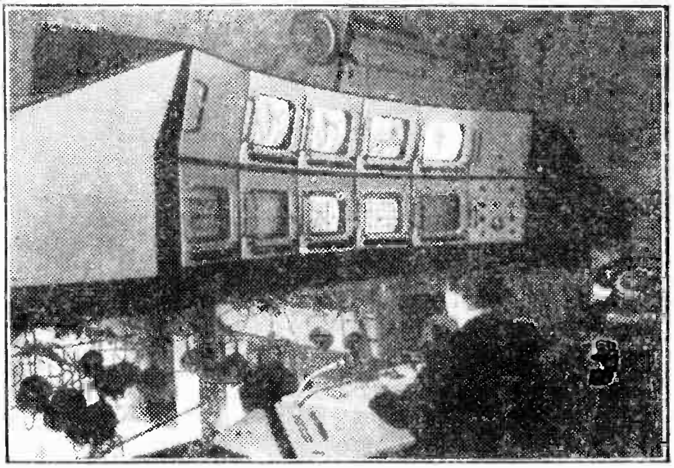
One of the latest French cameras, and a general view of one of Télévision Françaises' studios.

vision on 185.25 Mc/s, with a power of 3 kW. and sound on 174.1 Mc/s, with a power of 700 watts. The aerial systems are horizontally polarised.

The cameras used in the high-definition system employ super iconoscopes. Those used with the 441-line transmitter have standard iconoscopes.

The average French receiver uses 31 or 36 centimetre cathode-ray tubes. Attention is now being given to the manufacture of larger tubes.

From these observations it will be realised that French television is not lagging behind. Indeed, the interest from both technical and programme stand-points is growing rapidly. The future co-operation between Télévision Françaises and the BBC will foster continued interest in French and British television programmes and technicalities.



The producer's control desk and monitor screens.

First Japanese TV Licence Granted

AFTER months of enquiry and consideration, the Radio Regulatory Commission recently granted a provisional licence to a private company, the Japan Television Broadcasting Co.

This was the final act of the Commission before its dissolution the following day under the Japanese administrative structure reform programme. Applications from five other private companies and the Japan Broadcasting Corporation were deferred for future consideration. Many newspapers express approval that private enterprise was entrusted with the initial start of television in Japan, rather than allowing it to become a State monopoly of the Japan Broadcasting Corporation.

Following this decision, it was announced that a regular television service will be in operation by the early spring of 1953. The Japanese Ministry of International Trade and Industry has drafted production plans for assisting manufacturers to produce receiving sets in preparation for the opening of the service and it is anticipated that 10,000 will be off the production line by March next.

The leading firms who will produce television sets will be Japan Electric, Tokyo Shibaura Electric, Matsushita Electric and Mitsubishi Electric. Estimated cost of a 12in. screen receiver is £150, while a 7in. screen will be available at £130—prices which will certainly not lead to very widespread use as they are prohibitive for the bulk of the population.

There has been lively controversy in the Japanese Press in recent months as to whether or not the commencement of a television service is premature in view of the state of the national economy. However, the weight of opinion seems to have been in favour of stimulating the radio industry and there have already been bold forecasts that Japan will now go ahead to enter the electronics industry with the declared intention of becoming one of the world's leading producers of electronic equipment.

The Japan Television Broadcasting Co. is a £2,000,000 amalgamation of three leading newspapers and three film companies. Their plans envisage a chain of about 20 relay-transmission stations, radiating from Tokyo and covering the whole length of the country, each on a mountain-top and linked by micro-wave beams. As mountain ranges run through the centre of Japan from end to end, the country is geographically ideal for such a system.

Each of the stations will broadcast television from coast to coast in its own area and at the same time relay the signals to the next mountain-top relay-transmitter. The first studios will be established at the Yomiuri Hall, in the centre of Tokyo, and the powerful originating transmitter will be on a nearby mountain. It is hoped to complete the entire system in about two years.

One interesting point about this nationwide chain of transmitters is that they will also be used for telecommunications—radio telephones and newspaper picture services. In the past a typhoon or earthquake has disrupted the entire Japanese communications service, but these interruptions will be completely eliminated when the proposed dual purpose communications service is in operation.

Leading sponsors of this proposal claim that the television service, apart from being of value in the "democratisation" of Japan, will be a medium for educational and cultural purposes. Already, representatives of the Buddhist Federation, comprising many Buddhist sects, are conferring on plans to invest capital on Buddhist television education. Commercial programmes on American lines are also planned.

It remains to be seen whether or not the present ambitious plans mature, but if they do there is every possibility of Japan entering the electronic field and making a determined bid for world markets in this modern industry.

R. F. TILTMAN

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ALPHA RADIO SUPPLY CO.

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ALL GUARANTEED MAJORITY IN MAKERS CARTONS.

6K8G	12/6					H63 ...	9/-
6K8M	13/-	7B6 ...	9/-	5U4G...	9/-	HL23DD	8/6
6L6 ...	10/6	7B7 ...	9/-	5Y3G...	9/6	HP210	8/-
6L7 ...	8/-	7C5 ...	9/-	5Y3GT	9/6	KT30...	11/-
6N7 ...	7/6	7C6 ...	9/-	5Z4G...	10/6	KT32...	10/-
6N7GT	7/6	7F7 ...	9/-	5Z4M	9/6	KT33C	11/6
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6R7 ...	8/-	7Y4 ...	9/-	35L6GT	10/-	KT66...	11/6
6SA7GT	9/6	1R5 ...	9/-	50L6GT	10/-	KT81...	11/-
6SG7...	7/9	1S4 ...	9/-	AC6PEN	7/9	KTW61	8/9
6SH7...	7/-	1S5 ...	9/-	CCH35	14/-	KTW63	7/9
6SJ7 ...	9/6	1T4 ...	9/-	CV183	3/9	KTZ41	6/9
6SK7...	7/-	1U5 ...	10/6	CV6 ...	2/-	KTZ63	7/9
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6U5G	9/6	3A4 ...	9/-	EBC41	11/6	UL41...	11/6
6V6G	9/-	3D6 ...	8/6	ECH35	15/-	UY41...	10/6
6V6GT	9/-	3Q4 ...	9/6	ECL80	12/6	EF39...	7/6
6V6M	9/9	3S4 ...	10/6	EL41...	11/6	EB34...	4/-
6X5GT	8/9	3V4 ...	9/6	E1148	2/-	EBC33	8/-
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1¼in. 1/4 1½in. 1/4 2½in. 1/7
2¾in. 1/8 3¾in. 1/10 4½in. 2/-

Eyebolts ... ... 1/6 doz.

Solid dielectric condensers, .0001, .0002, .0003 .0005 ... 3/10 each.

METAL TUBULAR FIXED CONDENSERS, WIRE ENDS

	Doz.
.1 MFD. 350 v. DC Sprague ...	9/-
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VOLUME CONTROLS

Morganite	Each.
100K ohms, ¼ Meg., ½ Meg., 1 Meg. 2 Meg., all with Single Pole Switch	4/3
50 K., ¼ Meg., 1 Meg., less Switch...	2/6
¼ Meg., 150K ohms, Midget Type...	1/9
1 Meg. Log. S.P.S.	4/9
1 Meg. D.P.S.	5/-
1 Meg. S.P.S. short 1in. Spindle ...	3/-

P.M. LOUDSPEAKERS

3in. Plessey, 12/6 : 10in. Plessey, 22/6 : 3½in. Elac, 13/6 : 10in. Rola, 27/6 : 5in. Goodmans, 13/9 : 12in. Truvox, 57/6 ; 8in. Goodmans, 16/- : 8in. Rola, 14/6.

P.F. SILVER MICA CONDENSERS

1, 2, 3, 5, 6, 7, 5, 8, 9, 10, 10K, 15, 18, 20, 25, 27, 30, 33, 35, 39, 45, 47, 50, 58, 68, 75, 100, 120, 150, 175, 180, 190, 200, 245, 300, 370, 375, 470, 500, 680, 750, 1,000, 1,200, 1,600 ... ... all at 4/- doz

TERMS : Cash with order or C.O.D. MAIL ORDER ONLY. Postage 6d. under 10/-, 1/- under 20/-, 1/6 under £5. Full list available. Send 3d. in stamps.

5/6, VINCE'S CHAMBERS, VICTORIA SQUARE, LEEDS 1.

SOLONS FOR ESSENTIAL JOBS!

Use SOLONS for the jobs that matter—this modern precision tool makes soldering speedier, simpler and more reliable. 5 models: 65 watt with oval tapered and round pencil bit ; 125 watt with oval tapered and round pencil bit ; 240 watt with oval tapered bit ; each with 6 feet 3-core Henley flexible. Voltage ranges from 100 to 250. Write for folder Y.10.

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FOR INDUSTRIAL USE

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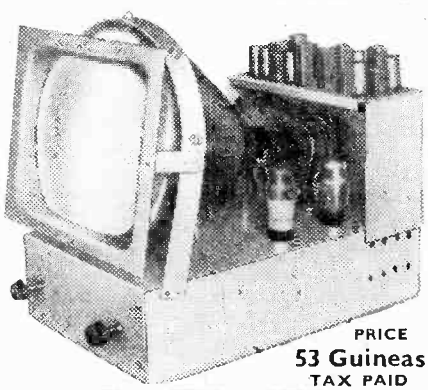
The new ARMSTRONG Television Chassis Model T.V.15

incorporating a 12in. C.R.T., is now available for distribution



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Available shortly

The new T.V.25 TELEVISION CHASSIS with 15in. CATHODE RAY TUBE and 10in. P.M. Loudspeaker.

PRICE 60 Guineas Tax Paid.

Comprehensive Maintenance Service available.

Please send for Radiogram and T.V. list, post free.

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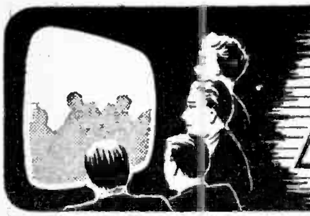


TELENEWS

Sponsored Television Test

IT is reported that a newly formed sponsored television company plans a mass test of public reaction to commercial television in this country next March. It is stated that the scheme embraces an exhibition in London, complete with live theatre and a cinema. It will be transmitted to 1,000 receivers within a given area, and a daily capacity of 40,000 to 50,000 viewers will be asked to judge in a ballot.

Ulster Disappointed

THE increased power of the Kirk o' Shotts transmitter failed to give improved results in the Ulster area, it is reported. In one case it is stated that a viewer who had his receiver altered to accommodate the Scottish transmitter obtained better results from the northern station.

BBC TV Films for the World

THE Government are to be asked to finance a three-quarter million pound scheme for the BBC to make films with British players of international reputation. The plan envisages a series of serials, each in about 13 instalments, to be made specially for the American and Canadian markets, but for showing first to British viewers.

V.A.F. Check

THE Variety Artistes' Federation at their annual conference are to seek support for a demand that foreign programmes radiated by the BBC should only be admitted on a quota agreed with the unions. The Federation's resolution "notes with concern the intention of the BBC to televise programmes from the Continent, without first consulting the theatrical unions and examining the effect on the livelihood of British artistes."

Ocean Study

THE Royal research ship *Discovery II*, which recently sailed from Plymouth, will carry out experiments with new methods of taking samples of and observing animal life on the ocean bed. Underwater television equipment will be employed.

Russian TV

IT is reported that the Soviet are building stations to radiate three programmes simultaneously in all republican capitals and other large Soviet cities. Smaller stations are being built for provincial towns. It is also reported from the same source that colour television will start next year from the new Moscow station.

Brighton Wants Booster Station

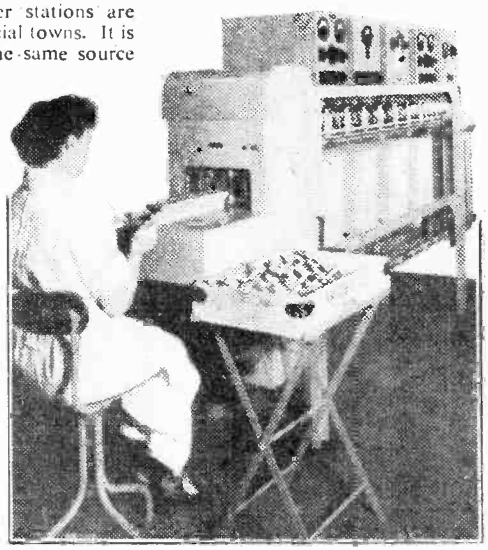
REPRESENTATIONS are to be made, by the M.P. for the Kemp Town division of Brighton, for the granting of an experimental licence for a television booster station adjacent to Brighton and Hove. A well-known manufacturer has built and tested a suitable station which will cost only £3,000, and has agreed to instal it free of charge in the experimental stage. Later a company would be formed from local dealers and other interested parties who would operate it for the public benefit. It is claimed that the the transmitter, which is very compact, would provide perfect reception from Shoreham to Rottingdean.

Norfolk Difficulties

ANOTHER area where reception is very bad is part of Norfolk, where a resident recently purchased a receiver and, on finding results so bad, stated that she would not have moved into the area had she known that reception was so poor. As a result the parish council of the area are to ask the BBC for a relay station as the village is suffering damage as a result of the poor reception.

Interference

AT Worthing, complaints are being received that a local taxi-service which is fitted with short-wave radio transmitter/receivers is interfering with television reception.



The "cake-walk"—a novel condenser-testing machine by T.C.C., which attracted considerable attention at the Radio Show. (See page 204.)

Fire Risks

THE latest report of the Department of Scientific and Industrial Research on fires points out that fires caused by television receivers are decreasing and states that modern sets have a considerably lower fire risk than earlier types.

Watch on Sponsored TV

THE Incorporated Society of British Advertisers has extended the terms of reference of its radio sub-committee "In order to keep itself closely informed on all aspects of commercial television with which it is likely to be concerned." They state that "Those directly concerned with this new medium of publicity will be no less anxious than the Government to ensure standards to which no exception can be taken by the viewing public, and ready co-operation will most certainly be forthcoming in the framing and administration of acceptable standards of practice."

Radar Interference

THE interference which was experienced when Wenvoe commenced its low-power transmissions was eventually traced to an R.A.F. radar beacon. The actual interference occurred between the beacon and a radio link between London and Wenvoe, and was not apparent when cable link was employed. To locate the source of the interference the G.P.O. used specially equipped radio vans, chartered aircraft and took 10 days before it was located.

Broadcast Receiving Licences

12,777,690 broadcast receiving licences, including 1,564,253 for television and 151,765 for receivers fitted in cars, were current in Great Britain and Northern Ireland at the end of July, 1952.

New viewers are reminded that they should take out a £2 television licence (which also includes reception of sound programmes) as soon as their television sets have been installed. When a television licence is purchased, a current licence to receive sound programmes only may be surrendered, and a rebate claimed on the unexpired portion.

Pontop Pike

A RESOLUTION is to be debated by the Whitley Bay Council calling for the construction of a television station for Pontop Pike.

Canadian TV

REGULAR transmissions are to start in Canada this month, using the equipment which has been supplied by Marconi's.

Aberdeen Anxious

IT is stated that Aberdeen may press for the erection of a medium-power transmitter in time for the Coronation next year. The Lord Provost's Committee recommended recently that representations to this effect should be made to the Scottish Secretary and other Ministers.

Car Interference

IN the Leeds area a viewer complained of interference, which the G.P.O. eventually tracked down to a fleet of vans owned by a local firm. After representations had been made the owner refused to fit suppressors to the vans, and the viewer had to sign a statement that the G.P.O. had done all that they could in the matter. When will it be made compulsory for all vehicles to be fitted with suppressors?

Colour Attachments

TO meet the falling market and shortage of money a move is afoot in U.S.A. to put on the market colour attachments which may be added to any normal black and white receivers, instead of supplying complete colour receivers.

Amateur Camera

AT a recent Town Show at Dagenham (Essex), the Mayor and opening ceremony were televised using a camera made by a local amateur from ex-Service equipment. A nearby marquee housed the receiver, and a large crowd watched the ceremony. It is reported that the camera cost about £20.

Welsh Scenes

TWO beauty spots in Wales may soon become well known to viewers throughout the country. Newport Castle and the Old Green Crossing are being shown in the morning demonstration film. These scenes, together with one or two other local spots, were in the newsreel shown on the opening night of the Wenvoe transmitter.

Cable in Operation

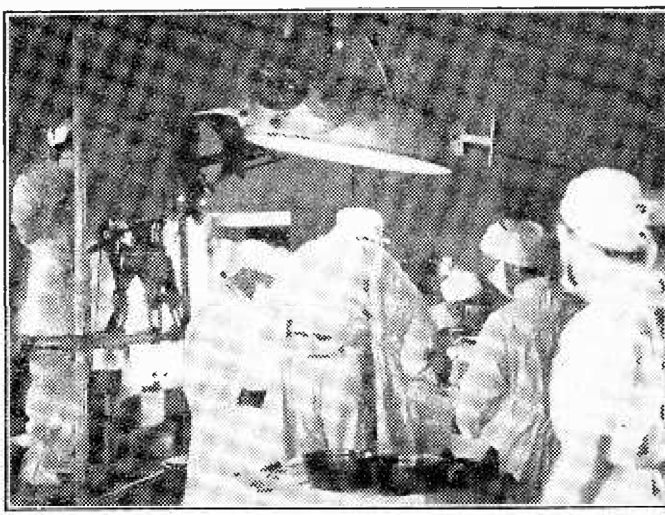
AS announced by the Postmaster-General soon after the Wenvoe transmitter opening, the underground television cable linking Bristol and Cardiff is now in operation.

It is not expected to pick up any interference.

No Licence for Dover

AFTER potential viewers in Dover had been led to believe that a licence would be granted to the Dover Council to permit a company to provide the town with a television relay service, they have learned that no licence can be granted now unless the receiving station is situated in Dover.

As Dover is situated in a bad reception area, however, the station would have to be built on the hill area outside the town and negotiations appear to be reaching a deadlock.



Delegates from all over the world attending the 11th International Dental Conference in London saw an operation televised and projected on a big screen. The illustration shows the Marconi equipment in use.

Come to CLASSIC for "THE VIEWMASTER"

Not just "The Television Specialists" but the "VIEWMASTER SPECIALISTS"

We are the boys, we have the goods, and we supply all Television Areas daily.

SEND FOR OUR LISTS TODAY!!

VIEWMASTER Components for Cash — £30

Can also be bought Stage by Stage, or on available Hire Purchase Terms.

VIEWMASTER COMPONENTS

WB/200 S/V Chassis ...	18 6	TCC Condensers ...	£7 7 0
WB/101 Chassis Supports	6 0	Morganite Resistors	£1 16 3
WB/102 T/B and P Chassis	18 6	Morganite Variable Resistances	9 0
WB/103 Mains Transformer	£2 2 0	Colvern Pts (Set 6) ...	£1 2 0
WB/103A Auto Transformer	£2 12 6	Westinghouse Rectifiers 36/EHT/100 ...	£1 9 5
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WB/105 Loudspeaker	£1 12 6	Westinghouse Rectifiers 14/D/36	11 6
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WB/107 Line Transformer	£1 12 6	Westinghouse Rectifiers 36/EHT/45 ...	£1 2 6
WB/108 Scanning Coils	£1 13 6	Westinghouse Rectifiers 36/EHT/50 ...	£1 4 6
WB/109/1 Focus Magnet	£1 2 6	TCC Condenser Type CP55QO	4 6
WB/110 Width Control	10 0	TCC Condenser Type CP55VO	7 6
WB/111 Boost Choke ...	5 9	TCC Condenser Metal pack CP47N	3 6
WB/112 Tube Support 12in.	£1 1 6	Wearite R.F. Choke ...	2 0
WB Conversion kit ...	£1 15 0	Bulgin Parts (complete set)	15 3
Wearite Coils, H/M, K'SHTS, W/V ...	£1 8 0	Belling Lee Conn. Unit and Fuses ...	10 6

So *"Take it from here"* by return of Post.

THE CLASSIC ELECTRICAL CO. LTD.

"THE HI-FI TELEVISION SPECIALISTS"

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9/6

VR91 (EF50)	5/-	6SN7 ...	12/-	SP41 ...	2/6	EA50 ...	2/-
EB34 ...	2/-	SP61 ...	2/6	VR56 (EF36)	4/6	VR55 (EBC33)	6/6
VR52 (EL32)	6/6	D1 ...	2/-	6V6 ...	9/6	5Z4 ...	10/-
1T4 ...	9/-	EL50 ...	8/-	1R5 ...	9/-	35L6 ...	9/-
6J7G ...	6/-	1S5 ...	9/-	6K7 ...	6/3	6Q7 ...	10/6
6K8 ...	12/6	6J5 ...	4/6	KT61 ...	9/6	KT66 ...	12/6
KT44 ...	10/-	KT8 ...	10/-	6AC7 ...	7/-	VR137 ...	4/6
6SH7 ...	6/-	KT2 ...	4/6	6N7 ...	6/3	2X2 ...	7/6
VU133 ...	3/-	6SK7 ...	5/-	VU120 ...	3/-	PEN220	3/-
HL2K ...	2/-	VU111 ...	3/-	5U4G ...	10/-	5Z3 ...	7/6
12A6 ...	7/-	HL41DD	4/6	955 ...	5/-	FW4/500...	10/-
1A5GT ...	8/6	954 ...	3/-	1LN5 ...	8/6	3D6 ...	8/6
APT4 ...	4/6	1LD5 ...	7/6	6X5 ...	8/-	80 ...	10/-
		2C34 ...	2/-	MU14 ...	9/-	ECC31 ...	6/6
		6A8 ...	11/3				

CO-AXIAL CABLE, 80Ω ¼in. dia., 10d. per yd.

POTENTIOMETERS, ALL VALUES, 2/5 each.

ERIE INSULATED RESISTORS, mixed, 4/- dozen.

CONDENSERS, 13, 15, 25, 50, 100, 500 pF., 5/6 doz.; .01, .1, .02, 7/6 doz.

26, EAST STREET, MIDDLESBROUGH

Tel.: 3418 MIDDLESBROUGH

D. COHEN

RADIO & TELEVISION COMPONENTS

LINE EHT TRANSFORMER, suitable for P.T. AC/DC RECEIVER. 19/6, plus 1/6 P. and P.

SMOOTHING CHOKE, suitable for above. Five Henry 250 mA. 50 ohms, 6/6. P. and P. 1/-.

T.V. COILS, wound in Aluminium Can, size 2¼ x ¾, with former and iron dust core, 1/-.

FRAME OSCILLATOR TRANSFORMER, 4/6. P. & P., 8d.

B7G VALVEHOLDER with screening can, 1/6.

HEATER TRANSFORMER.—Pri. 230-250 v. Sec. 2 v. 2½ amp., 5/-. Pri. 230-250 v. Sec. 6 v. 1½ amp., 6/-. P. & P., 1/-.

SMOOTHING CHOKE.—150 mA. 2 Henry, 3/6. P. & P., 1/-.

P.M. FOCUS UNIT.—Any 9in. or 12in. Tube, except Mazda 12. State Tube. 12/6, with front adjustment, 15/-. For 12in. Mazda, 15/-. Similar to above, with front adjustment, 17/6. P. & P., 1/6 each.

MAINS TRANSFORMERS

15, 18, 20 24 and 30 v. at 2 amps, 13/-

Primary 200-250 v. P. & P. on each, 1/6 extra.

300-0-300, 100 mA., 6 v. 3 amp., 5 v. 2 amp., 25/-.

350-0-350, 70 mA., 6 v. 2.5 amp., 5 v. 2 amp., 14/6.

Semi-shrouded, drop-through, 280-0-280 80 mA., 4 v. 6 amp., 4 v. 2 amp., 12/6.

350-0-350, 120 mA., 4 v. 6 amp., 4 v. 3 amp., drop-through, 21/-.

350-0-350, 100 mA., 4 v. 2 amp., 4 v. 4 amp. Upright or drop-through mounting, 16/-.

Transformer. Primary 200-250 v. Secondary 3, 4, 5, 6, 8, 9, 10, 12, **Primary** 230 v. Secondary 200-0-200 v. 35 mA. 6 v. lamp. 8/6.

Tube supporting Bracket in 18 gauge cadmium-plated steel, size 9½in. x 4¾in., with 3¼in. diameter cut-out complete with 12in. Tube supporting clamps, 2/-.

Frame output transformer. 10 Henry matching 10-1, 9/6.

Auto-wound, could be used in the Viewmaster, H.T. 280 v. 360 mA. 4 v. 3 amp., 4 v. 3 amp., 2 v. 3 amp., 2 v. 3 amp., 10/-, plus 1/6 post and packing.

9in. White rubber mask with armour-plate glass, 10/-; 12in. Cream rubber mask with armour-plate glass, 15/-; 15in. Rubber mask, 15/-; 12in. Armour-plate glass, 4/-; 9in. Armour-plate glass, 3/-.

TV CHASSIS.—Size 9¼ x 9½ x 3¼. 18 gauge steel cadmium plated, complete with five coil cans, size 1¼in. x 1in., with ironed cored former. These are wound for television frequency, 6/6. P. & P., 1/6.

6½in. **ENERGISED TELEVISION SPEAKER** by Plessey. Field resistance 68 ohms with Humbucking coil. Will pass up to 300 mA. Require minimum 200 mA. to energise. These are cheaper than a TV choke, 9/6 each, 2 for 18/-.

LINE E.H.T. TRANSFORMER. 7 Kv. U37 rectifier winding. Extra winding easily added for EY51 (8 turns) or for voltage doubling up to 14Kv. 19/6. P. & P., 1/6.

EXTENSION SPEAKER CABINET in polished walnut, size 15½ x 13½ x 7¼in., complete with ELAC 10in. P.M., 35/- P. & P., 2/6. This cabinet would accommodate 1155 power pack.

WATERHOUSE 5in. EXTENSION SPEAKER, complete with volume control, in gold and green, 22/6. P. & P., 1/-.

WALNUT BAKELITE CABINET, size 17½ x 12 x 8in., complete with 3-wave band scale, size 8½ x 3½in., 5 valve superhet chassis with I.F. valve holder and transformer cut-outs, pointer, drum, drive spindle, 4 knobs, 2 scale clips, 3 pulley wheels, two brackets, scale pan and back. Despatched to England. Only 31/-, post paid.

CONSTRUCTOR'S POLISHED CABINET, size 10 x 6½ x 5in. approx., supplied in flatted form, grooved and ready to glue together. Complete with plastic front, 3-valve chassis, size 8½ x 4 x 1½in., tuning scale, back-plate and back. Two knobs not supplied. 10/-. P. & P., 1/6.

TWIN-GANG and pair of **T.R.F. COILS** to suit above, 8/6.

B.T.H. CRYSTAL DIODE, wire end, 2/3 post paid.

12 YDS. PUSH-BACK CONNECTING WIRE, 1/6 post paid.

P.M. SPEAKERS
Closed field

	with trans.	less trans.
2½in. ...		15/6
3½in. ...		13/6
5in. ...	16/6	12/6
6½in. ...	16/6	12/6
8in. ...	18/6	15/-
10in. ...		25/-

Post and packing on each of the above, 1/-.

TERMS OF BUSINESS: CASH WITH ORDER. DISPATCH OF GOODS WITHIN 3 DAYS FROM RECEIPT OF ORDER.

Orders under £2 add 2/-. Under £1 add 1/6 post and packing. **All enquiries and lists, stamped, addressed envelope.**

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Post Terms C.W.O. or C.O.D. No C.O.D. under £1. Postage 1/- charged on orders up to £1 ; from £1 to £3 add 1/6 ; over £3 post free. Open to callers 9 a.m. to 5.30 p.m. Sats. until 1 p.m. S.A.E. with enquiries, please. Full list, 5d. ; Trade List, 5d.

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

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250-0-250 v. 100 ma., 6.3 v. 4 a., 5 v. 3 a. ... 23/11
350-0-350 v. 100 ma., 6.3 v.-4 v. 4 a. C.T. 0-4.5 v. 3 a. ... 23/11
350-0-350 v. 120 ma., 6.3 v. 4 a., 5 v. 3 a. ... 28/11
350-0-350 v. 150 ma., 6.3 v. 4 a., 5 v. 3 a. ... 29/11
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250-0-250 v. 80 ma., 6.3 v. 3 a., 5 v. 2 a. ... 18/9
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FULLY SHROUDED UPRIGHT
250-0-250 v. 60 ma., 6.3 v. 2 a., 5 v. 2 a. Midget type 2½-3-3in. ... 17/6
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FILAMENT TRANSFORMERS
All with 200-250 v. 50 c/s Primaries : 6.3 v. 2 a., 7/6 ; 0-4-6.3 v. 2 a., 7/9 ; 12 v. 1 a., 7/11 ; 6.3 v. 3 a., 10/11 ; 6.3 v. 6 a., 17/9 ; 0-2-4-5-6.3 v. 4 a., 17/9 ; 12 v. 3 a., or 24 v. 1.5 a. ... 17/9

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250 ma. 8-10 h. 50 ohms ... 16/9
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200 ma. 5 h. 200 ohms ... 7/6
100 ma. 10 h. 200 ohms ... 7/6
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80 ma. 10 h. 350 ohms ... 5/6
60 ma. 10 h. 400 ohms ... 4/9
40 ma. 5 h. 150 ohms ... 3/9

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Primaries 200-250 v. 50 c/s. 120 v. 40 ma. 7/11
120-0-120 v. 30 ma., 4 v. ½ a. ... 12/9

OUTPUT TRANSFORMERS
Standard Pentode, 5,000 to 3 ohms ... 4/9
Standard Pentode, 8,000 to 3 ohms 4/9
Push-Pull 10-12 watts 6V6 to 3 or 15 ohms ... 15/11
Push-Pull 10-12 watts to match 6L6, PX4, 6V6, etc., to 3-5-8 or 15 ohms ... 16/9
Push-Pull 15 watts to match 6L6, etc., to 3 or 15 ohm Speaker ... 22/9
Push-Pull 20 watt 6L6, KT66, etc., to 15 ohms. High Quality, Sectionally wound ... 51/9

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BRAND NEW VCR97 (Guaranteed free from cut-off), 35/-, plus carr., 5/-. Holders for above, 2/6.

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	Each		Each		Each
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IS4	9/11	6V6Met.	9/6	EF36	6/9
IS5	9/6	6X5GT	8/9	EF39	9/6
IR5	9/11	7D8	6/9	EF80	12/9
3S4	10/6	807	10/11	EF91	11/9
5Y3G (U50)	9/6	8D2	2/11	EB91	10/6
		80	9/11	ECL80	12/9
5U4G	10/6	9D2	2/11	EL33	9/11
5V4G	11/6	954	1/11	KT66	11/6
5Z4G	9/6	12K7GT	10/6	MU14	9/6
6J5GT	5/9	12K8GT	10/6	OZ4	6/11
6J5Met.	6/11	12Q7GT	10/6	QP21	6/9
6J7G	6/11	12SK7	6/11	MS/PEN	5/9
6K7G	6/11	12SC7	6/11	RK34	1/11
6K7Met	7/11	12SQ7	7/9	UCH42	10/11
6K8GT	12/9	15D2	5/3	UF42	10/11
6Q7G	9/11	25L6GT	9/6	UL41	10/6
6SN7GT	12/9	35L6GT	9/6	UY41	10/6
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6SK7	6/11	D1	1/3	X78	12/9
6SG7	6/9				

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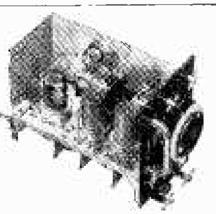

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Frequencies covered, 65-50 mc/s (5-6 metres). Variable tuning 2/VR136 (EF54), VR137 (EC52). Output approx. 7-3 mc/s. In metal case, 9½ x 7½ x 4½in. Uncartoned but good condition.
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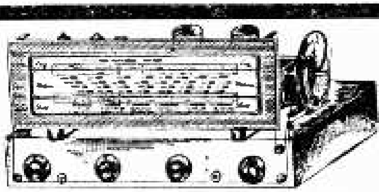

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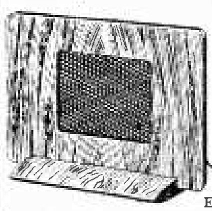

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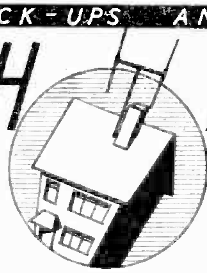

By Iconos

THE BRITISH KINEMATOGRAPH SOCIETY

TRADE interests naturally tend to keep television and films apart. Theatre and cinema managements realise that only the very best productions are good enough to beat the competition of television in the home. They fear the introduction of sponsored television as yet another form of competition, especially as it is likely to keep the BBC TV well up to scratch. But the technicians and engineers in both fields have much in common. This has been recognised in America by changing the name of the long-established Society of Motion Picture Engineers into the Society of Motion Picture and Television Engineers. Its "opposite number" in Britain, the British Kinematograph Society, has not yet changed its title, but has organised a special Television Division. This will cater for all technicians professionally engaged in the operation and design of television studios and transmission equipment. A good many BBC engineers have already joined this society, and papers on TV subjects have been read by Philip Dorté, T. C. Macnamara, W. D. Kemp, D.C. Birkenshaw and others. The B.K.S. Television Division will not compete with the Television Society in the specialised field of television receiver design and circuitry, but will concentrate on the many facets of production and transmission. Already, a joint consultative panel has been formed to advise the British Standards Institution, and work has commenced on a glossary of definitions.

HOW LONG ?

OPINIONS differ on the ideal length a television play should be. These opinions I feel are based largely upon the other interests or duties of the viewer. The small farmer with animals to attend to can scarcely be expected to suspend all work for a couple of hours in the early evening, but he is not averse to 30 or 40 minutes respite from his labours. I think there is a great deal of merit in the plan of starting long plays rather on the late side—say nine o'clock. This enables the gardeners, smallholders and poultry-keepers to make use of the last daylight without missing a long play. And, talking about long plays, the TV play that is long *has* to be good and well acted to hold the attention. *Arrow to the Heart*, a TV play based upon the German war novel *Unquiet Night*, was a long play with several very moving sequences. Esmond Knight, Robert Harris, Martin Starkie and a fine cast did full justice to a fine piece of play-writing. The production was a joint venture of Douglas Moodie, the BBC producer, and Rudolf Cartier, the film director.

SPONSORED TV

DURING the past few weeks, many stories have been circulating in radio, television and film circles—some fantastic, some pessimistic, but most of them highly coloured by the opinions of their tellers—and they all concerned sponsored television. My inclination has been to distrust these fantasies of the "grapevine telegraph" and to await some positive confirmation of developments. First came the news that the Associated Broadcasting Development Company had been formed, with Norman Collins on its board of directors. This was followed by inside information that High-Definition Films, of which Norman Collins is managing director, was endeavouring to acquire a film studio, and the names of Denham, Marylebone and Highbury Studios were mentioned as "possibles."

STAKING CLAIMS

THERE is no doubt whatever that more than one interested party was surveying disused film studios both in and out of town. Later, it was known that the Highbury Studio had been acquired by High-Definition Films and that the local authorities had withdrawn previous objections to its use for television or film purposes. And so, the ugly mid-Victorian building at 96A, Highbury New Park is likely to become the home of the first sponsored television programmes to be made in England. Following American practice, picture and sound will be recorded on film, but the new High-Definition Films electronic system will be utilised and television technique will be used. Meanwhile, rather significantly, the smaller Marylebone Studio had been purchased by J. Weiner and Co., Advertising Contractors, who stated they intended to use it for sound recording purposes. And—unconfirmed—came news of the acquisition of a West-end theatre by a third advertising interest and also the acquisition of Denham Studios by E.M.I., for purposes unspecified.

It rather looks as though there is going to be quite a rush by would-be TV sponsors to stake claims on disused film studios—of which there are quite a few. There is every reason why it should all be done in a hurry. Sponsors hope to establish competitive television as quickly as possible, even with low-powered stations, so that viewers can judge for themselves whether they want competitive television programmes or not. If their reaction is favourable, no Government would dare to withdraw the licences for sponsored television.

THE HIGHBURY STUDIO

THERE is no doubt that the acquisition of the Highbury plant puts the Norman Collins companies in a very favourable position for an early start to serious production. Originally built as a Conservatoire of Music, it was converted in 1927 into the recording studios of Metropole and Piccadilly Records. Two studios were used: a small, moderately reverberant studio for dance bands and the bigger (and rather echoey) hall for large orchestras and choirs. In about 1934 the premises were acquired by a film company, who soundproofed the two recording studios, making useful stages with dimensions of 113ft. x 60ft. and 60ft. x 30ft. respectively. In addition, the usual lighting and electrical plant, cutting rooms, theatre, workshops and dressing-rooms were fitted up. Power for studio lighting was drawn from the Islington Borough Council supply mains and converted to 115 volts D.C. with motor generator sets, with an output of 600 kW. During the power cuts, diesel-electric generators were used. A large number of films were made here, principally comedies, and latterly—until a few months ago—it has been used by the Rank Organisation for making a series of inexpensive second feature films for the training and grooming of a number of Rank "starlets." Highbury is very conveniently located compared with most studios, which are usually some distance from London.

UNOFFICIAL VIEWS

THE reaction in BBC circles to all this activity has been interesting. Officially, the very thought of sponsored television seems to produce no reaction whatever—just a "dead pan," as the comics say. But, *unofficially*, it is having a remarkable spurring effect upon everyone, from executives to rank and file. The BBC Staff Association's magazine breaks the ice by airing views which are unwelcoming or even antagonistic to sponsored TV. On a recent visit to the Alexandra Palace, I was amused by the unanimity of the views of about nine members of the engineering staff. Looking around and metaphorically checking that they weren't observed, they rubbed their hands and said either, "Wait until their sponsored TV starts—there'll be some good jobs going!" or, alternatively, "Wait until the sponsors get going—we'll show 'em what we can *really* do!" The views differed, maybe, but all welcomed the possibility of a competitive system. The outlook, therefore, seems healthy to me. And if the BBC seek to delay progress by refusing transmission facilities to sponsors during the "dead" periods between their own programmes, for radiating films or studio productions from the sponsors' own studios, then the Associated Broadcasting Development Company (A.B.D.C.) have stated that they can put up low-powered transmitters to cover the larger cities, without interfering with the rearmament programme. I haven't heard the answer to this one yet! But I would hazard a guess that the BBC service charge for such facilities would be so high as to be tantamount to a definite refusal.

PROVINCIAL "O.T's"

THE opening out of provincial TV transmission centres has brought with it a number of remarkably good outside television broadcasts—"O.T's" being the equivalent of "O.B's" on sound. Technically they have reached a very high standard. Thomas Hardy's "Tess of the D'Urbervilles" from the Theatre Royal, Bristol, was a far better technical presentation than it was a play. The quality and definition of close-ups, obtained with very long-focus lenses, was quite remarkable. But the play—never as good as the book—creaked and dragged on, in spite of excellent performances by the players. There was one technical blemish, however: the interlude music between the acts. This music, from a gramophone record or tape, was of poor quality and was played over a machine subject to speed variation. The wows and tremors on the music were excrutiatingly painful to hear.

BACKGROUND NOISES

PLAYS are not very often produced in the Alexandra Palace Studios these days. They used to be notable for the extraordinary background noises of footsteps, rustling of papers, coughing and hammer-dropping—not to mention the humming of fans and the creaks of the camera dolly. All these noises seem to be far less from Lime Grove. But the backgrounds of music and effects necessary in the dramatic action are frequently badly handled. Musical backgrounds are often far too loud and seem to be manipulated on the control panels by Ham Handed Henry (or Henrietta!). And when an open-air effect is desired, the tweet of birds sometimes acquires the impact of a well-filled cage of parakeets. Sound effects require discreet handling, excepting when the dramatic situation calls for something bold and shattering. On such occasions, precision is essential and important lines of dialogue should not be drowned. This is all the more important lately, since so many actors have acquired the silly habit of mumbling or "throwing away" their lines in a so-called "naturalistic" manner.

D.C. Equipment

THE introduction of special valves has greatly simplified the design of D.C. receivers and also, in some respects, those of standard A.C. design. In the normal A.C. receiver a mains transformer is used to feed the receiver, and it is customary to make this with a step-up ratio so that upwards of 300 volts are used for the main H.T. rail. This permits of adequate decoupling values whilst not starving the valves of H.T., and in many cases they may be used at their maximum H.T. rating with a suitable high value resistor for decoupling. Therefore with the normal type of valve this arrangement is desirable, and although a D.C. receiver may be constructed with series-fed heaters, so that the filament transformer may be suitably dispensed with, there is the question of the H.T. voltage when low-voltage mains are used.

200 Volt Supplies

If the mains are 220 volts upwards, the majority of circuits may be made up with very little loss in the H.T. feeds. As soon as we come to mains of only 200 volts, however, there is little to spare for the decoupling, and standard types of valve will prove in most cases inefficient. Where, however, the set is to be used on A.C. supplies it is possible to cut down the initial expense by using the auto-transformer technique, and this permits of a step-up in voltage without the bulkiness and consequent expense of the standard transformer, and the core may thus be reduced in size and one winding dispensed with. Of course, with D.C. mains even this arrangement is barred and, therefore, with mains below 200 volts it is almost essential to use special types of valve if maximum performance is desired. The Mullard 80 range includes most of the types of valve required in a modern television receiver, and the H.T. ratings are quite low for some of these. For instance, the ECL80 is a triode pentode which may be used in a timebase with the triode section functioning as a blocking oscillator and the pentode as the amplifier, and the H.T. may be as low as 170 on the pentode section. A further advantage of these valves is that they are of the miniature type with B9A bases and thus the overall physical size of the receiver may be kept down, and it is thus possible for the D.C. mains user to make up a really efficient receiver of quite compact size even when the mains are down to 200 volts.

There is, of course, the fact that at the low voltage mentioned any fluctuations on the mains below 200 will result in inefficiency, and there is little latitude available, but it is no longer necessary for the reader on 200 volt D.C. mains to regard his position as hopeless.

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).

MAINTENANCE COSTS

SIR,—Re commercial service sheets. I fully agree with L. R., of S.E.23, and wish to add that, in my own case, I could borrow a comprehensive service sheet for my set for 10s. per month, and pay £1, *I believe, if I lost it*, which may be one way of procuring one. But I also note that in my case my dealer is not an agent of the makers, and he also has to beg or borrow a service sheet. Will these manufacturers come into the open and take off the gloves? In my case the sensitivity control was U/S, and the cost, I believe, was 6s., but the dealer wouldn't sell it to me so I had no option but let him put it in and the bill jumped to 19s. 9d.! Thirteen shillings and ninepence to undo two screws, unsolder and make two solder joints; surely no more than 15 minutes' work! In the bargain I had to reset all the controls.

But in fairness to the set, I must state that it is three years old and has the original tube and valves and has cost so far:

	s.	d.
Sensitivity control	19	9
2 condensers and 1 resistor	25	0
1 condenser	15	0
	59	9

I must admit everyone I know who has a similar model has had *less trouble* than my £3 in three years. Whereas an in-law with another make has had *three tubes in two years*, and more valves than I care to remember, and without doubt the set has been 75 per cent. back for repairs in two years. I also know of another make of set six years old and working every day and never seen a radio or TV engineer.—JOHN H. BIXLEY (Dartford).

INTERLACING

SIR,—Being only 16 I have not before felt moved to write to your excellent magazine, but the inference in your August issue, that a correct interlace on flyback gives a correct interlace on scan, has prompted me to do so. This popular idea is in the majority of cases untrue. The best way to ascertain whether the picture is interlacing correctly is to open up the height till the lines may be more clearly seen and the interlace inspected. Another method is to distort the picture with a magnet held near the neck of the tube (not near the focus ring) so that the picture is opened out.—DAVID GASKILL (Hale).

(Whilst the suggestion is good, it is not reliable, and in some circuit arrangements will not function. Have any other readers alternative suggestions for checking reliably the interlace?—EDITOR.)

AERIAL PRE-AMPLIFIER

SIR,—Your correspondent, B. L. Morley, of Bristol, in his letter in the August issue, headed "An Aerial Pre-amplifier," appears to overlook the most important factor in pre-amplifier design. I refer to the "noise" generated in the amplifier itself. This effect is present at all times and sets a limit to the sensitivity that can be used. Mr. Morley's reasons for mounting the pre-amplifier on the aerial are sound when considering external interference. Amplifier noise will be the same for either position and, in my experience in this area, just as objectionable as the passing vehicle.

The most effective method I have found is to balance the feeder to aerial connection, which provides considerable protection against currents included in the feeder itself. The first stage of pre-amplification is best effected with a neutralized triode, because of its low noise factor.

At 78 miles from Alexandra Palace the reception on a slot aerial in my loft is very satisfactory using the above methods.

Triode connected pentodes are satisfactory, but the best results are obtained with the EC52 or 6L18 valves; the latter would be a suitable neutralized triode for Mr. Morley's aerial amplifier, although the former valve will give a slightly higher gain.—RONALD B. MILES (Lydd).

VCR517C DATA WANTED

SIR,—Could any reader give me the network for the R.A.F. VCR517C cathode-ray tube? I have tried several, but the tube only comes near the focus point at the extreme end of the pot., and I should like to ascertain whether or not the tube is soft.

Also, I would like some gen on converting the RF25 for the Wenvoe frequencies (66 Mc/s vision). All letters will be answered.—B. GILBERT (14, Elmes Road, Moordown, Bournemouth, Hants).

LINEARITY FAULT—CONDENSER CAUSE

SIR,—While I have never seen this cause mentioned in print I have repeatedly found line fold-over, as described by H. Wilkes (August issue), to be due to a defective C42—particularly if of the old type with soldering eyes pinched on to A1 wire stubs. In such case it may be found that fractionally rolling the defective condenser between finger and thumb causes the fold (and bright line) to appear and disappear.

The remedy is to replace with either the new type (wire ended) condenser or, since the use of a miniature component has here no advantage, with a more robust condenser of conventional size.—L. D. STUART (Hornchurch).

USING ELECTROSTATIC TUBES

SIR,—There have been many designs published in PRACTICAL TELEVISION for televisors using the VCR97 or similar electrostatic tubes.

All these have had somewhat elaborate resistance-coupled push-pull output time bases.

It seems possible that a great simplification would result from the use of normal (electromagnetic) time bases with transformer coupling to the deflector plates.

In this connection it may be mentioned that some of the later Services display units used this type of coupling.

I have had to construct some special purpose oscilloscopes at various times and there has been no difficulty in this connection.

The only precaution is to shunt the secondary of the transformer with a finite resistance in order to be able to match the output valve accurately as the plates alone represent open circuit conditions.

This resistor must, of course, be of the high wattage type.

No attempt was made to obtain E.H.T. from this circuit as the 2.5 kV or so for a VCR97 is easily and cheaply obtained by other means.

Whilst this is the bare outline of the idea I think that it would be an interesting field for experiment.

The frame transformer can be about 1/1 with 10KΩ across the secondary for an output valve of the 807 class.

A small mains transformer will provide a good output if half the rectifier anode winding is used for the output.

The line transformer can be quite small as long as the core is of good quality iron.

The resistor may modify the output waveform but this can be corrected in the time base itself.

I should be glad to hear if anyone else has tried this circuit.—S. L. HUDSON (Paignton).

STEREOSCOPIC TELEVISION

SIR,—In July and August copies comments have been made re the possibilities of Stereo TV. Many readers have seen the South Bank Tele Stereo Cinema, and as a 16 mm. amateur cine fan I wish to point out that this system I believe used twin 35 mm. B.T.H. projectors, both, of course, synchronised to show on the screen at the same time a particular scene.

Now at the present moment there is an improvement which enables one projector (16 mm.) to handle a normal film which has two pictures side by side, and after passing through the normal gate and lens is then taken through prisms and reflected on to the screen, and, of course, the use of special spectacles is still required. I am led to believe through a good source that this system is to be brought into operation in several cinemas this coming winter. The beauty of it is, of course, the only extra attachments required are a set of special prisms to be attached immediately in front of the lens.

As I am only a dabbler in TV. and as yet have not made a home-built set, surely such a system could be utilised whereby two images could be superimposed on the screen together. I have noticed on my set what I thought was a third dimension but on closer examination and re-focusing and use of the line hold this illusion disappears.

But I should think it could be achieved, especially with the projection TV. models ! There would be no need for the BBC to adjust their transmitter so those viewers who prefer flat pictures could still do so.—JOHN H. BIXLEY (Kent).

AERIAL PRE-AMPLIFIERS

SIR,—May I take space once more to explain to Mr. S. V. Fleck why he obtains a result from his hypothetical example which leads him to suppose that I was in error in my original statements ?

It is not clear why Mr. Fleck employs the term aerial loss. I made no mention of this in my original statements because it is reasonable to assume that a feeder is approximately matched to the aerial in all cases. I think he really means feeder loss. Feeder loss is, of course, expressed as a ratio. This ratio is a function of the length of the feeder; for example, if the feeder's length is doubled, the loss is also doubled. It is necessary to assure Mr. Fleck that if a feeder has an attenuation (i.e., a loss) ratio of 2 : 1, then in the case of his 100-volt signal at the input to the feeder only 50 volts will be available at the output. Mr. Fleck gives the following example in his letter : "Assuming that there is a $\frac{1}{2}$-volt loss in the aerial lead-in, the pre-amplifier would be better placed at the aerial, as illustrated by the following : 1 volt input at the aerial, amplified 10 times, and allowing $\frac{1}{2}$-volt loss, would give $9\frac{1}{2}$ volts at the set. Otherwise, with the pre-amp. at the set, we would have 1 volt at the aerial, and allowing $\frac{1}{2}$-volt loss the amplification would be 10 x $\frac{1}{2}$-volt, giving 5 volts, a difference of $4\frac{1}{2}$ volts."

I think that the most useful manner in which to show Mr. Fleck his error is to work out the correct answer for this example. The input to the feeder is given as 10 volts (i.e., 1 volt of signal x an amplifier gain of 10), and the output as $9\frac{1}{2}$ volts. From these figures it is seen that the attenuation ratio of the feeder is 9.5/10 that is .95. When the amplifier is fitted at the output end of the feeder the input to the feeder is 1 volt. This 1 volt is reduced by the attenuation ratio of the feeder, which we have seen is .95, to .95 x 1, that is to .95 volts. Now connecting the amplifier with its gain of 10 x gives an output voltage of .95 x 10 that is 9.5 volts, which, as I thought I had made clear in my original criticisms, is exactly the same signal voltage as is obtained with the amplifier fitted at the input (i.e., the aerial end) of the feeder.—S. WEST (Gt. Yarmouth).

THE "VIEW MASTER"

(*Concluded from page 219*)

sharp points ; if this is not done, then brushing occurs, which causes ozone to be released and leads to eventual breakdown of insulating materials. The same will, of course, apply to the cathode-ray tube support for metal tubes, since it too will be at a high potential and care is essential to ensure that there are no sharp edges or points on the assembly.

Operating Notes

For correct adjustment of scanning amplitude and linearity it is advisable that all adjustments should be carried out during the transmission of the BBC Test Card "C."

Before switching on check all connections and adjust the line thyratron anode resistor for minimum drive (variable resistor fully in circuit) so as to keep the E.H.T at its lowest value when first switching on ; this will probably be around 10 kV. Then, with brightness control turned down, switch on.

Turn brightness up, focus, adjust locking of timebases and frame amplitude, then increase drive to line amplifier. Line amplitude will increase in width, and the E.H.T. will rise until a point is reached when distortion will occur in the form of bright vertical bands at the centre of the picture. The drive should be reduced until there is no sign of these bands, after which the focus, line linearity and amplitude controls may be adjusted.

With the line satisfactory the frame may now be adjusted, the height control being set, then the vertical linearity control adjusted. It may possibly be found that there is some very slight non-linearity about 1 in. from the top of the frame. If this should occur then a slight adjustment to the frame amplifier cathode resistor will be required, but once set this need not again be touched.

The following cathode ray tubes have been used and found satisfactory :

English Electric, 16in. Type T901. Tetrode with ion trap.

G.E.C., 16in. Type 6901A. Triode.

Brimar, 14in. Rect. Type C14BM. Triode.

Information has also been received which indicates that the following tubes could also be used :

Mullard, 16in. Type MW41-1. Tetrode with ion trap.

Brimar, 17in. Rect. Type C17BM. Triode.

Emitron, 14in. Rect. Type 14KP4. Tetrode with ion trap.

In all cases the ion trap magnet used is Elac. Type IT9.

HANNEY OF BATH offers the following from stock:—Viewmaster complete kits of parts, any channel, less valves, **£31**; Kit of 12 BVA Valves inc. tax, **£12/10/4**. Constructors' Envelopes, state channel, **7/6**, post free; or supplied in Stages as follows:—Stage 1, **61/-**; Stage 2, **42/9**; Stage 3, **£5/1/8**; Stage 4, **£9/10/-**; Stage 5, **£10/4/-**; Stage 6, **£7/5/9**; Stage 7, **53/-**. WB200/101/102/103/104/105, packed in one carton, **£6/13/-**; WB200 S and V Chassis, **18/6**; WB101 Support, **6/-**; WB102 Power Chassis, **18/6**; WB104 Choke, **15/6**; WB103 Trans., **42/-**; WB103A Trans., **52/6**; WB105 Speaker, **32/6**; WB106 Frame Trans., **25/6**; WB107 Line Trans., **32/6**; WB108 Scan Coils, **33/3**; WB110 Width, **10/-**; WB111, Boost, **5/9**; WB112 9in., **21/-**; WB112 12in., **21/6**; WB300 Chassis, **17/6**; WB Consol Conversion Kit, **35/-**; Wearite Coils:— L'don, **22/-**; Wenvoe, **28/-**; B'ham, H. Moss and K.o' Shotts, **30/-**; B-Lee L707, **8/9**; G.E.C. Neons, **3/6**; Bulgin Kit, **13/6**; Morganite Resistors, **35/3**; Morganite Resistors, Type T, **6d.**, Type R, **8d.** (10 per cent. **2d.** each extra); TCC Condensers, **£7/7/-**, any Condenser supplied separately. Pre-amp Coils, **4/-** pair: .001 CP55QO, **4/6**; CP55VO, **7/6**; TCC .5 Metalpack, **3/-**; 36EHT50, **24/10**; 36EHT45, **22/6**; 36EHT100, **29/5**; 14D36, **11/7**; 14A86, **20/4**; WX3 and WX6, **3/9** each. Long and Hambly Masks, cream, 9in., **11/-**, 12in., **22/6**. Coils, Resistors, Condensers, etc., etc., also available for W.W., E.E., and P.T. TV Receivers. Send 6d. stamp for our comprehensive lists now; all goods post free over **£2**. L. F. HANNEY, 77, Lower Bristol Rd., Bath. (Telephone: 3811.)

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WALNUT 12in. T.V. Console cabinet; unused: **£5/5/-**. MAY, "Sherbourne," Glendene Ave., E. Horsley, Surrey.

PROJECTION TV., Philips 600A, excellent condition, **£55**; Pye B.18T., reliable little set, **£30**; both London channel. HUMPHRIES, Town Green Rd., Orwell, Royston, Herts.

SALE.—E.E. Television and cabinet; tube and few parts wanted, **£16**. 20, Carlton Avenue, Southgate, N.14.

VIEWMASTER (Sutton Coldfield), in working order, complete in cabinet with 12in. C.R.T. and pre-amp.; **£30**, or nearest offer. L. N. GARNER, Mill House, Sutton Bridge, Lincs.

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YOUR Problems SOLVED

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p.243 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

INSUFFICIENT WIDTH

I wonder if you could give me the benefit of your advice. I have built a Viewmaster with a 12in. tube and although I can obtain a very good picture I cannot get the width across the tube. There is a 1in. space on either side. I have had the 6P28 tested and this is working correctly.

I am also unable to obtain the picture and the sound together although I can, by adjusting the coils, obtain either separately. Perhaps you will be kind enough to let me have your views. Obviously, I am a beginner.—G. Wellpid (N.W.3).

Insufficient line scan amplitude may be due to any of several faults in the line timebase. We would, in the first place, suggest checking voltages in the V9 and V10 stages and, particularly, the boost voltage appearing across C42, and noting whether this agrees with the specified values given in the Viewmaster booklet. It is possible that R46 could be reduced in value thereby increasing the drive to V10; R46 may be reduced until a point is reached when distortion occurs on the left side of the picture; R50 may also be reduced very slightly though not to such a value that will cause V10 screen to glow. Insufficient amplitude may also occur if either the line transformer or line scanning coils are an unspecified type or unsuitable for the particular application.

TUNING EFFECTS

As a complete novice in television technology I wonder if you will be good enough to assist me in the following query?

I have a Pye F.V.1 receiver which I am using with a J Beam 4 aerial on extreme fringe reception of Sutton Coldfield (200 miles). When the fine tuner (which I assume is the oscillator trimmer) is tuned on maximum sound, the picture practically disappears and, conversely, if trimmed for best picture the sound is completely lost. This has not concerned me up till now as after all at this distance reception is just a novelty, but with the near opening of Wenvoe I am concerned to get the best possible results in the way of genuine entertainment.

It occurs to me that in view of this distinct selectivity of the aerial and receiver as regards sound and picture, if I set the tuner for maximum sound as per instructions the picture will still fall a long way short of optimum and presumably be lacking in bandwidth, despite the greatly increased signal I expect to receive from Wenvoe.

It has been suggested that the above type of aerial is too selective and that the advantage of considerable gain is nullified by lack of bandwidth. Before I go to the additional expense of converting my aerial to Wenvoe frequency I would appreciate your views on this, and if you consider that a 3 or 4 element folded-dipole array would overcome this trouble would you be good enough to give a sketch showing principal dimensions of such an array (preferably so dimensioned as to have an impedance near enough to 80 ohms to eliminate the use of special matching stubs). It may then be possible for me to utilise the existing components of my J Beam aerial to construct an aerial of this type.—A. Driver (Torquay).

The effect you notice when you trim the oscillator of your Pye receiver is quite normal, and is the result of the set being made for single sideband reception. When the sound is correctly tuned, the vision signal is *one-half* full gain, and this is as it should be. You should always tune the set for maximum sound, the vision pass band will then be correctly placed with respect to the received carrier. When you go over to Wenvoe, no doubt the receiver will function normally, so that both sound and vision can be received.

Your J Beam aerial has adequate bandwidth for normal purposes and does not account for the above difficulty.

SYNC FAULT—TIME FACTOR

I have a magnetic televisor constructed from a kit. I had no previous knowledge of television but after surmounting several initial difficulties I finally got the set working fairly well. It has now been going for about 12 months with one or two faults which so far I have been able to remedy.

It has now developed a fault which has me baffled, perhaps because of my acute lack of test equipment of any sort. The fault is that the picture appears on the screen in two parts. On the test card you see about five-sixths of the picture towards the left-hand side of the screen then a border, a thick black area, the other border and then the other sixth of the picture on the right-hand side of the screen.

I have assumed that the fault is somewhere in the line timebase and have substituted the valves and all the resistors and condensers in this area but with no success. The one thing I have not substituted is the line hold and this is very critical. I can occasionally get the proper picture by juggling with the line hold and getting it set a fraction off minimum resistance but it only stays normal for a short time and then reverts to the two parts. I have also noticed that if I keep it on test for, say, 15 minutes or so the very top of the picture slips and no adjustment of the line hold will remedy it.—E. W. Allen (N.19).

The fault is in the sync separator stage or in the coupling to the line oscillator. A value has changed in some component and a long time delay is occurring in the sync pulse feed to the oscillator, thus causing the line timebase to trigger at the wrong point. The most likely cause is a high resistance, although the sync valves themselves should be checked, and condensers investigated for leakage.

The critical line hold control points to a poor sync pulse in any case, and so it will be necessary to check the whole of the sync circuit for the fault.

MAINS VARIATIONS

My set was built three or four years ago. A curious fault has developed in that the picture intermittently decreases in size in both vertical and horizontal directions. At the same time as it shrinks the brightness reduces so that the picture almost vanishes. When it increases in size again it becomes over-bright. At the same time as these happenings occur the focus varies. In an endeavour to locate the fault I have disconnected the video and sound power supplies individually and together, but the fault persists. I have also removed the frame and line

oscillator valves and the spot or trace left varies in size and sometimes disappears altogether. This leads me to suspect E.H.T. capacitor, which I have replaced, but the same conditions prevail. I recently had a condenser short in the video section which damaged the H.T. rectifier, and this was replaced and the set worked all right afterwards. I have noted a pin-head size blue glow in this rectifier valve now but it seems to be working correctly. When disconnecting the power supply to the sound chassis the background hum increased slightly and I noticed that this varied in pitch or strength slightly. I shall be most grateful for your guidance in tracing this trouble and rectifying it.—W. J. S. Hamphries (Brockworth).

From your description it is evident that there is a variation in the A.C. supply voltage to your receiver, since not only is the D.C. supply feeding the time bases reduced, thereby giving a smaller picture, but also the E.H.T. supply is reduced, thereby reducing the brightness, and furthermore the focusing alters, either as a result of the E.H.T. itself falling or, what is more likely, by the D.C. supply falling. We suggest connecting a meter across the A.C. input to your receiver and noting whether there are changes in voltage at such times as the picture varies, or if these are not apparent, then connecting the meter to the output of the transformer and noting if there is a variation at this point; a variation on the output of the transformer but not in the input would indicate that the transformer itself was faulty, whilst no variation on the output transformer but a variation on the D.C. output would indicate that either the rectifier or one of the smoothing condensers was faulty.

INCREASING FRAME SCAN

I wonder if you could help me once more. My set, a "Viewmaster," is now operating well, apart from one small fault which annoys me a little.

My picture does not fill the screen: there is a black space of ½in. at the top and one of ¼in. at the bottom. My friends say it is because I am only using 6.3 kV. on my Mazda 12in. tube but, I may be wrong, I feel if I could just turn down the variable resistances R64, R65, the picture height and picture linearity, all would be well, as increasing, i.e., turning them clockwise, my picture can be closed to 1in. On turning anti-clockwise picture opens up nicely till I come to full anti-clock, leaving space at top and bottom. Is it possible to put a resistor in series or parallel to get that little extra ¾in. of picture? Also, I notice at long-distance shots the people's legs seem very short for their bodies. I may add I can get a full raster all over tube, but have to open my focus magnet up to the full and cant same a little to one side.—John Barnes (Gourock).

So long as there is no actual fault in your receiver it should not be difficult to increase the frame height, and we suggest you reduce the value of R56 slightly until you obtain correct amplitude with good linearity.

SMEARING

My Viewmaster table model which I made up to a console type by lengthening necessary leads, has the following fault: both blacks and white trail off instead of stopping "dead"—if a white object, say, a girl's dress, appears in front of a dark object, say, a stair case, the stairs appear to go right through the girl's dress.

I've spent many hours adjusting the coils in all manner of ways over a period of six months or more, changed over V9 and V11, interchanged all EF50's, checked wiring and even renewed aerial feeder wire but the fault remains. Can you please help me?

I'm a subscriber to PRACTICAL TELEVISION but haven't come across this fault in any of the issues except when sets are incorrectly aligned—I have no test gear except an Avo 7, but after so many evenings of adjusting the coils I do not see that this can possibly be my fault now.—B. S. Dengate (Tonbridge).

The fault you describe may be due to alignment, though a similar effect may be obtained due to the spot suppressor circuit. If this is so then it may be overcome by connecting a .1μF. condenser from the slider of R69 to chassis.

USING RDF1

I have recently purchased one of the RDF1 units as advertised in the columns of your periodical.

Owing to the fact that I am a newcomer to "television." I am not quite sure of the method of winding the coils. Are they wound with bare 22 s.w.g., with turns spaced, or closely wound with insulated wire?

With regard to the sound receiver could you please tell me the size of the formers, as in my conversion data it merely states Aladdin formers should be used.—S. Woodcock (Gillingham).

The coils are not critical in the conversion you mention, and 22 s.w.g. wire, bare or enamelled, with slight turns spacing will be suitable. The insulated type is preferred as there is then no danger of shorting turns.

The Aladdin formers referred to are the ⅜in. diameter pattern with dust-iron tuning slugs.

A suitable tube layout circuit is that used in the Argus described recently, or another is given on page 346, of the January, 1952, issue.

The exact coupling to the tube will depend on your video system, but the main bleeder chain values and E.H.T. circuits of the above will be suitable.

LINE OSCILLATOR FAULT

I have a fault in my set which I should like you to help me with.

After the set has been on for a minute, thin black lines run across the picture, which are not sound lines, also the picture comes out of focus and thick white lines run across; after a time it will all clear off and the picture is clear but only for a very short time, about two minutes.

I have tried to locate the fault, the only thing I can put it down to is the line transformer, as I can hear a sound like an arc inside, but I cannot open it up.—J. Mannering (Dagenham).

The line transformer could be responsible, but if this was so, other symptoms such as severe non-linearity and loss of width would be apparent. The sound that appears to come from the line transformer and which you think is arcing, is no doubt disturbing pulses from an earlier part of the time base; similar noises can be heard when car interference, etc., upsets synchronism slightly. You should inspect the line oscillator valve and its associated components, and also the feed from the sync. separator to the oscillator, as it would appear that the fault is in this part of the circuit.

QUERIES COUPON

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