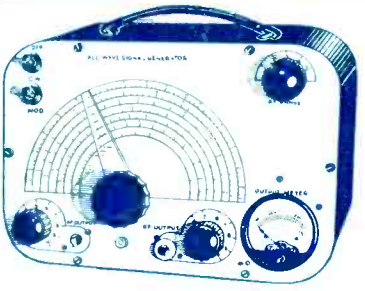
• PORTABLE TV RECEIVERS •

Practical Television

1'3

NOVEMBER: 1956 AND TELEVISION TIMES EDITOR: F.J. CAMM



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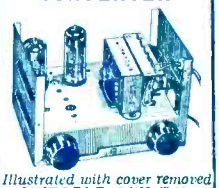

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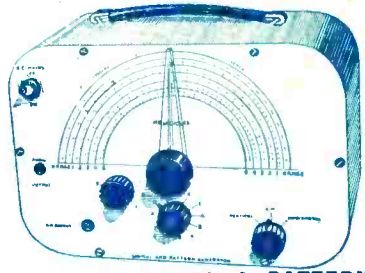

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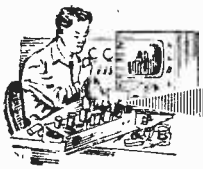
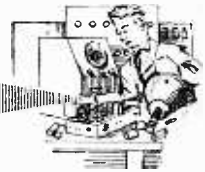


Practical Television



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Televiews

THAT VACANT TV HOUR

THERE are no TV programmes, either BBC or I.T.V., between the hours of six and seven in the evening. The official reason given is that Children's Hour finishes at six o'clock and the hour before programmes start again gives parents the time to put their children to bed This shows how out of touch the authorities are with modern times. Children may have been put to bed 50 years ago, when children were expected to be seen and not heard, but children are certainly not put to bed nowadays at the absurd hour of six o'clock, excepting, of course, very young children, who would not be interested in TV anyway. Presuming, however, that parents are still so Victorian as to send their children to bed at six o'clock, that is no reason why the programmes should cease, if parental control means anything at all.

Not so long ago the complaint was made that TV programmes were interfering with children's homework. Most children to-day do their homework in the evening and after six o'clock. We suggest that this vacant hour should be made use of.

PROJECTION TV

THE Radio Show this year showed a marked decline in the number of projection receivers on show. It would be a pity if this type of receiver disappeared from the market, for it has undoubted advantages which more than outweigh the main disadvantage that the picture must be viewed "square on," and presents a blurred image if viewed at an angle. The public is demanding a larger picture, and the C.R.T. has already, in our view, reached a practical limit. As the Bell Laboratories have claimed to have invented a method of amplifying light, perhaps a fresh fillip will be given to projection TV, on which at present brilliance is reduced as the size of the picture is increased.

TV IN TRAINS

FOR the first time in the history of TV it has been installed in a train. Two excursion trains from Glasgow to Oban were so equipped with a closed-circuit TV system, the guard's van being turned into a studio feeding two 17in. TV receivers in every 64-seater carriage. This was on September 24th. The studio was equipped with a miniature industrial TV camera, which from time to time televised the Highland scenery, whilst a commentator pointed out landmarks of particular interest. The passengers on the return journey changed trains so that they could see the alternative programme.

"UNSIGHTLY" TV AERIALS

THE Town Planning Committee of the London County Council is concerned at the unsightly appearance of television aerials in residential areas. It adds the rider that "at this stage, public opinion would not be favourable to the council's seeking new powers of control over their erection on private property." On the contrary, we think that the power should be taken away from all councils to interfere in this matter or to make regulations concerning it. It would be a further unwarranted interference with the liberty of the subject.

I.T.V. IN YORKSHIRE

THE new I.T.V. station at Emley Moor will commence broadcasting regular programmes on November 3rd, and it will make I.T.V. available to about 5,000,000 people in Yorkshire, Lincolnshire, Nottinghamshire and Derbyshire. Although I.T.V. at the present time is losing money, there can be no doubt that more and more viewers are deserting the BBC programmes for I.T.V. — F. J. C.

OUR NEXT ISSUE, DATED DECEMBER, WILL BE ON SALE ON THURSDAY, NOVEMBER 22nd.

A Beginner's Guide to Television

A NEW SERIES

8.—COLOUR TELEVISION

By F. J. Camm

ALTHOUGH it may be some years before we have a regular colour television service in this country colour TV technique is well advanced. The exact date of the commencement of such a service is dependent not so much upon technical development as upon finance and trade policy. Naturally, manufacturers of monochrome TV receivers are not anxious to disturb production by encouraging the public to believe that colour TV is imminent. Nonetheless, it is well that we should understand something about it in readiness for the day when TV emulates the films.

Now before we can understand colour TV it is necessary to know something about the spectrum. In Fig. 31 I have shown a diagram of the visible and invisible spectrum with corresponding types of rays and approximate wavelengths. We all know that we only see anything by virtue of the light which it reflects and that it is impossible, even for a cat, to see in complete darkness. The commonly held belief that a cat can see in the dark cannot be substantiated, although it is possible that it can see better in a darkened room than a human being. The source of all natural light is the sun, and the emissions from the sun are considered as white light, and by this is meant the colour of light which does not appear as any of the colours in the visible spectrum, such as the colours seen in a rainbow. It was Newton who demonstrated that when a beam of white light is projected through a glass prism, and the light which has passed through is projected on to a white screen, a series of coloured bands appears on the screen and they appear in this order: red, yellow, green, blue-green, blue, and violet. These are, indeed, the colours of the rainbow. Each of these colours has a certain frequency and wavelength, and they therefore have electro-magnetic energy. It may be said, to put it another way, that each band of colour embraces a band of frequencies and wavelengths. To be more specific, the blue band, which, of course, includes violet and some of the blue-green, extends from 400 to 510 millimicrons approximately, and the green band, inclusive also of some of the blue-green, extends from 510 to 580 millimicrons, whilst the yellow band extends from approximately 580 to 600 millimicrons. Finally, the red band, including the orange, extends from 600 to the practical limit of 700 millimicrons. Beyond the red at one end there are, however, the infra-red rays, and beyond the violet the ultra-violet rays. These are rays beyond the scope of the retina of the human eye, just as certain sounds are beyond the aural frequency of the human ear.

The separation of these colours by means of a prism is due to the phenomenon known as refraction, and the refraction will, of course, depend upon the substance. In the case of glass, for example, which is a solid, if light strikes a surface at right angles (90 deg.), the light will be slowed down at each edge of the ray and the direction of the light is not affected. At any other angle, however, the ray is bent. This is because the right-hand edge of the ray strikes the surface before the left-hand edge. The glass, therefore, slows down the right-hand edge and this portion of the ray can travel only a certain distance, whilst the left edge in air will travel a greater distance.

It will thus easily be seen that by the time the whole ray has penetrated the solid material what may be termed the wavefront of the ray is bent, and a similar state of affairs exists when the ray leaves the material, but the bending in this case is in the reverse direction, because the ray is proceeding from solid to air instead of from air to solid. What may be termed the departing ray can be bent or deflected in relation to the entering ray by using a prism of triangular section. As a result of the different angles of the surfaces of a prism, the ray is bent the same way in both cases, but it is important to note that the ray is always bent towards the normal in entering the solid and away from the normal when it is departing.

The greater the ratio of the velocity in air to

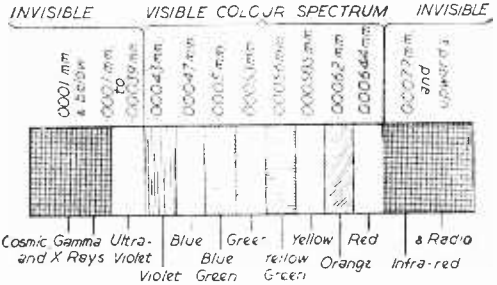


Fig. 31.—The visible and invisible spectrum with approximate wavelengths in mm.

velocity in the solid, the greater will be the bending and the deviation, and this velocity ratio for a particular solid and for a given light wavelength is known as the index of refraction, a term you will often see quoted in books on telescopy, microscopy, optics and spectroscopy.

The important thing to remember, however, is that each colour has a different index of refraction in relation to a particular solid, and light rays of different colours which enter a solid at the same angle will depart at different angles.

Light, as we have seen earlier, is a combination of the light of different colours, or wavelengths, and when these enter the prism at the correct angle the light of each different colour will leave the prism at a different angle.

We have all at some time spun a disc containing the colours blue, red and yellow, and found that when spun they appear white. An examination of the visible spectrum shows that blue, green and red occupy by far the greatest part of it, and that blue-green, yellow and orange form a comparatively small region of the spectrum.

From this basic fact emerges the basis for colour television. For colour television the spectrum may be simplified and considered as extending from blue, through blue-green, green, orange-yellow to red, embracing the band of frequencies from 400 to 700 millimicrons. It would be practically impossible to devise a TV colour system which would embrace the whole of the visible spectrum. As with colour films, which will never look quite the same as the natural objects shown, so with TV. It cannot be expected because of the limitations to which I have referred that the pictures will be represented in really natural colours. Newton demonstrated that he could produce white light by reversing the prism procedure. He passed the visible spectrum through one prism, through a second prism and thus was able to show a band of white light on the screen.

Now, due to the optical limitations of the human eye, the sensation of white light can be created in the mind of the viewer by a sort of mental illusion. That is, by combining only three colours in the proper proportion. These are blue, green and red lights, which are the TV primary colours.

We know that by combining these three primary colours in other than equal proportions, or indeed, any two of them, a much wider variety of other colours can be seen by the viewer. It is, then, the colours of blue, green and red which are used in the colour television system in use to-day.

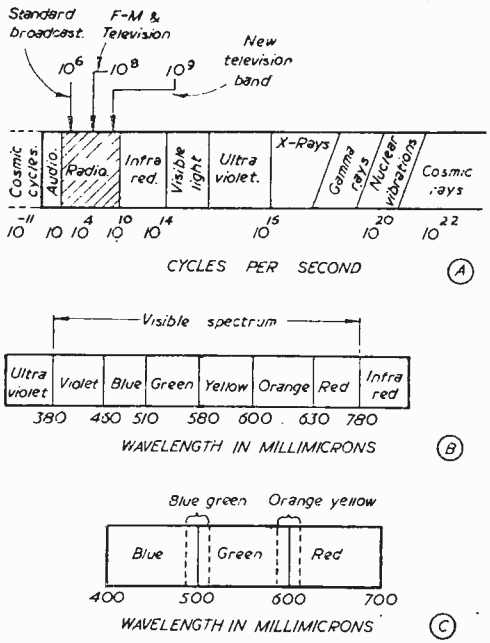


Fig. 32.—The complete electromagnetic spectrum (a); the visible spectrum (b) and (c) simplification for colour television.

To give a technical name to it, the phenomenon that a particular colour can be matched by a proper combination of the three primary colours is known as trichromatic vision. Opticians tell us, although there is some doubt about it, that within the mechanism of the eye there are three receiving devices and each is capable of responding to the colours of all wavelengths, and one of these devices is more responsive to blue, another to green and the third to red; and when the eye sees a particular colour, these three devices respond according to the colour value—or the respective wavelengths to which it is responsive. I have mentioned earlier that we see all objects by the reflection of light and we see all coloured objects by reflection of the colour rays and also by the projection of them. A simple experiment will demonstrate what is meant. If all the colours of the rainbow are projected on to a screen and a piece of red cloth is held in front, it will appear to the eye as black or brown, except when it is placed in front of the red colour area of the projected spectrum. This is because the red cloth is only reflecting the red colour radiations in the light that impinges on it, but is absorbing the radiations of the other colours.

Now when the piece of cloth appears brown to the eye it is because of the reflection of the colour radia-

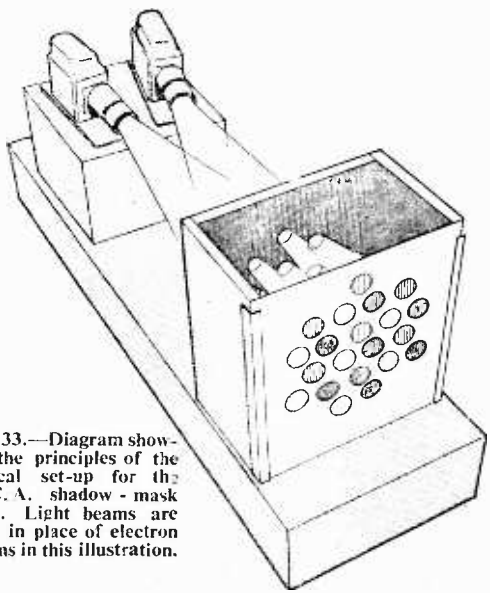


Fig. 33.—Diagram showing the principles of the optical set-up for the R. C. A. shadow-mask tube. Light beams are used in place of electron beams in this illustration.

tions which, to the eye create the colour sensation of brown. It is for these reasons that colour matching should never be undertaken in artificial light.

Another important fact. A white object appears white to the human eye only when it is viewed in a pure white light. In those circumstances it reflects all of the wavelengths radiated by the light source, but when viewed in a light which does not contain the full range of colours in the visible spectrum any white object will appear as the colour corresponding to the wavelengths present in the source of light radiation. This does not apply, of course, to black, which appears as black under white light and, indeed, will remain black under all colours of light. This is because black objects absorb all visible light rays, but do not reflect any of them. Black, therefore, may be said to be due to the absence of reflected light rays. Many systems of projecting colour TV pictures have been tried from the time that Baird first demonstrated that colour TV was possible. One method which has been successfully demonstrated is to generate radiations corresponding to certain wavelengths and, therefore, of certain colours from self-luminant sources. Sodium vapour light is one such source and it produces a yellow light. The argon tube, when the cathode is connected to a source of electrical energy, will produce a blue or purple light, and there are many other different kinds of gases which are capable of radiating wavelengths which correspond to different colours. Neon will radiate an orange colour, but it must be appreciated that the band of wavelengths in radiations from these sources is quite limited.

The tricolour picture tube is, in effect, a generator of colour. Its screen contains red, green and blue phosphors, and these are excited as with ordinary monochrome TV by the electron beam. Each of the phosphors will radiate light of its own colour. The quantity of light radiated from each of the phosphors is electronically controlled so that the emitted light in combination forms the composite colour of the object being scanned in the television studio.

Another system of colour projection makes use of a white light source, in turn followed by a colour filter.

In colour photography, filters are used in front of the lens so that only the light which passes through the filter is impressed on the negative, and each filter will allow only the desired colour to pass through it, absorbing all the other colours. Indeed, the traffic lights of red, amber and green are simple examples of the use of colour filters. The source of light in each case is white, but the motorist only sees the light which passes through the filter or coloured glass, and it absorbs all the other colours. One system of colour television which may be considered as a mechanical system makes use of filters, but it has not been found successful. The system which has most favour and appears to be the one most likely to be used makes use of three cameras for red, green and blue respectively which separate the colours reflected from the object being scanned into the three primary colours. As with ordinary TV each camera will deliver its own signal voltage, corresponding to the colour passed by its filter, and these signals pass through the TV network in the ordinary way.

I said earlier that the three primary colours are red, blue and yellow, but in TV they must be considered as red, green and blue. The R.C.A. colour television system which is used in America and is likely to be used over here, is shown diagrammatically in Fig. 34. As shown in the diagram, light coming from the scene being televised passes into the R.C.A. colour camera and then through a series of mirrors to the camera tubes. These mirrors have the property of "splitting" the light from the scene into three components—blue, green and red. Each mirror reflects one of the components of the light, while passing the other components, thus separating the light into three colours.

Each primary colour is directed to one of the camera tubes. The pictures are then simultaneously scanned by electron beams, a process in which each image is dissected into 525 horizontal lines. This scanning procedure is repeated 30 times a second. The output from the camera consists of three simultaneous high-definition television picture signals—each representing one of the three colours.

The signals leaving the camera are made up of elements representing both black-and-white and colour pictures. The black-and-white portion of these signals represents the very fine detail of the scene being televised. At the same instant the three colour signals are processed electronically to make it possible for them to be transmitted in the standard television channel. Once this has been done to the colour signals the black-and-white picture is added and the result is a video signal which is in full colour and high in picture detail.

The video signal is sent to a standard television transmitter which is the same kind of transmitter used for standard black-and-white television broad-

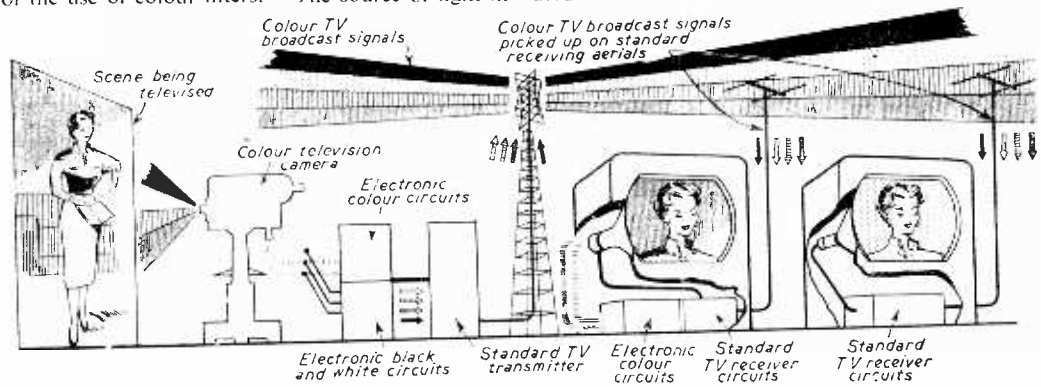


Fig. 34.—How the colour system used by R.C.A. is used to pick up a signal and reproduce it in either colour or black and white.

casts. The signal is then broadcast for reception in the regular manner. The channel width—6 Mc/s—is the same as the standard black-and-white television channel. Hence, the standard television channel may be used to transmit either black-and-white television or R.C.A. colour television.

R.C.A. colour television signals can be received in one of three ways: 1, they can be received in colour on colour television receivers ; 2, they can be received in colour on converted black-and-white receivers ; or, 3, they can be received as standard high-quality black-and-white pictures on ordinary receivers without any modification. In each case all-electronic equipment is used throughout. Fig. 34 shows how R.C.A. colour television signals are reproduced in black and white on a standard unmodified black-and-white television receiver. This illustrates the compatibility of the system.

Fig. 34 also illustrates how R.C.A. colour television signals are reproduced in colour. This applies to both a colour television receiver and a black-and-white receiver converted for colour. As shown in the diagram, the incoming television signal passes through standard television receiver circuits and then through colour circuits to the tricolour picture tube on which a full-colour high-definition picture is reproduced. As in black-and-white television, the size of the picture is determined by the size of the tube. The R.C.A. colour system can use any size picture tube.

Several development models of R.C.A. colour television receivers have been produced and demonstrated. One model uses the 16in. R.C.A. direct-view tricolour kinescope. Another modulates a 21in. tube. The screen of the colour picture tube is composed of hundreds of thousands of dots of red, green and blue light-producing phosphors. These dots are arranged in groups of three and so positioned that the electrons from each of the three electron guns always hit the dots of their own colour. The phosphor dot groups are so small and so close together that

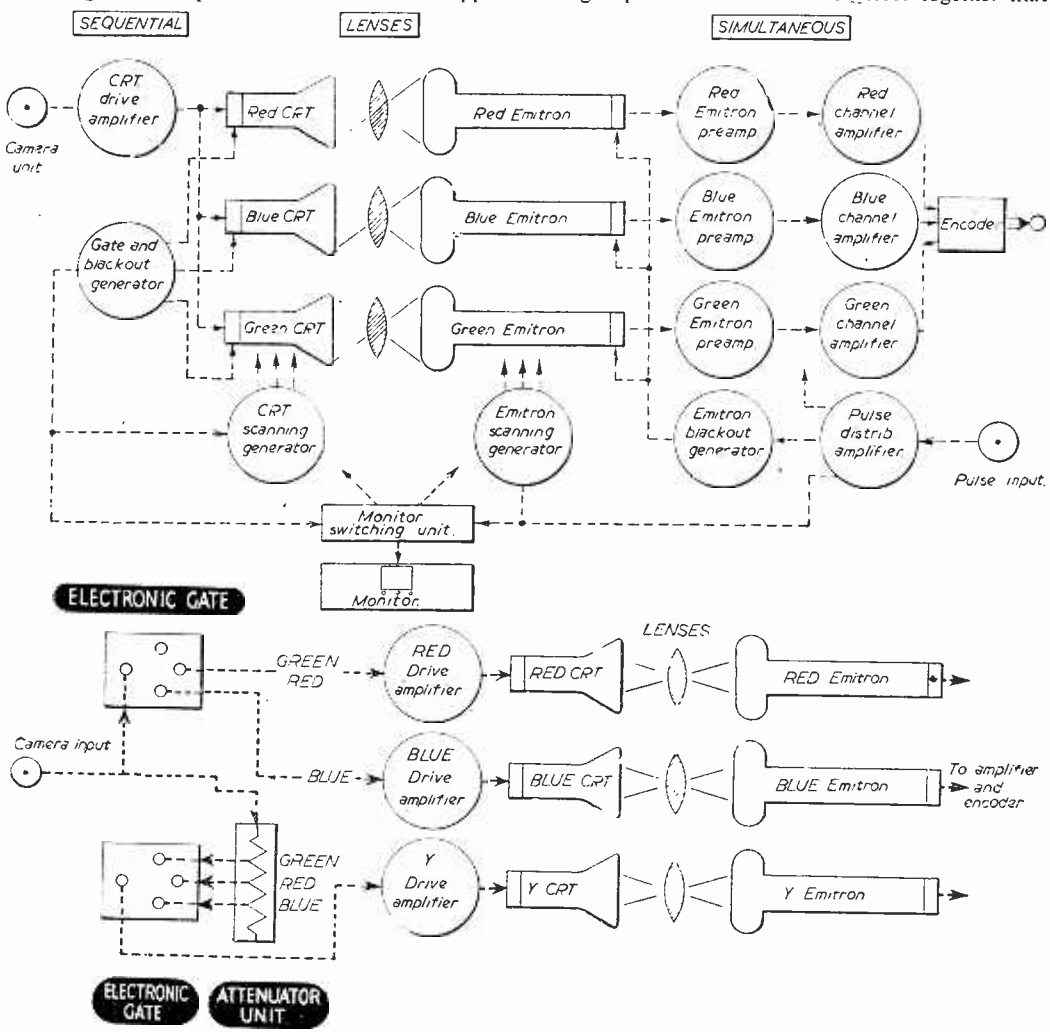


Fig. 35. — Schematic layout of the E.M.I. chromacoder, and below the modified R.Y.B. colour scheme.

when activated by the electron streams they present a continuous smooth full-colour picture.

The reception in colour on a converted black-and-white receiver is identical with the foregoing. In this case the colour television tube is used instead of a black-and-white C.R.T. The necessary circuits are added to the black-and-white receiver. After a set has been converted to colour black-and-white television pictures can still be received from those stations transmitting in black and white and viewed on the tricolour tube as high-quality black-and-white pictures (Fig. 33).

Other systems produce pictures with poor detail and they must make use of scanning rates which are not the same as those used in black-and-white television and such pictures cannot be received on standard black-and-white receivers unless costly alterations are made to the set. Even then the picture has less than half the detail or sharpness of the present black and white. The system just described, however, provides a picture of the same detail as the standard black-and-white picture. It can use the same scanning rates as in black-and-white television and it will give a high-quality black-and-white picture on standard television receivers without any modification. *(To be continued)*

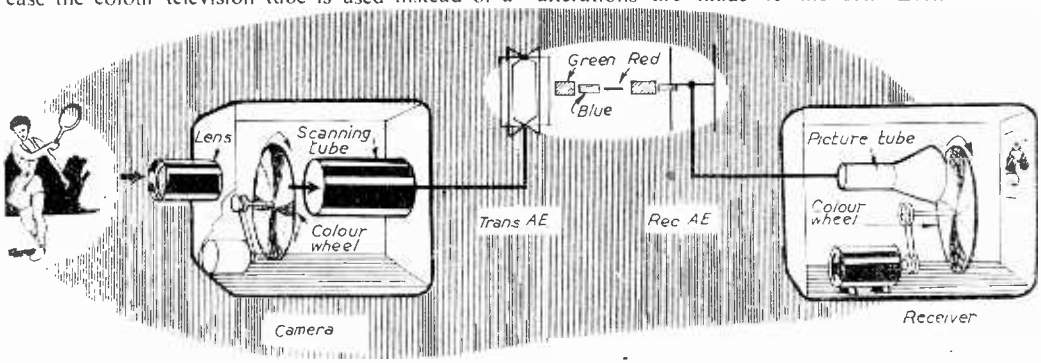


Fig. 36. — A disc colour system as used by the C.B.S. of America.

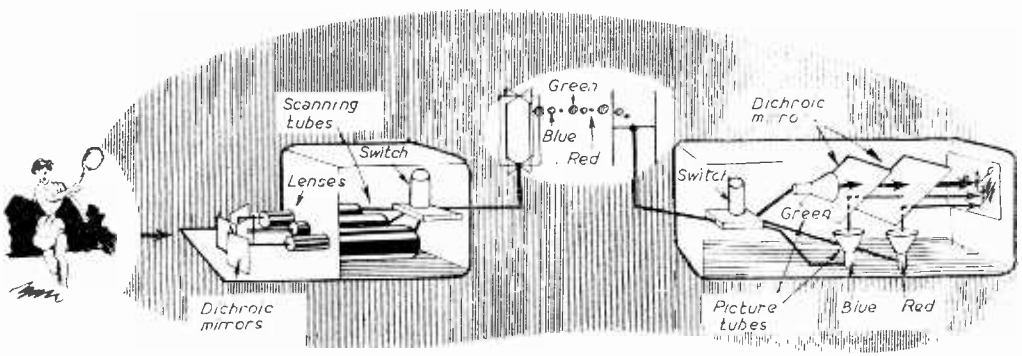


Fig. 37. — The dichroic mirror system of the R.C.A.

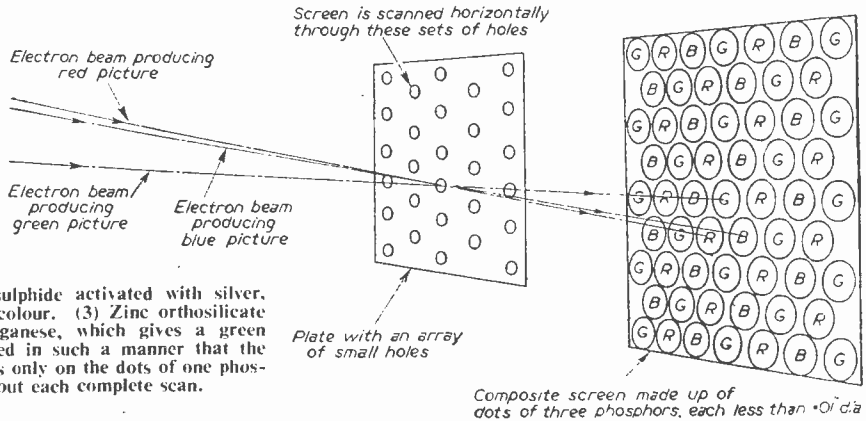
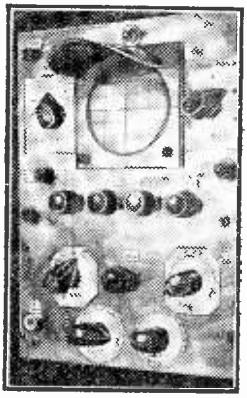


Fig. 38.—Diagrammatic representation of the R.C.A. single screen system of television. The screen is built up from a mosaic of dots of three phosphors, viz. (1) zinc orthophosphate activated with manganese which gives a red colour. (2) Zinc sulphide activated with silver, which gives a blue colour. (3) Zinc orthosilicate activated with manganese, which gives a green colour, are assembled in such a manner that the beam from each falls only on the dots of one phosphor throughout each complete scan.

HOW TO USE AN OSCILLOSCOPE



On the right is the 'scope which was described in our May and June issues.

HOW TO UNDERSTAND AND EMPLOY THIS VALUABLE SERVICING ACCESSORY

By J. Hilllman

(*Continued from page 118 October issue*)

Sensitivity

THE sensitivity of all British C.R.T.s is given as mm/VA3 and in the case of the VCR139A this is 170 mm/VA3. VA3 is the final anode voltage, and unless this is accurately known the exact sensitivity figures given by the makers cannot be checked. However, to the service engineer, the main thing to know is what voltage input will produce a given height of trace. First set up circuit as Fig. 17. Where V is an A.C. voltmeter or multimeter switched to its A.C. range. Connect output terminals A and B to the Y output terminals of the oscilloscope; set Y amp switch to direct; timebase off, i.e., range 6; sync S.W. to ext. Set VR1 to give 50 volts on A.C. meter, and measure height of trace which will be a vertical line. In my oscilloscope this was 47 mm, and sensitivity is 50 volts for 47 mm. However, this voltage is the R.M.S. voltage and the oscilloscope measures peak to peak voltage, and so it is desirable to work with this value. With 50 volts R.M.S. the peak voltage is $\sqrt{2}$ x 50 peak volts, and 2 x $\sqrt{2}$ x 50 peak to peak volts which is 2 x 50 x 1.414 = 141.4 volts. The sensitivity is then 47 divided by 141.4 or 0.33 mm/V. If this is checked at 20 volts, the line is 21 mm, giving 2 x 20 x 1.414 or 56.5 peak to peak volts and this gives sensitivity as 21 divided by 56.5 or 0.37 mm/V.

Similarly for 60 volts line is 55 mm giving 60 x 2 x 1.414 or 170 P.P. volts and sensitivity is then 55 divided by 170 or 0.32 mm/V. You will notice that the sensitivity values seem to vary for different voltages. This is due to errors in the voltmeter, and it is best to use the highest range of the meter and to get the reading near the full scale reading in order to ensure accuracy. It is best to take several readings and take the average figure as the sensitivity of the tube. Now connect A and B to the X output socket and measure the sensitivity of the horizontal plates. With this test it is better to connect direct to the X plates, and for this purpose my oscilloscope has a socket fitted on top of the C.R.T. partition, and a 0.5 μF condenser connects this to pin 7 of the C.R.T. The sensitivity should be approximately the same for both X and Y plates. The X amplifier can be checked by first measuring the sensitivity of the direct X connection and then changing to the X ext. socket and putting the X amp control to maximum, and the amplification should be just over eight times. A point of interest in regard to the published figures of sensitivity of C.R. tubes is the relation between the sensitivity and the final anode voltage. The formula used by British manufacturers is S=K divided by VA3. Where S is the sensitivity and VA3 is the final anode voltage whilst K is a constant. From this it will be seen that the higher the anode voltage the less sensitive the tube becomes, so that for service work it is preferable to keep the anode voltage as low as possible and so get a more sensitive oscilloscope. Of course, there is a limit to the voltage, as the brightness of the trace depends on this voltage. Another advantage of using a low anode voltage is that the life of the tube is increased.

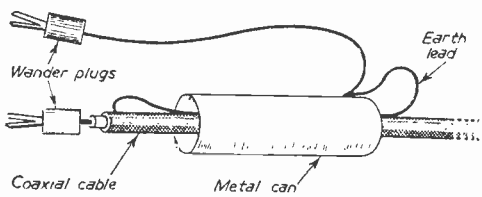


Fig. 18.—Simple screened connector.

Checking Hum

First check the hum level with the coaxial lead not connected to the set and with the Y amp switch at high; range 1; Y amp maximum; X amp 4;

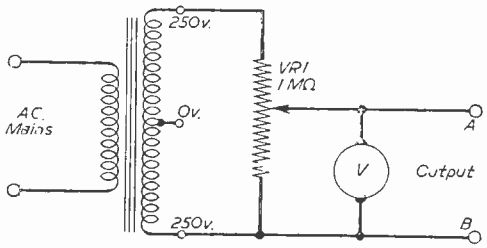
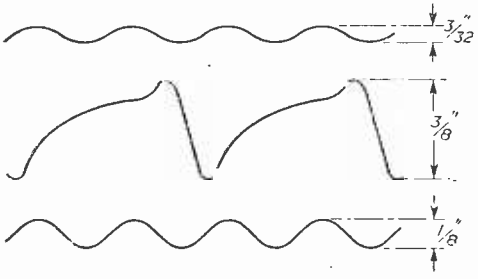


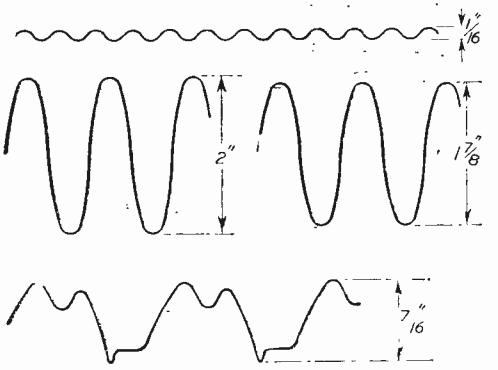
Fig. 17.—Circuit for sensitivity checking.



Figs. 19, 20 and 21.—Oscillograms referred to on page 160.

X and sync switches int.; beam blanking hard. There should be no trace of hum, and the trace should be a straight line, but as the amplification of the oscilloscope is high some precautions need to be taken in the lead used. The connections at the oscilloscope end are by means of wander plugs and some hum pick-up can occur unless the plug is screened completely as Fig. 18..

The metal case can be made from the top of an



Figs. 22, 23, 24 and 25.—Further Oscillograms.

old pen torch and the metal braid of the coaxial cable is soldered to a lead which passes through the case, allowing sufficient slack for tube to slide far enough back to connect the wander plugs. This lead is then soldered to the case, together with another lead terminating in a wander plug. In checking hum level in TV sets connect Y out to cathode of C.R.T. or grid, whichever is being modulated and earthed to chassis, and in radio sets connect Y out to L.S. and earth lead to chassis, and with controls set as previously stated line of trace should be fairly straight. With a PAM751 model the line was as Fig. 19, and no hum was visible on the screen of the set. With a G.E.C. BC5442 trace was practically a straight line, and very faint hum could be heard in background, whilst with the scope connected to the reservoir condenser and controls set range 1, Y amp low, Y amp 3, X amp 4 fine frequency 25 cps, the trace was as Fig. 20. With a Columbia C301 A.C. radio the trace was as Fig. 21 when connection was made to H.T. + with controls set as follows: Range 1, 1 amp high, Y amp max., X amp 4. With the same settings but with the lead connected to reservoir condenser trace was as Fig. 22. The hum was audible in the set and, after replacing the two condensers, the trace was as Fig. 23. For H.T +, and as Fig. 24 for reservoir condenser, and hum was not audible now.

Sound Waves

Sound waves can be seen if a microphone is connected to the Y out socket and earth, and with Y amp max., Y amp high, X amp 4, range 1, Fine frequency 7. X and sync int. beam blanking hard;

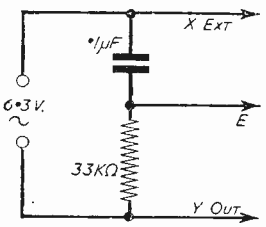


Fig. 26.—Circuit for checking phase displacement.

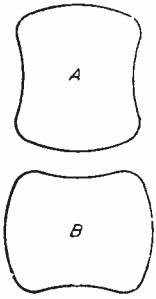


Fig. 27.—Oscillograms showing phase displacement.

on speaking into the microphone vibrations will appear on the trace. If the sound is a pure note a single trace will appear, but if harmonics are present there will be several traces. The audio note from a signal generator will appear as Fig. 25.

Phase Displacement

Using an external 6.3 volt A.C. source connect up circuit as Fig. 26, and set controls as follows: Range 6; X ext.; Y amp high; Y amp 4; X amp 6; beam blanking hard; sync int. Trace A Fig. 27 should now appear. Now reverse connections E and Y out, and trace should appear as B Fig. 27, showing a 90 deg. displacement.

(To be concluded)

Syria Sees Live TV

AFTER three weeks' concentrated work in building and installing equipment into a specially constructed studio, Pye Limited of Cambridge, England, have transmitted the first "live" television programmes to be seen in Syria. The first pictures were seen during the evening of the 1st September, when the President formally opened the Fair.

A considerable number of receivers, belonging not only to Pye, but also to manufacturers from several other countries, had been installed in different parts of Damascus, as well as in Pavilions at the Fair. Among those which had been distributed by Pye were sets for leading Government officials, hotels, clubs, shop windows, bazaars and cafés.

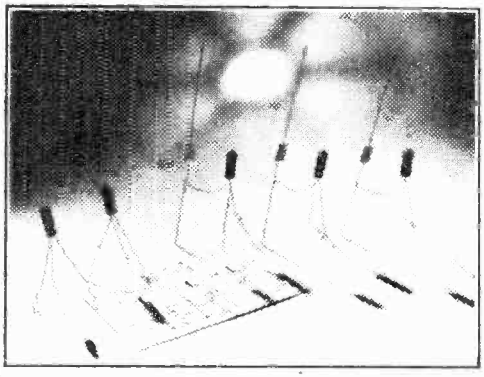
The first programme to be transmitted was a press conference and reception for Damascus journalists, televised from the studio. At it, the journalists were encouraged to ask questions of a general nature on the subject of television which they thought would be of interest to the public watching the conference. This was followed by a cabaret by Syrian artists.

The most up-to-date equipment had been installed in the Damascus studio and it incorporated all the latest modern developments. There were three television cameras, as well as a unit of telecine capable of transmitting either 35 or 16 mm. films. An outside broadcasts van, completely air-conditioned, acted as a control room and was parked immediately outside the studio with a connecting window for the producer to see into the studio. The outside broadcasts van was chosen so that the maximum mobility could be achieved in producing programmes away from the studio.

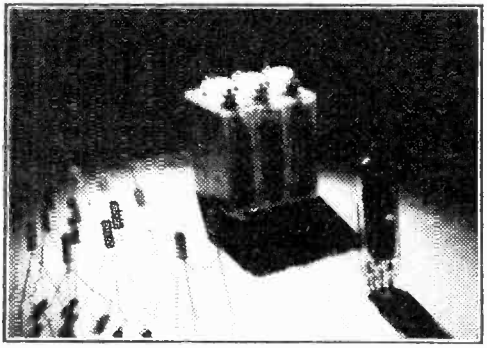
The aerial mast for the station was over 100ft. high and dominated the entrance to the British Pavilion and all the other Pavilions at the Fair. In addition to the large studio, forty-feet square, there were office and dressing-room facilities for artists taking part in the "live" programmes.

THE TRANSISTOR STORY

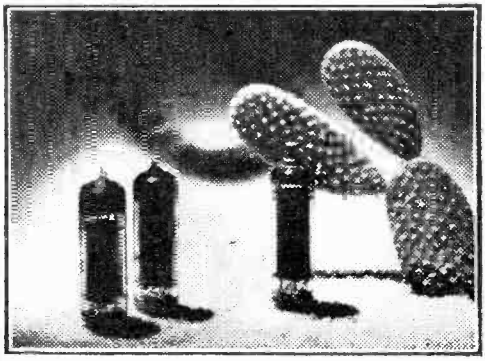
A REVIEW OF THE MODERN TRANSISTOR IN PICTORIAL FORM BY MULLARDS



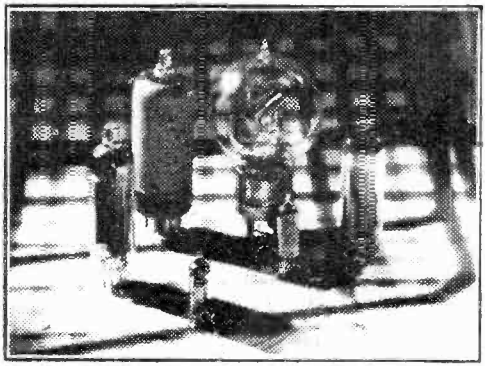
THE STORY SO FAR . . .
Latest products of Free Space evolution ; the diminutive Semicons have increased their numbers so much that they plan to take over more living space. This means trouble for the Trons . . .



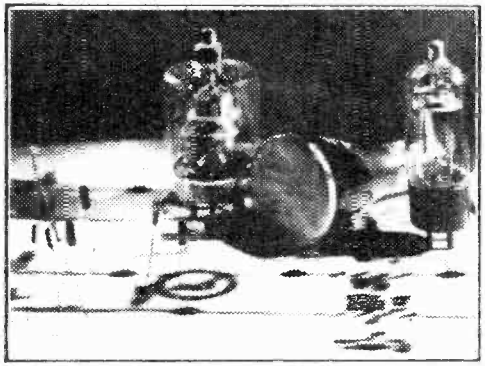
The Semicons are small, but active. More than 100 of them can keep going on the supplies needed by a single Tron.



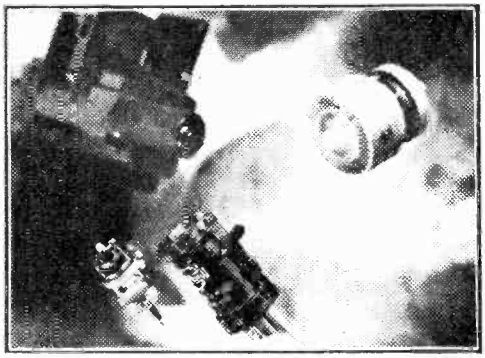
The heat of the equatorial regions is too much for the Semicons. There the Trons still reign supreme.



. . . who have been Lords of Free Space from the earliest times.



Overwhelmed by armies of Semicons, some of the Trons are forced to retreat. Others are too powerful. A truce is arranged. They live together in a state of uneasy peace.



In the higher regions of space, too, the Semicons are no match for the specialised types of Tron which have evolved there.

READ NEXT YEAR'S THRILLING INSTALMENT

Servicing TELEVISION RECEIVERS

No. 24.—THE REGENTONE 14T AND SIMILAR MODELS

By L. Lawry-Johns

AS this receiver uses a standard Plessey chassis these notes may be used in the servicing of several other receivers, including the Marconi VT63DA and various others in the Defiant, R.G.D., Argosy and Decca ranges. These are 14in. table models using a superhet circuit easily tunable with the adjustment on the rear right side of the chassis. Models marked S, L, M, W, or with no marking at all, have a vision I.F. of 14 Mc/s and a sound I.F. of 10.5 Mc/s. Models marked N (north) HM or KS have 15 Mc/s vision and 11.5 Mc/s sound I.F. tuning. Some variation may be found between various models and the focus magnet assembly may differ from our drawing. Most models are fitted with facilities for the line and frame shift, although this is not shown in the timebase drawings.

The aerial input is intended for 75 ohm coaxial cable, an attenuator being fitted in the aerial circuit marked "Distant" and "Local."

The contrast control operates on valves V1 and V3, thus its operation affects the sound volume as well as the vision. V1 is an EF80 operated as a conventional R.F. amplifier feeding vision and sound signals at R.F. to the V2 EF80 mixer-oscillator. The oscillator coil is wired in the screen grid circuit of this valve and the R.F. signals at the control grid are mixed with the screen oscillatory voltages to produce the signals at the anode at the required I.F. frequencies of sound and vision. These are tuned by the first I.F. transformer and passed to the control grid of V3 EF80, which again is common to both sound and vision. These signals are separated at the anode circuit of this valve, the sound being fed to V6 EBF80 via a 2 pF capacitor, whilst the vision signals are tuned by the vision I.F. transformer and passed to V4 EF80 control grid. Included in this circuit is the sound rejector coil which shunts signals at sound I.F. to chassis. The clear vision I.F. signals appearing at the anode of V4 are passed via the third vision I.F. transformer to the detector, which is one section of V12 EB91. The other diode section functions as the vision interference limiter. The detector diode section is that wired at pins 2 (anode) and 5 (cathode), whilst the anode and cathode of the limiter are pins 7 and 1 respectively. The detected vision signal voltages are developed across a 5.6 K and a 1 K resistor, which are wired in series from pin 5 to chassis. A test point is provided at the junction of these resistors to enable a meter to be connected across the 1 K resistor. The developed signals are passed via a resistor-capacitor filter to the control grid of V5 EF80, which is the video amplifier. Although the anode circuit of this valve is quite conventional, a single 6.8 K resistor

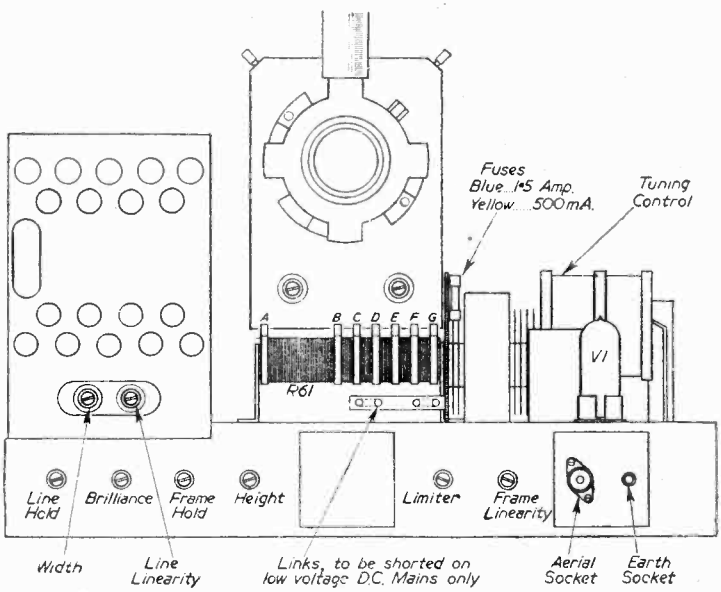


Fig. 2.—A rear chassis view.

being used as a load, the cathode circuit requires some description. Pin 1 and 3 are the common cathode connections at the valve base. From here a 2,000 pF capacitor is wired to chassis, whilst a 150Ω resistor is wired in series with a 180Ω to chassis with a 250 μF electrolytic shunted across the 180Ω.

The circuit is shown in Fig. 3 and it should be realised that a severe loss of vision response and sync will result if this capacitor becomes defective.

At the anode of V5 signals are fed to the C.R.T. cathode to the sync separator control grid via a 10 K resistor and a .05μF capacitor and also to the limiter diode V12B. The limiter control operates upon the anode of this diode, varying the H.T. applied to its anode. As the H.T. applied becomes greater and approaches that of the cathode, the valve becomes conductive and this flattens the white content of the picture. The correct setting for the control is found by advancing it until the whites tend to flatten and then retard it until this effect no longer occurs. This ensures that all interfering signals which have a greater magnitude than peak white are attentuated by the diode.

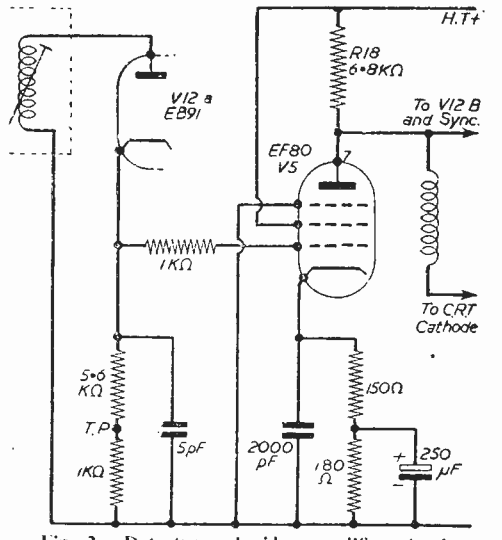


Fig. 3.—Detector and video amplifier circuit.

The Sound Circuit

Signals at sound I.F. are applied as previously stated to the control grid of V6 EBF80, being tuned by the second sound I.F. transformer. Signals appearing at the anode circuit are tuned by the third sound I.F. transformer and are passed to a diode section of the same valve. Signals developed across a ·68 KΩ resistor are applied via a .01μF capacitor to a WX6 sound interference limiter rectifier. Fig. 7 shows the circuit, and in the event of low and distorted sound the marked 2.2 M resistor (red, red-green) is to be suspected.

Other sound troubles can usually be overcome, either by the replacement of V6 or V7. Quite often a loud hum may develop due to one of these two valves developing a heater-cathode leak or short, and in this respect V7 is usually the offender.

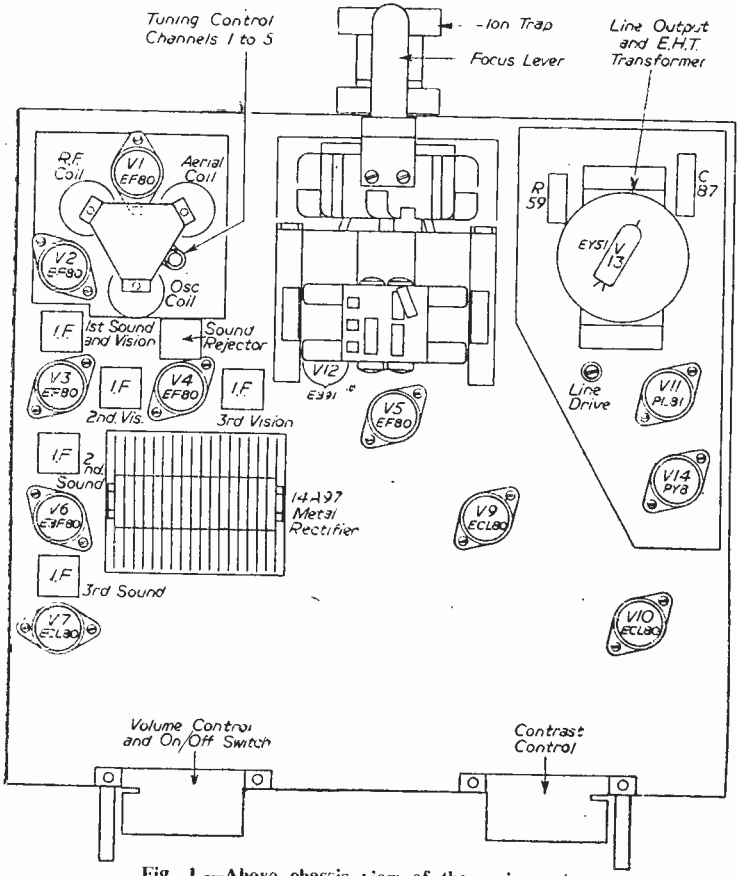


Fig. 1.—Above chassis view of the main parts.

The Line Timebase

The triode section of V9 functions as a blocking oscillator, the frequency being controlled by the line hold control.

If this control has to be at the end of its travel in order to lock the picture horizontally, suspect V9; and if a replacement does not produce a cure the 150 K resistor, which is in series with the centre tag or slider, should be inspected, as this had a tendency to rise in value. The line oscillations are fed to the V11 line

amplifier via a variable capacitor marked "line drive." The setting of this capacitor is fairly critical, and its adjustment is as follows. Screw in the control (maximum capacity) until a white line appears down the screen. Unscrew the adjustment until the white line just disappears: do not unscrew beyond this point as this may result in damage to V11 and/or the line output transformer.

The picture should then be adjusted for the best width and shape by means of the width and linearity controls.

The output of V11 is applied to the line output transformer, an overwind on which supplies the high voltage required at the anode of V13, EY51. Other windings and tappings supply the heater of the EY51 and the cathode of V14, PY81, width control, etc.

V14 is the efficiency diode. Its anode is fed from the H.T. line via the linearity coil. It will be seen from the diagram that being wired across a section of the transformer and scan coils, it effectively damps the flyback voltages and adds them to that of the H.T. line to supply the line output valve with the extra energy required. Also the boost voltages obtained is smoothed and applied to the tube 1st anode (tag 10) to supply the comparatively high voltage required by this electrode. An accurate measurement of voltage cannot be obtained at tag 10 using a normal meter due to the presence of the 2.2M resistor, and a measurement of voltage must not be attempted at the top cap or cathode of the PY81 due to the high pulse voltages present.

Lack of width can usually be traced to a failing 14A97 metal rectifier, insufficient line drive from V9, a failing V11 or V14 or a variation in the value of R56, 3.3K screen dropping resistor of V11. Frequent failure of V11 should also direct attention to this resistor, as the valve will be overrun if R56 decreases in value to any great extent.

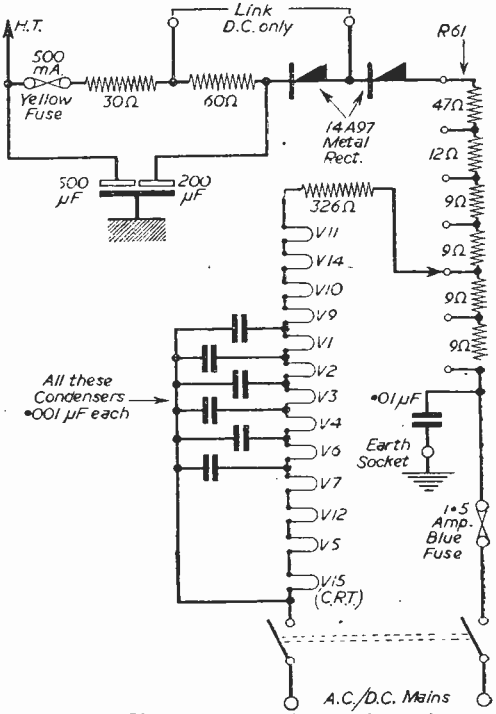


Fig. 6.—Circuit of the mains supply section.

Frame Timebase

From the anode of the pentode section of V9 which is the sync separator, frame pulses are passed via a W6 interlace diode to the anode of the frame oscillator. The triode section of V10 (ECL80) functions as the oscillator, and the pentode section as the amplifier or output.

Most frame timebase troubles which are evidenced by a distorted vertical scan can be cured by

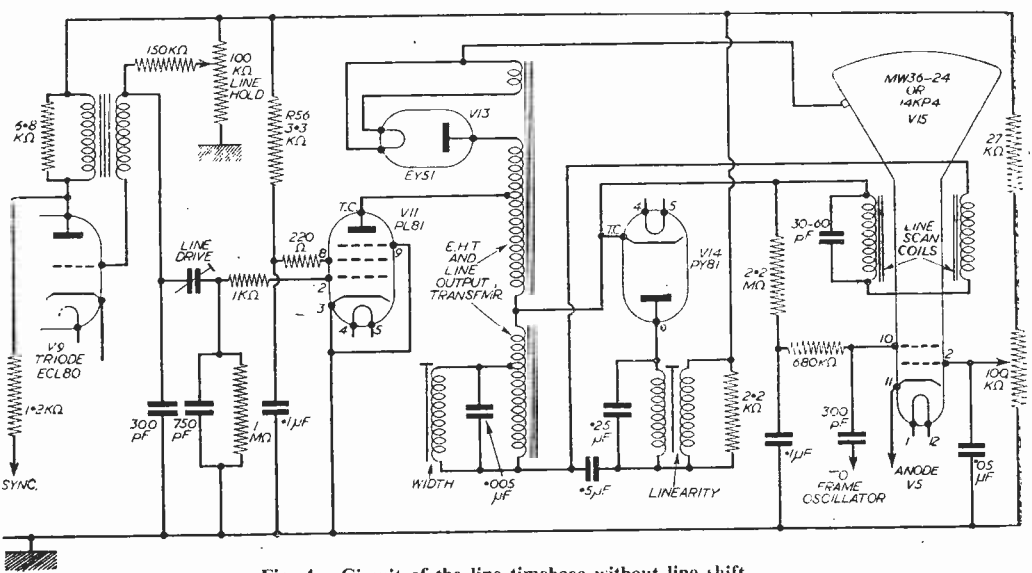


Fig. 4.—Circuit of the line timebase without line shift.

replacement of V10, although loss of hold can be due to several factors. If the hold control is at one end of its travel, suspect R47 330K. If the control works normally, i.e., will make the picture roll both upward and downward but will not lock it, suspect the interlace diode, R41 (2.2M sync separator screen resistor), R37 or R38. R37 is a 220K and R38 a 1.5M. If weak frame sync (picture will not lock) is accompanied by critical or weak line sync, check V9 and R41, and if the picture seems under contrasted at the same time, check C63 video amplifier 250 μF cathode capacitor.

C.R.T. Type and Wiring

In the Regentone, the tube fitted is usually a Mullard MW36-24 or an Emitron 14KPH. These are tetrode tubes with a duodecal base wired as follows. Pins 1 and 12—heaters; Pin 2—control grid; Pin 10—1st anode; Pin 11—cathode. The EHT supplied to the final anode is some 12-13KV and this, of course, is derived from the EY51 mounted on the line output transformer. As is well known, a common fault to develop on these tubes is a cathode to grid short, which causes the beam current to become excessive, thus overloading the EY51 and the line output stage. If no picture is obtainable, and inspection reveals that the EY51 heater is not glowing, listen for the line timebase whistle. If it is present, connect tag 10 of the tubebase to chassis. Due to the 2.2M resistor this will cause no harm. If now the EY51 heater lights up and the EHT voltage is present at the tube anode, try connecting a 2.2M resistor from tag 10 to tag 12 of the tubebase. In all probability the picture will be quite presentable, and due to the decreased A1 voltage the short should clear. A little experimenting with the value of the additional resistor, say up to 4.7M, may brighten the picture and still "hold off" the original short. If this procedure fails, use the tube as a triode, strapping tag 2 to tag 11 and connecting the lead to tag 2 in the place of tag 10, which should become redundant. If however no line timebase whistle is audible, check valves 9, 11 and 14. Uncontrollable brilliance, or a raster which is brilliant at minimum brilliance setting and vanishes as the control is advanced, indicates usually a cathode to heater short. If the set is used on A.C. mains, the fitting of a 6.3 volt isolating

APPROXIMATE VALVE VOLTAGES

	Anode	Screen	Cathode
V1	175	175	3-35 (contrast)
V2	180	40	—
V3	175	175	3-35 (contrast)
V4	175	175	2.2
V5	140	215	3.3
V6	205	100	3.75
V7 triode ...	60	—	7
V7 pentode	200	200	7
V9 triode ...	205	—	—
V9 pentode	140	5-10	—
V10 triode ...	200	—	—
V10 pentode	200	200	—
V11 ...	*	155	1.3
V13 ...	—	—	12 kV
V14 ...	215	—	*

* No test advisable.

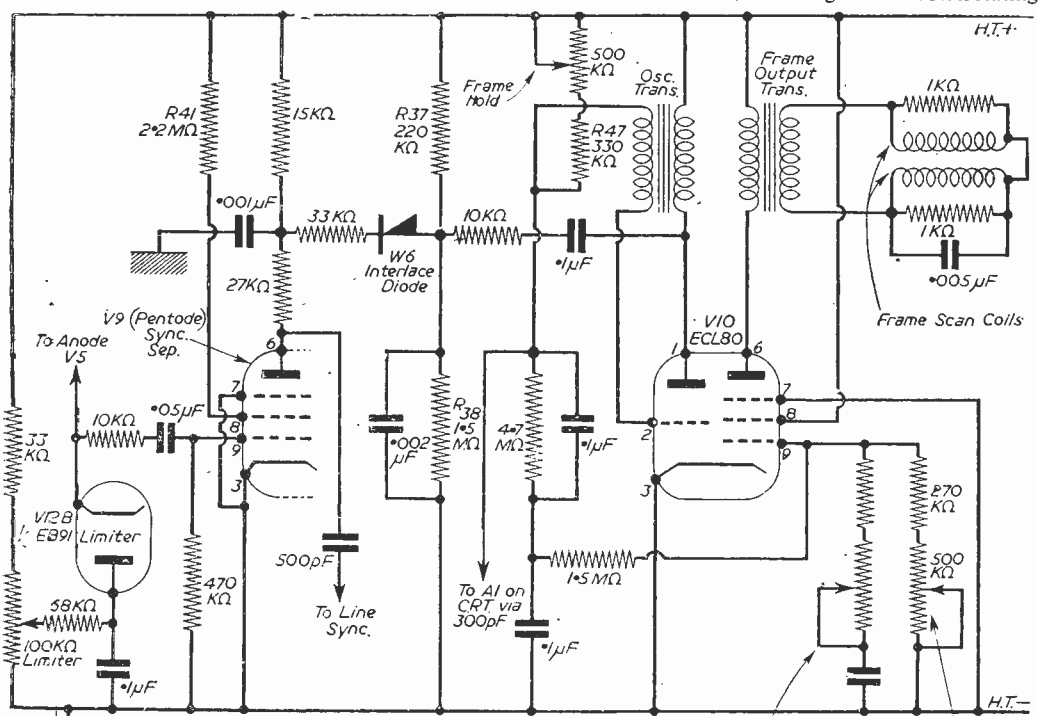


Fig. 5.—Frame timebase, sync. separator and limiter circuit.

heater transformer presents no difficulty. It should be realised that in the event of a short occurring the cathode is at chassis potential.

Therefore the 6.8 K video amplifier load resistor is effectively connected from H.T. to chassis and a certain amount of overheating is bound to occur. If, after fitting an isolating transformer, results are not as expected, check this resistor (R18) to ensure its value is correct. The heater voltage of the tube is 6.3 and if it is desired to fit a resistor in the heater chain to take the place of the tube heater when a transformer is fitted, a value of 20Ω at 3-5 watts will be in order. Alternatively, the leads to tags 1 and 12 may be connected together (after removal from the tube base of course) and the green leads of the main supply voltage selector placed on the next tag to the left.

As the receiver is designed for connection to A.C. or D.C. mains, the valve heaters are wired in series and are therefore all of the same heater current rating, i.e., .3 amp. Two fuses are provided. The 1 or 1.5 amp. is coloured blue and is in series with the mains supply. The 500 mA is coloured yellow and is in series with the main H.T. supply from the metal rectifier.

The mains supply is applied to the metal rectifier via R61, the actual tapping depending upon the mains voltage. The D.C. output of the rectifier is applied to the reservoir capacitor (200 μF) which maintains the voltage at this point fairly smooth, despite mains ripple and varying current demands. The current is further ironed out by the 30 Ω and 60 Ω resistors and is finally smoothed by the 500 μF section. The link beneath the voltage adjustment must only be made when the mains input is D.C. and the effect of this link is to short out one section of the metal rectifier to minimise the voltage drop across it and to remove the 60 Ω resistor.

It may be found that the valve numbers do not correspond with those given in this article. In place of the EF80 valves, 6BX6s may be found. 6AB8s in place of ECL80s and the PL81 may be replaced by a 21A6, the PY81 by a 1723, the EB91 by a 6AL5 and the EY51 by a 6W2.

On the Decca D14 receiver a Ferranti T14/2 triode tube is fitted, and in this case the tube wiring and circuit values are slightly different.

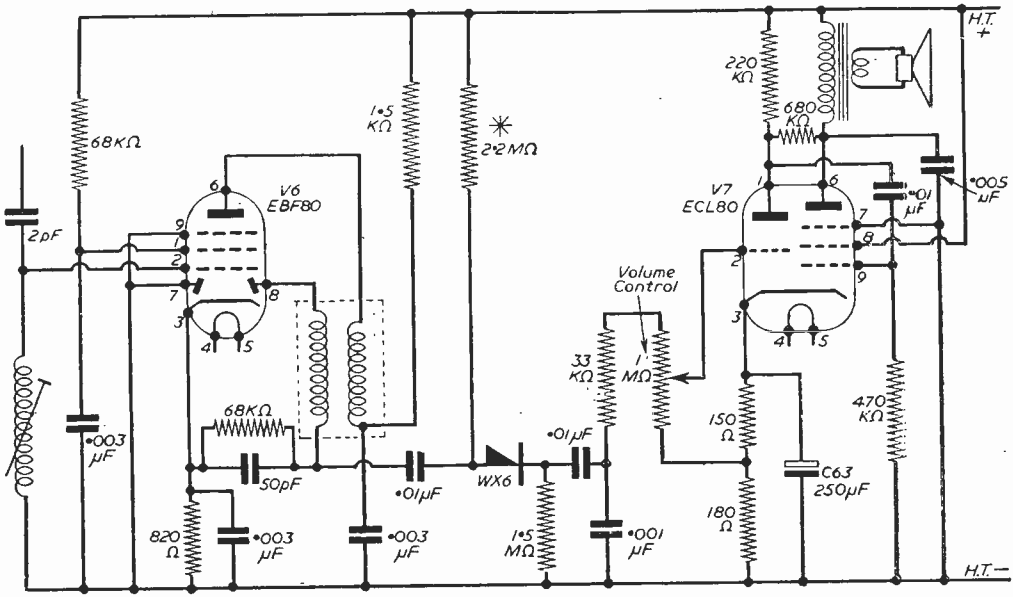


Fig. 7.—Sound I.F., detector, limiter and output circuit.

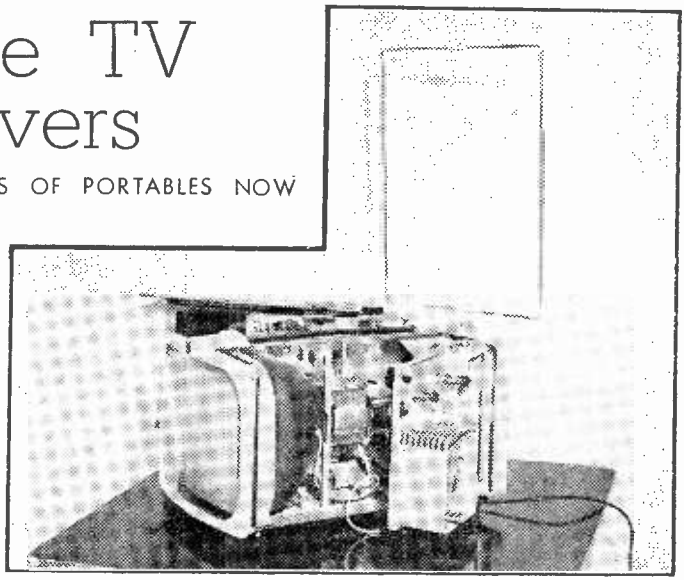
PRACTICAL WIRELESS NOW ON SALE — NOVEMBER ISSUE PRICE 1s. 3d.

The current issue of our companion paper, PRACTICAL WIRELESS, which is now on sale, contains a special article for the newcomer to Short Wave working. This consists of a constructional feature on an A.C. mains-operated Short-Wave three—two stages plus a valve rectifier for the mains section. It uses plug-in coils and is simple to construct and operate.

An interesting contemporary design for a radiogram cabinet forms the subject of another constructional feature, whilst transistor enthusiasts are catered for this month by a constructional article on a small square-wave generator housed in a fountain-pen cap. Other practical articles cover a Signal Tracer and Amplifier, the use of 807s in Class A.B2—with special reference to a transmitter modulator, a Simple "S" Indicator using a worn-out Magic eye. Other articles cover the conclusion of the series on Push-Pull and a Novel Baby Alarm, and model control enthusiasts are told how to make a single valve Model Control Transmitter. An electrostatic loudspeaker is described, whilst for Tape Recorder fans there is an article on modifying the Sound-Master and one on the fitting of an automatic switch for Tape Recorders. The Servicing article this month deals with the Marconiphone T24DAB.

Portable TV Receivers

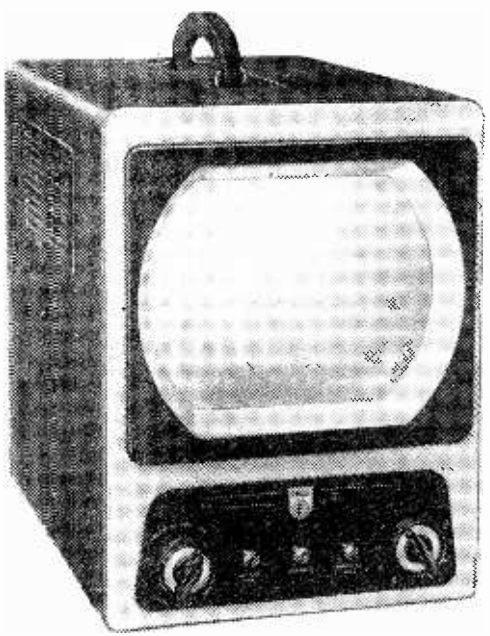
SOME INTERESTING DETAILS OF PORTABLES NOW AVAILABLE, AND THE FACTORS WHICH GOVERN DESIGN



The Pye Portable, with frame aerial in position.

WITH the increasing popularity of television as a form of home entertainment, there has arisen a need for a "second set." This may be so that certain members of the family may view one station, whilst others may have the alternative programme, or one set may be placed in a bedroom in a case of sickness, etc. There is also the possibility of wanting to use a receiver in the open on picnics or other outings, although due to the brightness of the light satisfactory reception may be difficult to obtain. These facts have led to the development by a few manufacturers of small receivers intended for what might be termed portable use, although, of course, they are by no means as light in weight as a portable radio receiver.

Now that the 17in. or 20in. screen is accepted as the more or less standard domestic size, the old 9in. tube has become obsolescent, but it is ideal for a portable receiver. The picture is large enough to offer satisfactory viewing, and in fact many homes are still using the older 9in. sets. The tube, therefore, forms the main part and governs the dimensions of the set. It is interesting to see how the various manufacturers have tackled the problem of reducing size and weight in this type of equipment and in this article four models which were shown at this year's Radio Show are illustrated.



This is the Ekco Portable.

Pye

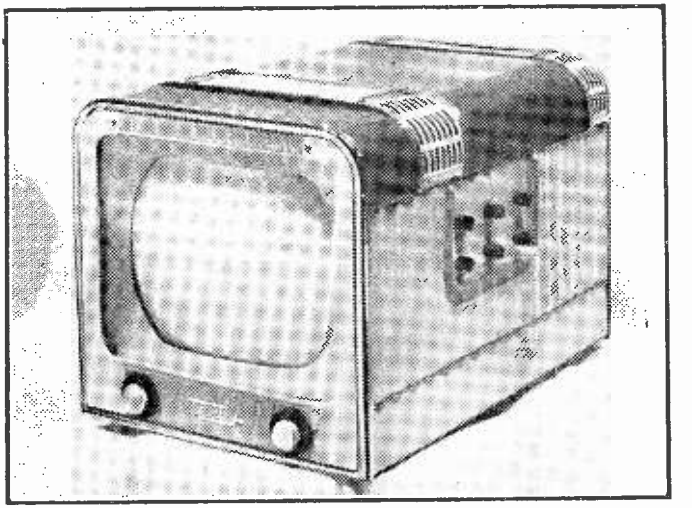
At the top of this page is the Pye, removed from its case to show the general method of assembly. In this model the front of the cabinet forms the tube mask and there are no controls or anything else to increase the overall frontal area. As this model utilises a 14in. screen, the frontal dimensions are 13¼in. by 11⅜in., and all the remaining equipment is housed in the length, making this measurement 19⅞in. The elliptical speaker (6½in. by 4in.) is on the side of the assembly, and in this particular model a frame aerial is provided for areas of good signal strength. The number of valves used in these portables may be reduced by the employment of diodes for certain functions, and double types of valves can also be used in places so that the number of actual stages is not much reduced. In the Pye, for instance, there are 17 valves, 5 selenium diodes and 3 germanium diodes, and in addition there is a 13 channel tuner.

The cabinet for this model is in aluminium, and the side portions are made removable for easy access to components, whilst the chassis swings out for easy servicing. The overall weight of this model is 40 lbs.

Ekco

The Ekco is designed on different lines, and is intended for use with a normal mains power supply, or a 12-volt D.C. supply. In this manner it may be used with a normal car battery and, unlike other portables, it may be taken out into the country in a

car and then, by merely plugging into the car lighting circuit, it can be brought into operation. The load on the battery is 7 amps. and the necessary mains or power switching is automatic, the action of plugging in the appropriate connecting lead automatically selecting mains rectifier or D.C. supply. In this model a 9in. aluminised tube is fitted and the front of the cabinet, as may be seen from the illustration at the foot of page 167, carries also the various volume, tuner and essential controls. This brings the frontal area in this model to 13⅜in. by 10½in., whilst the depth has been kept to 15⅛in. The weight is 5 lbs. less than the Pye (35 lbs.), and it will be noted that the "double-D" type of mask is employed to offer a slightly increased picture area, compared with the normal "5 by 4" rectangular picture on a 9in. tube. Again an elliptical speaker is fitted (7in. by 4in.), and the case is of aluminium covered with leather-cloth.



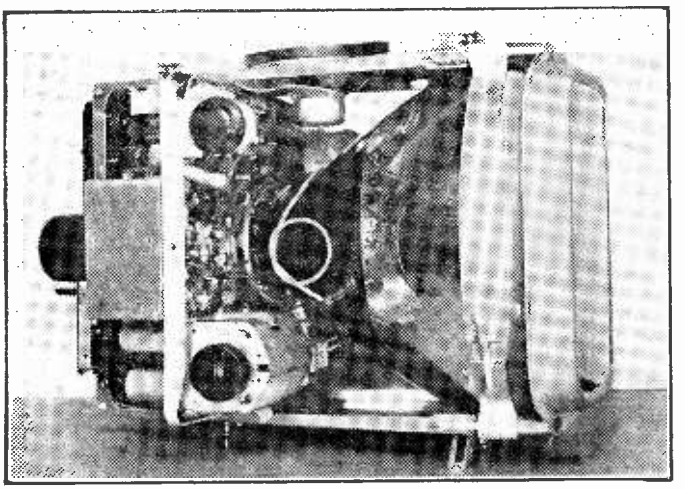
The Spencer-West "Teevy."

Spencer-West

The Spencer-West "Teevy" also incorporates a 9in. tube, and although no details are available concerning the circuitry, etc., the case is finished in various forms according to the particular use to which the receiver is to be put. One form is shown above, and another has the cabinet finished with interesting nursery pictures where it is intended that the receiver shall be a "second set" in the nursery. The general lines of design may be seen from the illustration and the general size should not be much different from the Pye.

Murphy

In the Murphy model, shown below, a 12in. tube has been fitted, but apart from other interesting features of design the containing case follows novel lines. Again the frontal area is "all picture," the controls being recessed into the sides. Instead of metal, the makers here have used a fibre-form material which is moulded in two halves—after the manner of a chocolate Easter egg. When placed together, the two halves are held by a die-cast aluminium fitment which holds the receiver in a vertical plane. To take the weight of the set when it is placed down the set stands on feet which form part of the chassis—not the case. The latter is therefore merely a shell and as such protects the interior from damage rather than the more customary utility use to which the cabinet is put. The overall dimensions of this set are 14½in. by 14in. for the front, with an overall depth of 17½in. and the weight has been kept down to 28 lbs. The layout of the interior may be seen from the illustration from which it will be noted that a form of assembly has been adopted which does not appear to have found much favour in this country, although quite popular on the Continent. In this, the chassis upon which the main receiver is assembled carries a central hole to which the scanning coils, etc., are fixed, and the tube neck is inserted into this hole so that the set is arranged round the tube. There are a number of advantages in this form of assembly, although all the valves then become horizontal and need retaining springs or screens. The turret tuner may be seen in the lower left of the picture, whilst one of the metal feet upon which the set stands may be seen on the right. The loudspeaker in this model lies on its back and points upwards through the carrying handle, and this may be seen above the looped EHT lead to the tube cap. Much of the mechanical design of this receiver was influenced by the cabinet shape.



An inside view of the Murphy Portable.

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MT2 :
Primary : 200-220-240 v. Secondaries : 350-0-350 v. 80 m/a 0/6.3 v. 4 amp. 0-5 v. 2 amp. Both tapped at 4 v. ... ... each 19/8

MT3 :
Primary : 200-220-240 v. Secondary : 30 v. 2 amps. Taps at 3 v., 4 v., 6 v., 8 v., 9 v., 10 v., 15 v., 18 v., 20 v., 24 v. ... ... each 13/3

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"ICONOS" VISITS MANCHESTER'S NEWEST ITV ESTABLISHMENT

Centre

MANCHESTER is a great city—centre of a thriving industrial area, hub of the cotton trade and a great port. Historians think of it as the cradle of the Manchester school of political theory, where Mill and Cobden expounded their ideas of economics, Free Trade and the individualist. Thanks to the constant wisecracks of music hall comedians, however, the name of Manchester has become associated in the minds of most viewers with rain—steady rain.

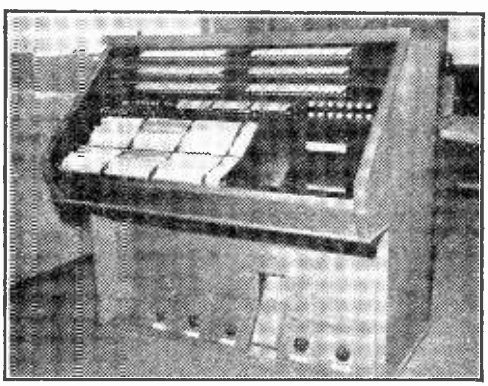
I am not quite sure whether it is by intention or coincidence that the Granada TV Network have selected an umbrella-shaped dipole as their symbol or trade mark, appearing before each transmission. This seems most appropriate. But like everything else at the Granada TV Centre, Quay Street, Manchester, it has been carefully thought out and planned, right from the zoom lenses on the cameras to the buttons of the commissionaires' uniforms.

The Granada TV plant is not of huge dimensions, judging by BBC standards or even by the aggregate space taken up by the scattered components of, say, Associated Rediffusion in London. It is compact: an admirable mixture of brand new buildings and adapted old ones situated 50 yards or so from Deansgate, in the heart of the city. There are actually two sites. The one in Quay Street contains all the production plant, workshops, production offices, dressing rooms and four stages, with ample space for extensions and garages for the outside broadcasting trucks (known here as "Travelling Eyes"), radio link vans and other vehicles. The second site, in Water Street, houses the accounts and other administrative departments, the film editing and handling sections and viewing theatres. All the premises, whether built up completely new, or re-built old, have been decorated in a pleasing contemporary style slightly reminiscent of the Royal Festival Hall, London. The cleanliness of the floors and corridors was almost clinical. I noticed that the muddy footmarks I had made in the entrance hall were magically removed when I passed it by, 20 minutes later, in the company of Simon Kershaw, the genial general manager of the Centre.

The Main Stage

Most of the studio transmissions originate from the main No. 1 Studio, 48ft. x 84ft., which is equipped with a new system of mechanical light placement. The incandescent lamps, spots and floods are suspended from the overhead grid on telescopic supports, and may be raised or lowered or slid along the R.S.J. supports on runners. This latter movement, however, is limited to some extent by the supporting girders. It is possible for an electrician to walk about on the closely placed lighting grid and make very speedy alterations to lamp positions below. The lamps, all of which are of the normal incandescent type (mostly by Mole Richardson), are supplied with alternating current through an organ-like lighting console (by Strand Electric) which controls remote contactors and dimmers situated in the roof. Two hundred and fifty amps at 115 volts is the maximum requirement with the sensitive cameras used. Direct current for arcs from a rectifier is also available but has not so far been used.

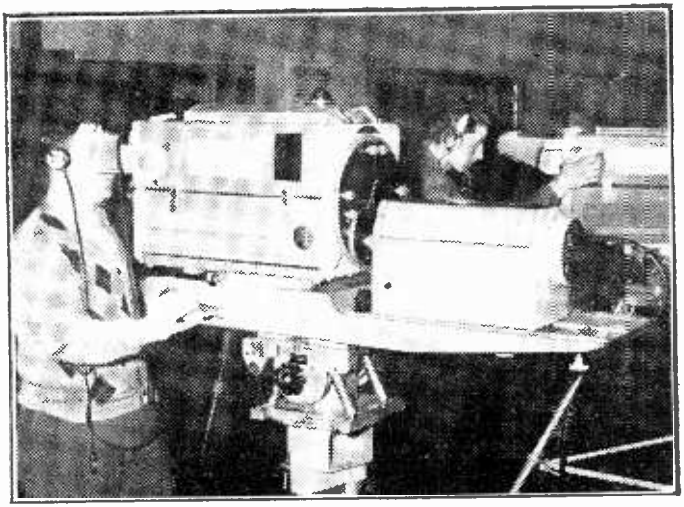
The studio is equipped with 4½in. Image Orthicon cameras (Marconi) of which three are in use and a fourth is standing by in permanent readiness. These are linked with the studio vision control apparatus, which enables the producers to make the usual cuts, fades and lap dissolves. The cameras are mounted on Houston-Fearless pedestals, with the



The lighting console in the vision control room. It is from here that the lighting operator controls the intricate lighting system.

exception of one, which is usually mounted on a Vinten Pathfinder crane.

Adjacent to this main stage and separated from it by a large plate glass window is a small "Interview" Studio, No. 2. This has been found to be especially useful for parlour game transmissions and the cameras are sometimes required to shoot through the glass from one stage to the other. Studios 3 and 4 were not fully completed at the time of my visit, though partly operational.



One of the Granada O.B. cameras fitted with a zoom lens.

Ventilation

Heating and ventilation of TV studio premises is always a problem, especially as regards the elimination of noise in both studios and control rooms. The Granada engineers have tackled this problem in a very thorough manner. Precautions have included flexible couplings between sections of the ventilation ducts and, in some places, the lining of the interior of the ducts with sound-absorbing material. The incoming air is filtered and heated but is not washed. After three months of operation in Manchester atmosphere it was necessary to replace the filters!

Telecine Facilities

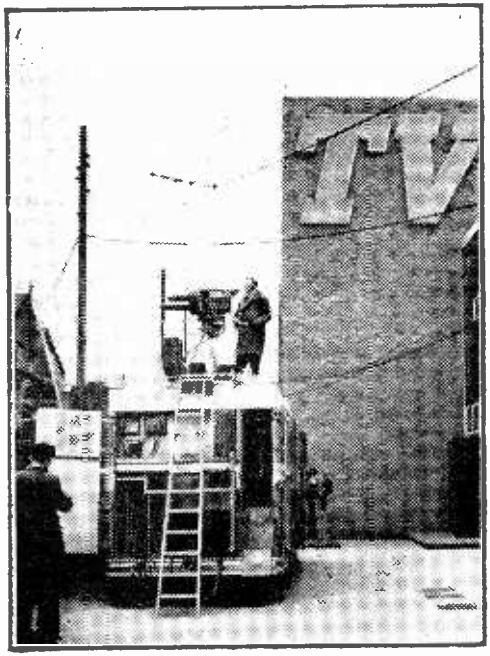
The telecine equipment consists of two E.M.I. Flying Spot scanners of the latest type, capable of handling 35 and 16 mm. film with optical or magnetic sound tracks. These machines have produced some of the finest film reproductions seen on television. There are also two Vidicon telecine machines which each includes a slide projector and also 35 and 16 mm. film mechanisms. An unusual item is a special Telejector slide handling equipment, which gives remote control of slide changing, handling 12 slides at one loading and providing an automatic lap dissolve. There are no facilities at present for telerecording, but these are under consideration.

Co-axial Links

There is a special cable between the Granada TV Centre and the G.P.O's Telephone House, Manchester, which provides six vision circuits, of which five are in use at the moment. Two outgoing circuits link the Centre with the Winter Hill transmitter in Lancashire and—shortly—the Emley Moor transmitter in Yorkshire. One incoming line handles the I.T.A. networked programmes and two incoming lines are set aside for outside broadcasts. Either of these two can be used for feeding from the Capitol, Didsbury, the A.B.C.-TV television theatre for the Manchester area. The sound and control line arrangements are orthodox.

Travelling Eyes

Granada's two outside television trucks, their "Travelling Eyes," are extremely well equipped. Each truck has a Pye three-channel system and a complete monitoring, sound mixing and gramophone reproducing desk. In addition, there are two radio link vans which can be used as radio-control rooms, and two special tender vehicles for the transporting of outside broadcast equipment. The latter are fitted with ramps to facilitate the loading of camera dollies and similar wheeled equipment. The technical planning and operation of the equipment comes under the supervision of the Chief Engineer, Reginald Hammand, who was with the International Marine Radio Co., Ltd., from 1930-35. In 1935 he joined the BBC Engineering Division, where he stayed until joining Granada in April of last year. Hedley Gower, Assistant Chief Engineer, also came from the BBC,

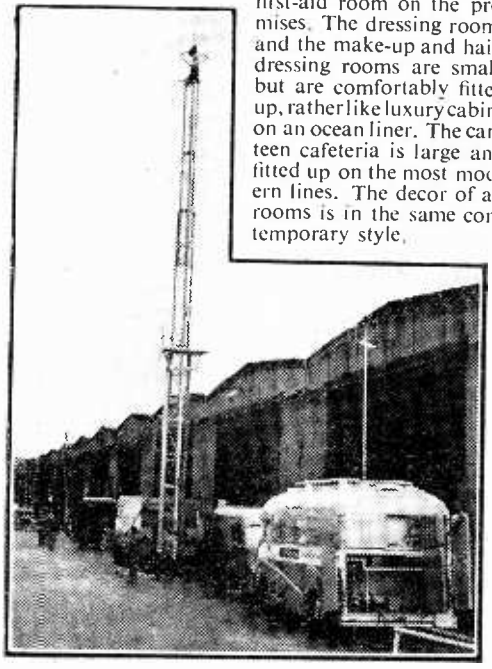


A "Travelling Eye" truck being tested outside the Granada TV centre.

where he was in the Planning and Installation Department. Leonard Holt, Second Planning Engineer, specialised in lines and communications at the BBC, including the designing of equipment used in Eurovision. These three engineers and their staff are to be congratulated upon the excellent layout and smooth technical operation of the Granada transmissions, the fine results of which I heard much from viewers in Manchester, Lancaster, Morecambe and Blackpool during my northern trip.

Ancillary Workshops and Premises

The same care and thought has been applied to the important ancillary servicing departments as was given to the electronic side. George Speller, Construction Manager, ex-Ealing Film Studios, where he was well known for his many ingenious time-saving gadgets, has laid out a fine series of workshops equipped with various types of woodworking machinery for making scenery, sets and properties. Mr. Speller, with several other leading personnel, together with Simon Kershaw, are all exiles from the Ealing Studios who seem to have settled down comfortably in their new surroundings. They have been joined by Ealing's Sister Ross, who is in charge of the first-aid room on the premises. The dressing rooms and the make-up and hairdressing rooms are small, but are comfortably fitted up, rather like luxury cabins on an ocean liner. The canteen cafeteria is large and fitted up on the most modern lines. The decor of all rooms is in the same contemporary style.



An O.B. control room (to the right of the picture), with an Eagle Tower which enables the mobile mast to be raised to 60ft.

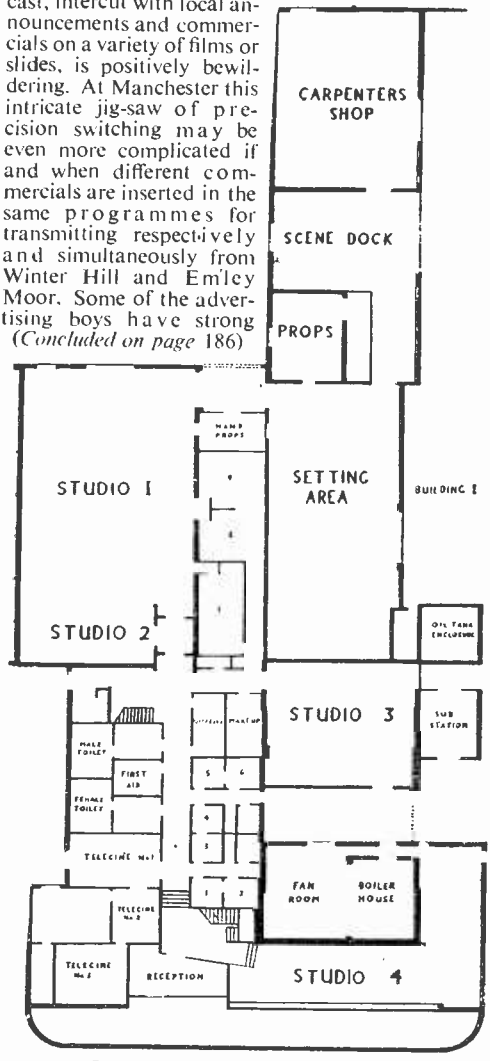
Granada Programmes

The principal object of this article is to report upon the premises and engineering facilities of the Granada Television Centre. But I must also refer to the programmes side, under the control of Denis Forman, who was formerly Director of the British Film Institute, and to Eddie Pola, who handles the variety programmes. The live programmes which originate from both the studio and from the "Travelling Eyes" have been very favourably received by viewers in the Lancashire area and elsewhere. Granada has paid special attention to the need for programmes which are serious and informative but, at the same time, not pompous or boring. I seemed to sense that the spirit of Cobden—suitably streamlined—emerged in some of these. The proportion of programmes originating at this studio is likely to increase in the future. At present, the number of live transmission hours in an average week is about 25, plus nine hours of film. These figures include, of course, programmes from other sources and the National ITV network.

Commercials

Split-second timing of programmes is the rule here, as at other ITV centres. The mixture of local announcements with or without local picture, followed by, perhaps, an ITV network outside broadcast, intercut with local announcements and commercials on a variety of films or slides, is positively bewildering. At Manchester this intricate jig-saw of precision switching may be even more complicated if and when different commercials are inserted in the same programmes for transmitting respectively and simultaneously from Winter Hill and Emley Moor. Some of the advertising boys have strong

(*Concluded on page* 186)



Ground plan of the Granada centre.

THE device to be described measures, in conjunction with a 1 mA meter and suitable power supplies, A.C. signals between 10 c/s and 60 Kc/s, of amplitudes between 0.1 and 10 volts. It has an input impedance of 0.5 megohm, so that it does not appreciably load the circuit under test.

It can be used for checking test equipment, audio and supersonic voltages, measuring gain, feedback factor and output power.

The voltmeter consists of an input attenuator, acting as a range switch, followed by a two-stage resistance-capacity coupled amplifier which drives a 1 mA meter via a full-wave bridge rectifier. A total

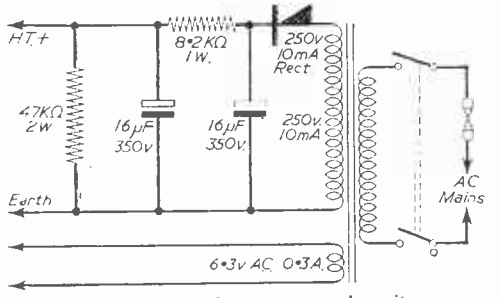


Fig. 3. A mains power supply unit.

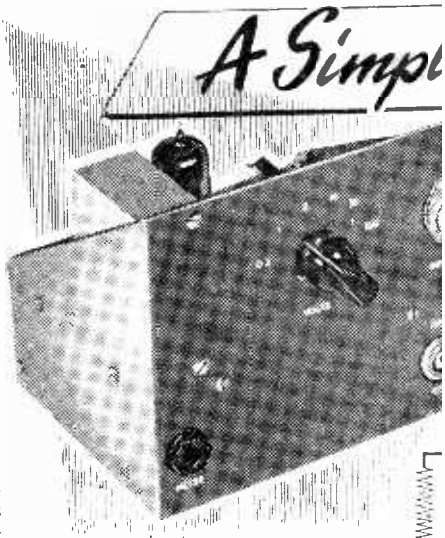
of 30 dbs feedback is provided by unbypassed cathode resistors in both stages, and by overall current feedback from the output to the first valve cathode. This gives a feedback voltage proportional to the output current, eliminating much of the non-linearity associated with meter rectifiers. The amount of this feedback, and consequently the gain of the amplifier, is adjusted by the wirewound potentiometer RV1. C2 and R7 reduce the feedback at high frequencies to compensate for the fall in amplifier gain due to stray capacitances.

The minimum frequency is governed by the values of C3 and C4, and is about 10 c/s.

The second stage feeds into a very low load impedance, and to give high gain without distortion a high-slope low-impedance valve is desirable. Consequently a 12AT7 double triode is used.

The attenuator consists of high-stability resistors with a total resistance of nearly 0.5 megohm. This is a somewhat low value for a valve voltmeter, but it is the best that can be achieved without the use of a cathode follower. Even with the values specified, on the 1 volt range where the resistance feeding the first stage is highest, stray capacitances cause the meter to read 5 per cent. low at 25 Kc/s. On other ranges the maximum frequency is 60 Kc/s.

The external



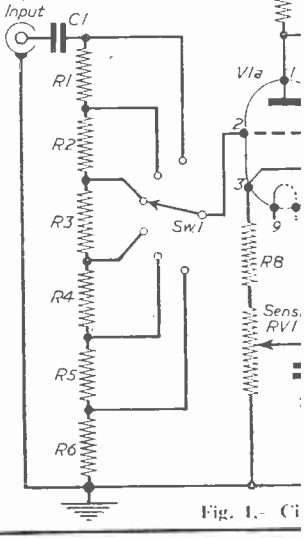
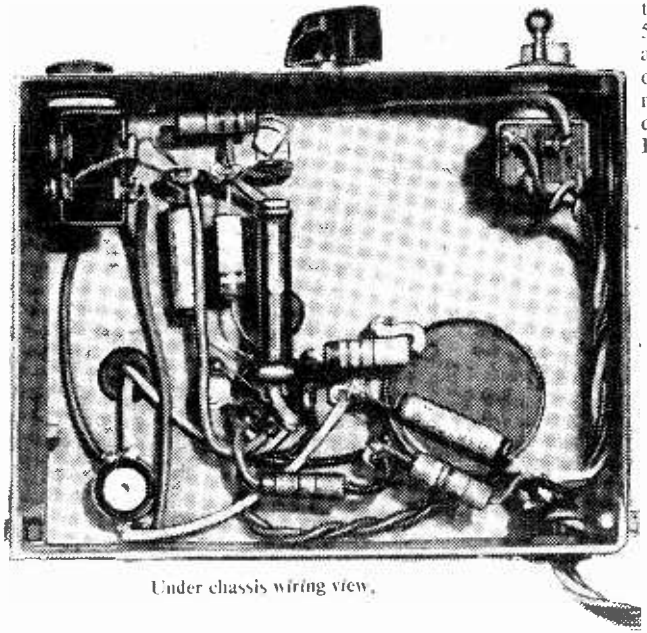


Fig. 4.- Ci



Under chassis wiring view.

LIST OF C

Capacitors –

C1 –0.5 μF 350 volts working 25 per cent. Paper

C2 0.001 μF 350 volts working 25 per cent. Paper

C3 0.005 μF 350 volts working 25 per cent. Paper

C4 2 μF 350 volts working 25 per cent. Paper

Resistors –

R1 to R6 are attenuator resistors and must be of high stability. The table on page 176 lists these and at the same time shows the voltage readings which those values will give.

R7 –3.9 K ½ w. 10 per cent. Carbon

R8– 150 ohm ½ w. 10 per cent. Carbon

R9 - 100 K ½ w. 10 per cent. Carbon

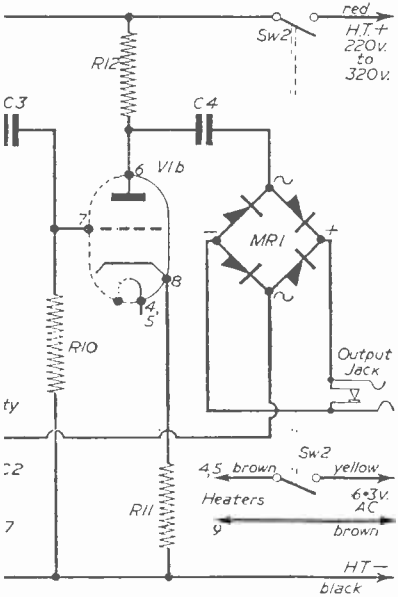
? Valve Voltmeter

AN A.C. MEASURING DEVICE WHICH IS EASY AND INEXPENSIVE TO CONSTRUCT

By R. C. Marshall

power supplies required are 220 to 320 volts D.C. at 3 to 5 mA, and 6.3 volts A.C. at 0.3 amps. If it is desired to make the instrument self-contained, a larger chassis may be used to provide space for the power pack and 1 mA meter beside the unit described in detail. A suitable supply unit is shown in Fig. 3.

It is recommended that the layout shown in the photographs be adhered to, or modification to the values of R7 and C2 may be required. Chassis details are given in Fig. 2.



t of the valve voltmeter.

Wiring

First wire up the attenuator as a separate unit and then assemble the chassis and all those components which are bolted to it. Next wire up the power cable and on/off switch SW2, and connect the attentuator to pin 2 of the valve. Lastly, the remaining connections should be made, and the wire-ended components fixed. The meter should be connected by the wires supplied, as soldering directly to its tags will cause damage. Note that neither side of the meter is earthed; make sure that the jack used does not introduce such an earth.

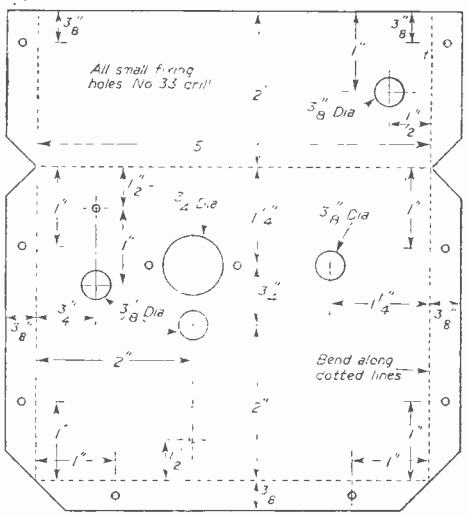
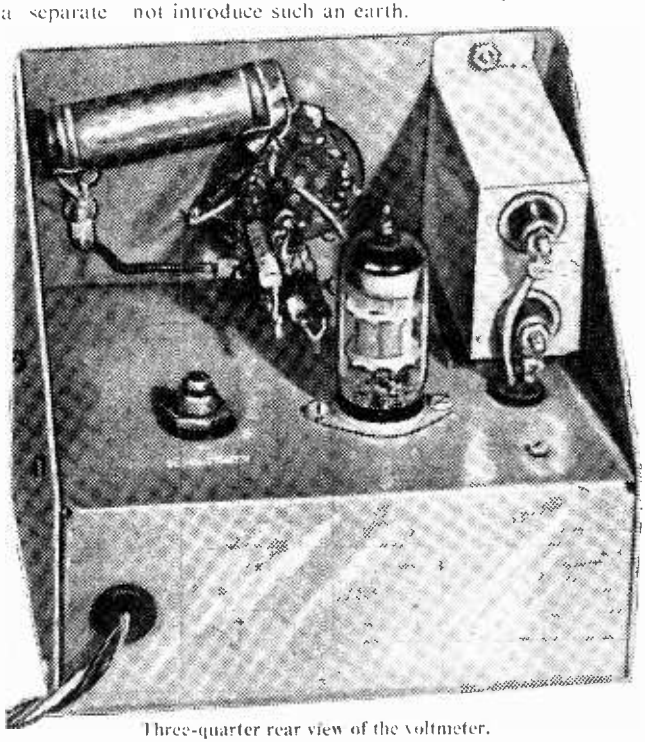


Fig. 2. Chassis bending and drilling details.



Three-quarter rear view of the voltmeter.

COMPONENTS

R10—1 M ½ w. 10 per cent. Carbon
R11 680 ohm ½ w. 10 per cent. Carbon.
R12—68 K 1 w. 10 per cent. Carbon.

Miscellaneous—
MR1 1 mA Meter Rectifier
V1—12AT7
SW1—1 pole 6 way Wafer Switch
SW2—DPST Toggle Switch
RV1—500 ohm Wirewound Potentiometer
Closed-circuit Jack Socket
Belling-Lee Coaxial Socket L604S
B9A Valveholder
Aluminium (18 s.w.g.), nuts, bolts, solder tags, tag strips, grommets, wire, sleeving, knob.

Calibration

The meter should be initially calibrated against a standard, which may be any accurate A.C. meter. This may conveniently be done at 50 c/s. The comparison should be made on as many ranges as possible, to check the attenuator. The meter sensitivity is adjusted by RV1. As a check on open-loop gain, turn RV1 to the position of maximum sensitivity and check that the meter is 7 to 10 times as sensitive as it was when correctly adjusted.

When correctly adjusted the meter reading is unlikely to be in error by more than +1 per cent. or −4 per cent. over any of the operating ranges specified above. Changing valves may introduce up to 2 per cent. variation, so recalibration is desirable but not essential.

When the meter is used with speech or music signals, it must be remembered that whilst calibration is in terms of r.m.s. voltage this is only true for sinusoidal inputs, as the meter actually measures average voltage.

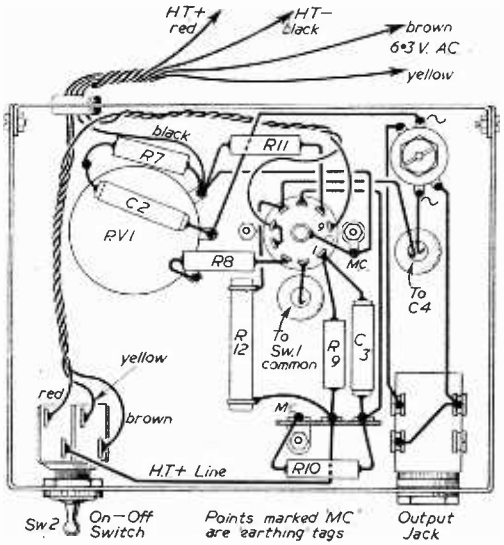


Fig. 4.—Under chassis wiring scheme.

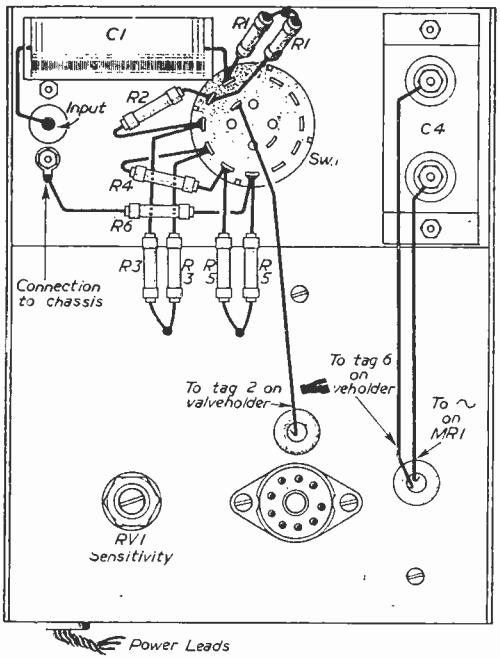


Fig. 5.—Above chassis and panel wiring details.

ATTENUATOR RESISTORS
(All Welwyn ½ watt High-Stability)

R1—700 K, i.e. 200 + 500 K
R2—200 K
R3—70 K, i.e. 20 K + 50 K
R4—20 K
R5—7 K, i.e. 2 K + 5 K
R6—3 K, i.e. 2 K + 1 K
With these resistors, ranges are:
1—300 mV
2—1 V
3—3 V
4—10 V
5—30 V
6—100 V

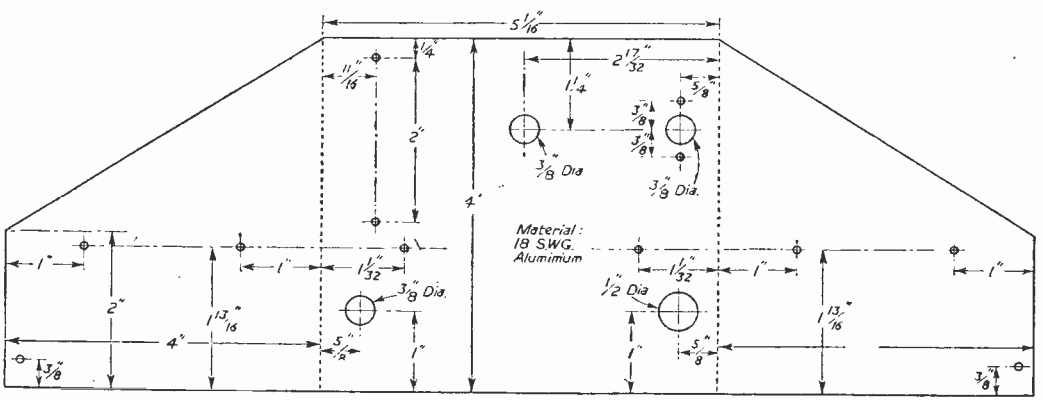
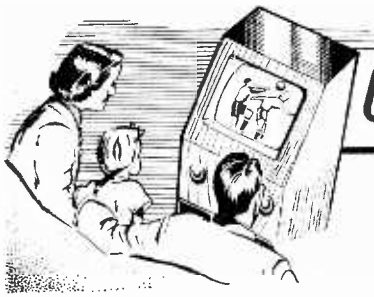


Fig. 6.—Case bending and drilling details.



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

NEWSREELS

NEWSREELS have been with us in one form or another for many years. The life of a cinema newsreel used to be about six weeks, descending during this time from the glittering presentation of the West End theatres to the flickery projection of the small town and fairground fit-ups. TV has outmoded the smaller cinemas, and the life of the newsreel is now little more than one week. TV newsreels and film sequences have the ephemeral life of one day, after which they shed their aura of topicality and are relegated to the junk bin or the film vaults. From the junk bin they go to the processers who recover various ingredients from the film base and the photographic emulsion, and the silver from the latter possibly goes to making more photographic emulsions and, perhaps, more TV newsreels. The silver photographic image of Sir Anthony Eden of to-day might, in fact, be the chemical reincarnation of Lloyd George or Mr. Asquith of years ago. More interesting is what happens to the film which is stored away in the film vaults, for use again—but when?

FILM ARCHIVES

THE BBC has been building up a library of picture and sound records of this day and age for some considerable time. Like the Pathé, Movietone and other newsreels, they have accumulated huge footages of all the national events together with many other filmed features, for future use. Telefilmed plays are occasionally brought out for reissue or prints are made for export. In the vaults, too, are thousands of useful shots of rough seas, huge crowds, big fires, aerial views, animals, sunsets, snowstorms, etc. etc., any of which can be produced and used for the film sequences in dramatic or documentary live TV subjects. The historic items are used from time to time in the popular scrap-book features. Television consumes large footages of these items week by week and the calls upon the resources of the film libraries maintained by the BBC and also by all the I-TV companies are constant. For many specialised shots, the assistance of the film studios' film libraries is sought, and many a spectacular shot of arctic wastes or sun-baked veldt, previously seen in some superfilm, is now finding its way into the complicated pattern of live TV presentation by both BBC and I.T.A. These special shots, frequently only 3ft. or 4ft. long, are usually quite expensive to buy and are, in fact, leased for use in one named subject only; after use, they must be returned to the owner-library or destroyed. Nevertheless, it is far cheaper to pay £10 or £20 or more for such a shot than to attempt to film it afresh. Library shots are usually leased at so much per foot, but the footage of individual shots is quite small. There is a good deal of interchange between the various libraries and a special organisation has sprung up to standardise on procedure, charges, descriptions and filing systems. Physically, the problem of actual storage of film has been eased considerably with the introduction of safety-base film. Until about two or three years ago the highly inflammable nitrate film base was used, and film vaults had to be fitted with elaborate and expensive sprinkler systems. Now, film vaults merely have to be brick-built and generally convenient, with iron shelves; sprinklers are not required. Storage space for film libraries has expanded enormously as a result.

"LE MANS"

ONE of the very best filmed items put out by the BBC was the "special" they made of the 1956 Le Mans car race. In record time there was presented a documentary record of the event, edited with the smoothness and slickness of a feature film, complete with commentary, sound effects and a little music. The highlight of this particular film was a trial run around the course by Mike Hawthorn, which was filmed with a camera mounted on the tail of the car, looking over Mike's shoulder. A microphone was strapped to his face and the viewer was able to hear as well as see just what goes on at all points of this exciting course: his commentary was characteristic and crisp, and added to the thrill of this epic shot.

I understand that a Newman Sinclair camera was used for the picture and a portable tape recorder for sound, the recording subsequently being transferred to magnetic sound-on-film for transmission purposes. Here is an item that well deserves to go into the BBC archives for future reference! It has been selected by the British Kinematograph Society for showing at one of the coming season's meetings, as an example of "outstanding filmcraft." The Shell-Mex film of the 1954 Le Mans race was very fine, compiled from dozens of cameras, painstakingly edited together and served up with typical French accordion music. But the latest BBC film has a supercharged zip even more in tune with the roar of the hotted-up racing engines.

"WHO GOES THERE!"

THE rapidly changing taste of the viewers for comedy is having an amazing effect upon the impact of the older stage comedies when they are presented on TV. *Who Goes There* was one of the comedy successes of 1951 when it was put on by Henry Sherek at the Vaudeville Theatre. And yet in 1956, this comedy by John Dighton seemed to be very much dated, with dialogue and situations which failed to arouse much mirth, and with presentation which seemed

to be almost static. It seems to me that we have become accustomed—or possibly drugged—to expect the pace and high-speed quips of the Burns and Allen Show and *I Love Lucy*, or the crazy nonsense of the Goons. Comedies which rely upon situations alone have less appeal, unless played with expert "character" interpretations. This, however, requires the presence of actors of the calibre of Alec Guinness, Peter Ustinov or Cecil Parker.

GOONATICS

THE short seasons we have had of the Goons on *Idiot's Weekly—Price Twopence* and *A Show Called Fred* started a new era in crazy humour, which seems to be breaking out in various other programmes, particularly on commercial TV. Harry Secombe has left the gang, but Harry himself, Peter Sellers, Spike Milligan and others seem to bob up in all kinds of shows to provide the quota of new style comedy. Peter Sellers appeared as a phoney operatic singer and performed a riotous duet with Dicky Valentine in his own TV Show. Dicky co-operated with engaging good humour and even took part in an amusing simultaneous dance with Peter Sellers. The song was "I'm walking backwards for Christmas," a burlesque of the sentimental ballads of which we hear so many. The crazy goon song has become quite a best-selling gramophone record, and this in itself has increased the public taste for goonatic humour.

"RATS TO YOU!"

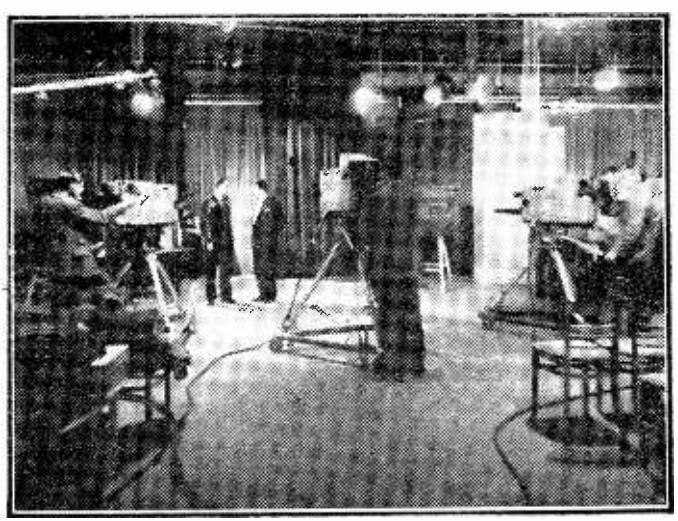
THE series of vaudeville programmes specially arranged for the BBC by that unique organisation, the Grand Order of Water Rats, has come to a dismal end, carrying with it evidence of the troubles and trials which beset its organisation. It started off hopefully, but not too successfully, with the veteran music hall star Wee Georgie Wood looking after the interests of the Water Rats, supported by a committee of fellow music hall artists. Following a few bad press notices of the first show there was considerable bad feeling about the choice of artists and the general production arrangements and Georgie Wood was asked to hand the reins elsewhere. The internal strife was made public in the theatrical newspapers and many artists weren't too keen in taking part, and the show degenerated into a conventional cabaret show of a type which is now considered by viewers to be of the "corny" variety. This is a pity, because there is an enormous range of talent available in the Water Rats fellowship of music hall artists, and their Rats Revel Shows for charity given at theatres or at banquets at the big hotels have always sparkled with fun, even if that fun was what might be termed "robust." Most of these shows have been produced by Wee Georgie Wood whose knowledge of the business and whose flair for giving scope for such famous "ad-libbers" as Tommy Trinder, Bud Flanagan and the Crazy Gang has been an enormous asset. Let us hope that the BBC appoint someone to take the show thoroughly in hand before the next series commences, making use also of the people who made contributions in ideas, scripting and production which were such a bright feature of the Rats Revels.

AMERICAN TV FILMS

THERE is no official quota for British TV films or British live TV features on commercial television. In the cinema, the quota calls for 25 per cent. of the films shown to be of British origin. In commercial TV the I.T.A. have the delicate responsibility of maintaining a "reasonable" proportion of items, filmed and live, which is of British origin. This seems to work out at about 85 per cent. of the total transmission hours. In other words, the screen time of foreign (mostly American) features which is transmitted seems to be about 15 per cent. This American material looms prominently because it is the cream of the items considered suitable for British TV audiences and it achieves peak viewing times here. If the percentage of imported material grows greater, I have no doubt that the trade unions will nudge Sir Robert Fraser's arm as a reminder. All the same, a little more latitude in this matter would give all TV organisations—both I.T.A. and BBC—a much needed relief, creatively and financially. The consumption of new ideas is prodigious. No wonder there is a tendency to fall back upon amateur talent shows and parlour games.

"THE LAST ENEMY"

ANOTHER outstanding TV play, this time from AR-TV, was *The Last Enemy*, a dramatisation of Richard Hillary's wartime biography. Technically, this was a very skilled mixture of filmed and live television. For the 'plane sequences and montages, official and newsreel sources must have been drawn upon in a big way. All fitted in perfectly with the narrative, spoken by Peter Murray, who also portrayed Hillary. Of all of the TV plays or features which have depicted the lives of pilots who took part in the Battle of Britain, this, I thought, was the most moving: Peter Murray is a young actor who should be watched—here is another TV star.

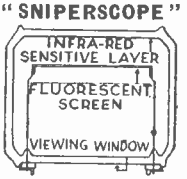


Shooting a live scene on No. 1 stage of the Granada centre, a description of which will be found on pages 171 to 173.

12in. TV. CABINET—15/-

We are offering these at not much more than the cost of the plywood they contain. If not wanted for TV. many useful items can be made — record storage cabinet, H.F. loudspeaker case, book case, etc., etc. Price **15/-**, carriage 3.6.

"SNIPERSCOPE"



"Cats eye" used for seeing in the dark. Will work burglar alarms, counting circuits, smoke detectors and the hundred and one other devices as will the simpler type of photo cell. Price **5** - each. Post and ins. 1/-. Data will be supplied with cells if requested.

WESTINGHOUSE (U.S.A.) METERS

All flush mounting type, outside diameter of face 3½in.

0-500 v. D.C.	25/-
0-1.5 kV D.C. external multiplier supplied	35/-
0-2.5 kV D.C. external multiplier supplied	35/-
0-15 v. A.C. moving iron	30/-
0-1 mA.	35 -
0-50 mA.	25 -
0-100 mA.	25 -
0-150 mA.	25 -
0-250 mA.	25 -
0-500 mA.	25 -

CONNECTING WIRE

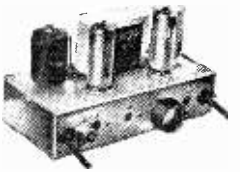
P.V.C. covered in 100ft.coils—**2 9** a coil or four coils different colours, **10/-** post free.

W.D. CIRCUIT DETAILS

Diagrams and other information extracted from official manuals. All **1/6** per copy, 12 for **15.-**.

American Service Sheets	78 receiver 76 receiver
A.1134	R23 ARC3
BC.348	R1116 A
BC.312	RA-1B
R.103A	AR88D
B.C.342	AN.APA-1
RA-1B	78
R-208	76
R-1155	R.T.18
R-1124A	CAY-46-AAM-
R-1132A/R-1481	RADAR
R-1147	A.S.B.-3
R-1224A	Indicator 62A
R-1082	Indicator
R-1355	A.S.B.3
B.C.1206-A B	Indicator 62
B-455-A (or -B)	Indicator 6K
B-454-A (or -B)	R.F. unit 24
B-453-A (or-B)	R.F. unit 26
Transmitter T1154	R.F. unit 25 R.F. unit 27
Fifty-eight walkie talkie	Wireless set No. 19
Frequency meter B.C.221 R.109	Demobbed valves

PRODUCTION INCREASED—CIRCUIT IMPROVED—PRICE REDUCED

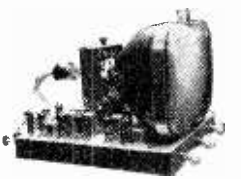


To-day's best value in Band III converters suitable for your T.V. or money refunded. Complete ready to operate, **49 6** non-mains, or **69 6** mains. post and insurance, 3.6.

T.R.F. CONVERTOR

New this month is a convertor for T.R.F. Set Viewmaster-Electronic Engineering, etc. Small mods. to the T.V. are necessary as this must be turned into a superhet to stop re-radiating.
Price complete with two valves **£6.10.0** assembled—ready Oct. Nov.

THE UNI—T.V.



Undoubtedly the most up-to-date televisor for the home constructor. You can build all or only part and the set when finished will be equal to a factory-made equivalent. What other constructor T.V. has all these features?

★Made up units if required.
★ All miniature valves.
★ Metal rectifier.
★ No expensive transformers.
★ 13-channel circuitry.
★ Multi-vibrator time bases.
★ Ferruxcube, E.H.T. and scan coils.
★ 34/38 Mc/s I.F.
★ Suitable for any modern 12, 14 or 17" tube.
★ Modern contemporary cabinet if required.

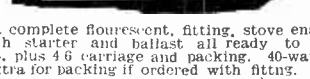
The building cost (less tube) is only **£29.10.0.** plus 10 - carriage and insurance. All parts guaranteed 12 months. Full information and data free with parts or available separately price **3 6.**

THE "CRISPIAN" PORTABLE RADIO

A 4-valve truly portable battery set with very many good features as follows: Ferrite rod aerials, low consumption valves, superhet circuit with A.V.C. ready - built and aligned chassis if required, beautiful two-tone cabinet covered with I.C.I. Rexine and Tygan. Guaranteed results on long and medium waves anywhere.

All parts, including speaker and cabinet, are available separately or if all ordered together the price is **£7.15** complete, post and ins. **3/6**, ready-built chassis **30/-** extra. Instruction booklet free with parts or available separately price **1·6.**

THE REALITE



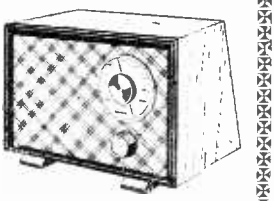
This is a complete flourescent, fitting, stove enamelled white with starter and ballast all ready to install. Price **25.-**, plus 4 6 carriage and packing. 40-watt tube, **10/-**, no extra for packing if ordered with fitting.

CROYDON BRANCH OPENING

We have taken the Lease of 266, London Road, Croydon, and hope to open this month.

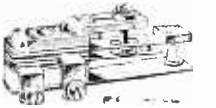
THE SKYSEARCHER

An all mains set for 19 6



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

THERMOSTATS

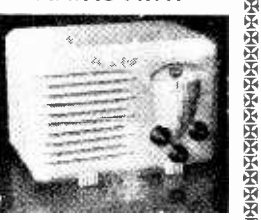


Useful for the control of appliances such as convectors, glue-pots, vulcanisers, hot plates, etc. Adjustable to operate over the temperature range 50-550 deg. F. 1 amp., **3 6**; 5 amp. **8 6**; 2 amp. QMB. **5 6**; 5 amp. QMB. **15 -.**

MULLARD AMPLIFIER "510"

A Quality Amplifier designed by Mullard. Power output exceeds 10 watts. Frequency response almost flat from 10 to 20,000 C.P.S. For use with the Acos "H.G." and other good pick-ups. Made up and ready to work is **£12 10 -** or **85/-** deposit, plus **10 -** carriage and insurance.

MAINS-MINI



Uses high-efficiency coils, covers long and medium wavebands and fits into the neat white or brown bakelite cabinet—limited quantity only. All the parts, including cabinet, valves, in fact, everything, **£4 10/-**, plus 3 6 post. Constructional data, free with the parts, or available separately 1 6.

ELECTRONIC PRECISION EQUIPMENT, LTD.

Post orders should be addressed to E.P.E., LTD., Dept. 5, Sutton Road, Eastbourne.

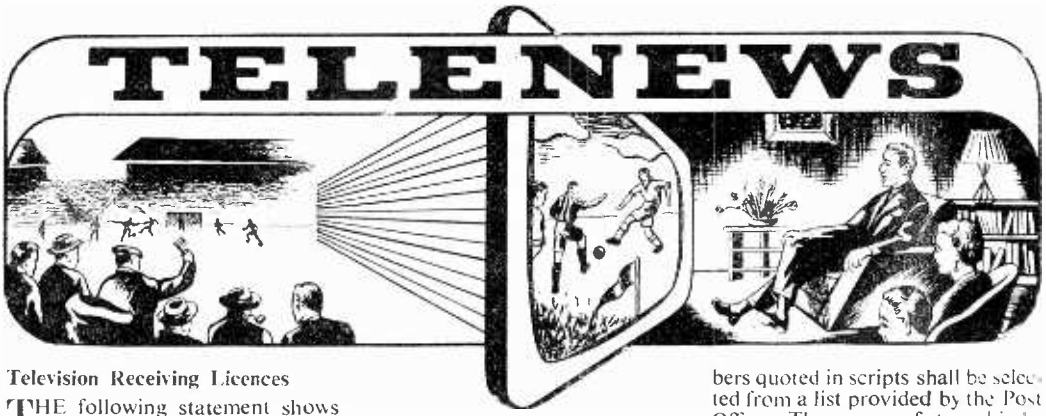
Personal shoppers to one of these addresses please.

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

152-3, Fleet Street, E.C.4.
Phone: FLEet 2833
Half day, Saturday.

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

249, Kilburn High Road, Kilburn.
Phone: MAIda Vale 4921.



Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of August, 1956, in respect of receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London Postal	1,344,110
Home Counties	695,058
Midland	1,038,454
North Eastern	923,138
North Western	868,436
South Western	413,773
Wales and Border Counties ...	336,689
Total England and Wales ...	5,619,658
Scotland	377,446
Northern Ireland	47,226
Grand Total	6,044,330

I.T.A. Lichfield Station

THE I.T.A. announces that, in association with Pye Radio Ltd., they have been able, by arranging for the simultaneous parallel operation of the two existing transmitters, to increase the power of their Lichfield station from 50 to 100 kW.e.r.p. This is an interim measure and it is expected that it will result in a more even and homogeneous pattern of reception within their Midland service area. It remains the Authority's intention to increase the power to 200 kW.e.r.p. as soon as possible, probably in the autumn.

BBC TV Service in the Channel Islands

THE BBC announces that its Channel Islands Television Service from the transmitting station at Les Platons, Jersey, which has been in operation experimentally since October last year, is now working on a permanent basis.

The service was started on an experimental basis because the television programme for re-transmission in the Channel Islands had to be received by radio from the temporary low-power transmitter at North Hessary Tor in South Devon, or alternatively from the station at Wenvoe in Wales. Because of the distances involved the quality of the picture was not at times up to the required standard, but the arrangement enabled transmissions to be started in the Channel Islands earlier than would otherwise have been possible. The recent completion of the permanent station at North Hessary Tor and the increase in its radiated power has made possible reliable reception of the television programmes for re-transmission by the Les Platons station, which now joins the BBC's network of television stations providing a regular service.

Telephone Numbers in Radio Plays

TELEPHONE numbers are frequently used in plays broadcast by the BBC and I.T.V. In the past some listeners and viewers when they have heard a telephone number have themselves called that number out of curiosity. To avoid any embarrassment that might follow from a live number being accidentally selected, arrangements have been made that in future all telephone numbers quoted in scripts shall be selected from a list provided by the Post Office. These are of two kinds, numbers which have not yet been issued to the public and the numerical equivalent of TIM and other fee-paying services. Thus, no embarrassment will be caused to private subscribers, and if one of the latter numbers is chosen, callers will at least get something for their money.

Temporary Station at Sandale

THE BBC announces that it is hoped to have a temporary television station in operation before the end of the year at Sandale, some 14 miles south-west of Carlisle.

The temporary station, compris-

At work on the BBC Television mast at Crystal Palace (440ft. high).

ing low-power vision and sound-transmitting equipment installed in portable buildings, mobile power plant, and a temporary 100ft. mast to carry the aerials, is being provided so that television can be made available in Cumberland at a much earlier date than would otherwise have been possible. It will continue in service until the permanent medium-power station with its 500ft. mast, to be built on the same site, can be completed, which it is hoped will be before the end of next year.

Because of its lower power the coverage of the temporary transmitter will not be as great as that to be provided by the permanent station, but it is expected to include Carlisle, Wigton and Maryport. In favourable conditions reception may also be satisfactory in Penrith, Cockermouth and Workington.

The temporary station will operate on the same frequencies as those which are to be used by the permanent station so that receivers and aerials set up for reception of the temporary station will not have to be changed when the permanent station comes into operation. The technical details of the transmissions are as follows :

Vision frequency : 61.75 Mc/s
Sound frequency : 58.25 Mc/s
Polarisation : Horizontal.

Television from a Helicopter

ON Thursday, September 20th, Pye Ltd., in conjunction with Bristol Aircraft Ltd., held a series of demonstrations to show the possibilities of airborne television.

The demonstrations, which were held in Cambridge, were attended by air-attachés from many countries, including the U.S.S.R., high-ranking officers from County Police Forces, Scotland Yard, and the three Services, and officials from the Home Office and the BBC.

A Bristol "Sycamore" helicopter, installed with a complete television transmission system specially developed by Pye, broadcast pictures of Cambridge, and also of instruments inside the aircraft, to several 21in. TV monitors at an hotel in the centre of Cambridge. Permission was granted for the helicopter to land on Parker's Piece, which is a famous recreation ground adjoining the hotel in which the receivers were installed.

The camera system used was a miniature Pye industrial unit, the transmitter having been specially constructed for experimental work. All the TV equipment was adapted to work from the 24-volt power supply of the helicopter. The aircraft was fitted with a new type of aerial that has been designed to avoid TV interference from the rotor blades.

TV Developments in Hungary

BUDAPEST television station, which has been broadcasting test film transmissions on low power for more than a year, plans to go over to its new 30-kilowatt transmitter by next April.

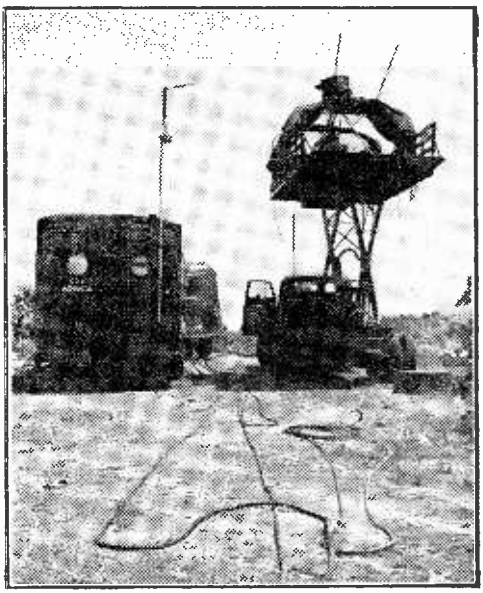
The transmitter has been bought from East Germany.

A mobile outside-broadcast unit has been bought from Britain and an additional one is being made by Hungarian technicians at the Ikarus factory.

Studio programmes will come from studios now being constructed in the city's Lenin Institute. These will be relayed to the Szécsenyi Hill transmitting station overlooking the city, which with aerial has a height of 340ft.

In 1958, a five-kilowatt station is to be installed at the northern city of Miskolc, and the following year another station will be erected on a site yet to be chosen to serve the western part of Hungary.

Then work will begin on a chain of relay stations to link Hungary with Prague, Vienna and Berlin—and later, probably, with Moscow.



A scene during recent U.S. Army trials of the use of TV in relaying to command forces at the rear, scenes at a battle-head. The chain consists of three field cameras, an airborne camera, and an Iconoscope film chain.

Yorkshire Press and Publicity Manager

MR. TOM BENTLEY has been appointed Press and publicity manager for A.B.C.-TV's Yorkshire station.

Mr. Bentley joins A.B.C.-TV from a Bradford advertising agency, Charles Walls & Partners Ltd., where he has been Public Relations Officer and Television Executive for the last two years. Before this he was Public Relations Officer at Nevin D. Hirst (Advertising) Ltd., Leeds and London, and Tatersall Advertising Ltd., Harrogate.

Mr. Bentley has a wide experience as a journalist and Public Relations Officer. He was P.R.O. for the Central Institute of Art and Design and the National Gallery in London for 18 months, and has lectured extensively for the Central Office of Information in South Africa.

Over 6,000,000 on TV

DURING August the number of television licences increased by 64,820 to 6,044,330.

14,389,474 broadcast receiving licences, including 6,044,330 for television, and 307,082 for sets fitted in cars, were current in Great Britain and Northern Ireland at the end of August, 1956.

I.T.A's Croydon Transmitter Power

THE experiments carried out by the Independent Television Authority in association with Marconi's Wireless Telegraph Company to increase the power of the Croydon station have been successful, and as from September 8th, the power was raised from 60 to 120 k W.e.r.p.

C.R.T. ISOLATION TRANSFORMER
Type A. Low leakage windings. Ratio 1 : 1.25 giving a 25% boost on secondary.
2 v., **10/6** ; 4 v., 10/6 ; 6.3 v., **10/6** ; 10.8 v., **10/6** ; 13.5 v., **10 6**.
Ditto with mains primaries, **12 6 each.**
Type B. Mains Input 220/240 volts. Multi Output 2, 4, 6.3, 7.5, 10 and 13 volts. Input has two taps which increase output volts by 25% and 50% respectively. Low capacity, suitable for most Cathode Ray Tubes. With Tag Panel, **21/-** each.
Type C. Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 220/240 volts. Output 2-2½-2½-3 volts at 2 amps. With Tag Panel, **17 6 each.**
NOTE.—It is essential to use mains primary types with T.V. receivers having series-connected heaters.

TRIMMERS, Ceramic. 30, 50, 70 pf., **9d.** 100 pf., 150 pf., 1/3 ; 250 pf., **1/6** ; 500 pf., 750 pf., **1/9.**
RESISTORS. All values. 10 ohms to 10 megs., ½ w., **4d.** ; ½ w., **6d.** ; 1 w., **8d.** ; 2 w., 1/-.
HIGH STABILITY. ½ w., 1%, 2/-. Preferred values 100 ohms to 10 meg.

5 watt	WIRE-WOUND RESISTORS	1/3
10 watt	25 ohms—10,000 ohms	1/6
15 watt		2/-

15,000 ohms—50,000 ohms, 5 w., 1/9 ; 10 w., **2 3.**
KNOBS, GOLD ENGRAVED.—Walnut or Ivory, 1½in. diam., **1/6** each. Not engraved, 1/- each.

12/6 PURETONE RECORDING TAPE
1,200 ft. on standard fitting 7" Plastic reels. Brand new, boxed, 12·6. Spools 5" metal, 1/6, 7" plastic, 4/3.

O.P TRANSFORMERS. Heavy Duty 100 mA., **4 6.** Multiratio, push-pull **6/6,** Tapped small pentode, **3 9.**
L.F. CHOKES 15/10 H. 60/65 mA., 5/- ; 10 H. 120 mA., **10/6** ; 15 H. 150 mA., **12/6.**
MAINS TRANS. 350-0-350, 80 mA., 6.3 v. tapped 4 v., 4 a., 5 v. tapped 4 v. 2 a., ditto 250-0-250, **21/-.**
HEATER TRANS. Tapped prim., 200/250 v. 6.3 v. 1½ amp., **7/6** ; tapped sec. 2, 4, 6.3 v., 1½ amp., **8/6.**
VCR97 TESTED FULL PICTURE, £2.
COPPER PLATED AERIAL RODS. ¼ x 12in. push fitting, 3/- doz., p. & p. 1/-.
ALADDIN FORMERS and core. ½in., 8d. ; 1in., **10d.**
FORMERS 5837/8 and **Cans TV1/2.** 1in. sq. x 2½in. and 1in. sq. x 1¾in., 2/- ea. with cores.
TYANA.—Midget Soldering Iron. 200/240 v. or 230/250 v., **16 9. Solon Instrument** Iron, **24/-.**
MIKE TRANSF. Ratio 50 : 1, **3/9** ea. ; 100 : 1, **10/6.**
MAINS DROPPERS. 3 x 1½in. Adj. Sliders, .3 amp. 750 ohms, **4 3.** .2 amp., 1,000 ohms, **4/3.**
LINE CORD. .3 amp., 60 ohms per foot, .2 amp., 100 ohms per foot, 2 way, **6d.** per foot, 3-way, **7d.** per foot.
LOUDSPEAKERS P.M. 3 OHM.
5in. Goodmans, **17/6.** 7in. x 4in. Goodmans, 21/-, 3½in. square, Elac., **21/-.** 8in. Elac., **22/6.**
6½in. Goodmans, **18/6.** 10in. R. & A., **30/-.**
TSL Tweeter, LSH75, 12/6. 12in. Plessey, **30/-.**
8in. M.E. 2.5 k. or 2 k. field, tapped O.P. transf., **24/6.**
CRYSTAL DIODE, G.E.C., **2/-.** Crystal Book, **1/-.**
GEX34, 4/-. Handbook of Germanium Circuits, **2,6.**
HIGH RESISTANCE PHONES. 4,000 ohms. **17 6 pr.**

CRYSTAL MIKE INSERT by Acos, precision engineered. Size only 1¼ x 3/16in. Bargain Price **6/6.** No transformer required.

SWITCH CLEANER Fluid, squirt spout, **4/3** tin.
TWIN GANG TUNING CONDENSERS. .0005 mfd. midget, less trimmers, **6/6** ; .0005 Standard size with trimmers, **9/-** ; less trimmers, **8/-** ; ditto, sealed, **2/6** ; .0005 mfd. 3-gang, **7/6.**
SPEAKER FRET.
Expanded metal. Silver, 15¾in. x 9¼in., **2/-** each.
TAPEMASTER RECORD PLAY HEAD, 45/-.

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8/8	5.6	1.6	6.6	10/6
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1S5	EF50	2X2	6K6	EBC41
3S4	Equip.	E1148	6K7G	EBF80
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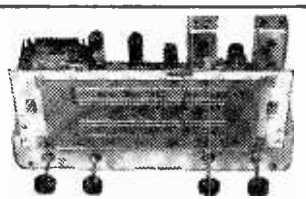
6AM6	EF92	3/6	(near)	ECH42
6AT6		3D6		EF41
6J7		6H6M		EF80
6K8	7/6	7/6	7/6	EL41
6S17	6BE6	6V6G	EL32	EZ40
6SN7	6BW6	6X4	HVR2A	KT33C
6V6GT	6F6	6X5	PEN25	MU14
EBC33	6K7GT	807	U22	PL81
EF50	6K7M	EF39	VP23	PY81
				12K7
Sy2v. Rect	11/6			35Z4
EF91	EY51	U25	PL81	6Q7



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M.W. 200 m.—550 m. ECH42, EF41, EBC41,
L.W. 800 m.—2,000 m. EL41, EZ40.
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TERMS : Deposit **£5.5.0** and six monthly payments of **£1.**
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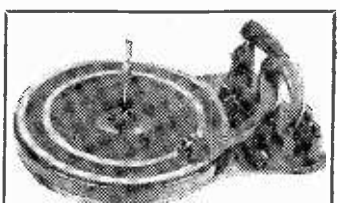

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Walnut Veneered Playing Desk 10/6 extra.

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For London, Midland and Northern Transmissions.
Suitable all T.V. makes. T.R.F. or Superhet. Ready wound coils, two **ECC90** valves, all components, punched chassis, circuit-diagram, wiring plans. **COMPLETE KIT** for mains operation 200-250 v. A.C. **£3.10.0.**

As ABOVE less POWER PACK. Requires 200 v. 20 mA. H.T. 6.3 v. .6 a. L.T.,		**£2.5.0.**
Mains Transformers to above Spec.	...	10/6
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SOCKETS ... 1 - **OUTLET BOXES** ... 4 6
BALANCED TWIN FEEDER, yd. 6d. 80 or 300 ohms.
DITTO SCREENED per yd. 1 -. 80 ohms only.
WIRE-WOUND POTS. 3 WATT. Pre-Set Min. T.V. Type. All values 25 ohms to 30 K., 3 - ea. 50 K., 4/-. (Carbon 50 K. to 2 meg., 3/-.)
WIRE-WOUND 4 WATT. Pots. 2½in. Spindle. Values, 100 ohms to 50 K., **5/6** ; 100 K., **6 6**
CONDENSERS. New stock. .001 mfd. 7 kV T.C.C., **5/6.** Ditto, 20 kV., **9 6** ; **100 pf.** to 500 pf. **Mica, 6d.** ; Tubular 500 v. .001 to .01 mfd., **9d.** .05, .1, 1/-. ; .25, **1 6** ; 1m.5, **1/9** ; 1,350 v., **9d.** ; 1,500 v., **1 3** ; 1 mfd. 2,000 volts, **4/-.**
CERAMIC CONDS., 500 v. .3 **pf.** to .01 mfd., **10d.**
SILVER MICA CONDENSERS. 10%, 5 pf. to 500 pf., 1/- ; 600 pf. to 3,000 pf., **1/3. DITTO** 1% 1.5 pf. to 500 pf., **1/9** ; 515 pf. to 5,000 pf., 2/-

I.F. TRANSFORMERS 7/6 pair
465 Kcs Slug tuning Miniature Cans., 2¼in. x 1in. x 1in. High Q and good bandwidth. By Pye Radio. Data sheet supplied.

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TUBULAR	TUBULAR	CAN TYPES
1/275 v. 2/-	100/25 v. 2/-	8 + 16/500 v. 5 6
2/450 v. 2 3	8 + 8/500 v. 4 6	16 + 16/500 v. 6/-
4/450 v. 2/6	16/500 v.	23 + 20/450 v. 5 6
8/450 v. 2 3	6/-	32 + 32/350 v. 4 6
8/500 v. 2 9	CAN TYPES	32 + 32/450 v. 6 6
16/450 v. 3 6	Clips 3d.	50 + 50/350 v. 7 -
16/500 v. 4/-	16/450 v. 3/6	64 + 120/275 v. 7 6
32/500 v. 5 6	32/350 v. 4/-	100 + 200/275 v.
25/25 v. 1 9	64/350 v. 5/6	12 6
50/25 v. 1 9	500/12 v. 3/-	1,000 + 1,000/6 v.
50/50 v. 2 -	8 + 16/450 v. 5/-	6 6

Screw Base Type 512, 8/500 v., 3/- ; 16/500 v., 4/-.
SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES. K3/25 2 kV., **4/3** ; K3/40 3/3 kV., 6/- ; K3/45, 3.6 kV., **6/6** ; K3/30 4 kV., **7 3** ; K3/100 8 kV., **12 6** ; **MAINS TYPE,** RM1, 125 v., 60 mA., 5/- ; RM2, 100 mA., 6/- ; RM3, 120 mA., 8/- ; RM4, 250 v., 275 mA., **16 -.**
PANEL LAMPS (Neon Lit), 230 v., A.C./D.C., **3 6.**
COILS Wearite, "P" type, **3 - each.** Osmor Midget "Q" type adj. dust core, **4 - each.** All ranges.
TELETRON, L. & Med. T.R.F., with reaction, **3 6**
FERRITE ROD AERIALS. M.W., 8/9; M. & L., **12 6**
T.R.F. COILS A HF, 7 - pair.
H.F. CHOKES, 4in. cored, 14 M.H., 3/- each

ALUMINIUM CHASSIS. 18 s.w.g. unbrilled. With 4 sides, riveted corners and lattice fixing holes. 2½in. sides, 7 x 4in., **4 6** ; 9 x 6in., **5 9** ; 11 x 7in., **6 9** ; 13 x 8in., **8 6** ; 14 x 11in., **10,6** ; 15 x 14in., **12 6** ; 18 x 16 x 3in., **16/6.**

FULL WAVE BRIDGE SELENIUM RECTIFIERS. 2, 6 or 12 v., 1½ amp., **8 9** ; 2 a., **11/3** ; 4 a., **17 6.**
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amp., **13 6** ; 4 amp., 23/-.
BERNARDS VALVE MANUALS I & II, 5 - ea. part.
VALVE and TV TUBE equivalents books, **5 -.**
ACID HYDROMETER. New Ex Govt. Unbreakable. Packed in metal case 7 x 1¼in. dia., **4,6.**
WAVECHANGE SWITCHES.
5 p. 4-way 2 wafer, long spindle **6 6**
2 p. 2-way, 3 p. 2-way, short spindle **2 6**
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3 p. 4-way, 1 p. 12-way, long spindle **3 6**
VALVEHOLDERS. Pax. Int. Oct. 4d., EF50, EA50, 6d. B12A. CRT, 1 3. Eng. and Amer. 4, 5, 6, 7 and 9 pin, 1 -. MOULDED Mazda and Int. Oct. 6d. B7G, B8A, B8G, B9A. 9d.. B7G with can, 1 6. VCR97 2 6, B9A with can 2 6. CERAMIC, EF50, B7G, B9A, Int. Oct. 1 -, B7G with can 1·9.
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CORRESPONDENCE

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

COAXIAL TIP

SIR,—I have recently noted the coaxial tips which you have published, and I think it is about time that many of these types of hint were given. For instance, there are two or three coaxial plugs on the market, and although I have managed to fit these to my aerials and converters from time to time, the work was most involved. When the plug is taken to pieces, in one case, there are five separate pieces, and how do you start? The first time I tried I found that the single lead inside the coaxial has twisted off in screwing on the plug and there was no connection to the inner part of the plug. Another time the projecting "claws" of the plug cut clean through the insulated covering of the aerial into the inner flex lead. Surely, after all this time, manufacturers could agree on a standard type of plug or socket and the fitment could be standardised. Also, what about a plug or socket which did not call for soldering? Quite a number of listeners no doubt break off the aerial lead in moving a set about in the house, and that means they have to make a very poor repair job if they can't solder, or call in the service engineer and he surely has enough to do without going out to solder an aerial plug on.—G. YOUNG (Bexley Heath).

SPECIAL NOTE

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

USING A 'SCOPE

SIR,—I had just written to you to ask whether there was any book on the subject of using a 'scope. I had been interested in the tester you described a few months ago, and wanted to build this up but postponed the event as I did not know how to make full use of it. I find this often happens with us amateurs. We see a nice bit of test gear in your pages, or in your companion paper, and on working out the cost this proves very cheap and it would no doubt be a useful acquisition, but we don't know how to use it. The 'scope seems to be a very good case in point, and as there is such a lot you can do with it, I was wondering when you would tell us. When the present series is finished, could you let us have some more on connecting it to a typical television set and working out what is wrong by the pictures which you get on the 'scope? I recently saw an outside unit of the I.T.A. at work near our home and I got near the camera man and there was a monitor set working with a picture on it, and in the corner a small 2in. tube face with the oscillogram of the signal on it (green) and it was fascinating to watch how the patterns changed, and I would like to do this. I spoke to one of the men and he said the black level was jumping or something and I should like to know how to see this, for instance, as I have read that this is a most critical adjustment in a set to get the proper graduations of tone. What do other readers do in cases such as mine?.—G. F. RAISTRICK (Manchester).

AERIAL DESIGN

SIR,—Whilst I am deeply interested in Mr. Burton's letter in your October issue, I feel that there is another point which should receive the attention of the experts. I refer to the general question of outdoor aerials. At present, if one is at all "radio-minded" one will have on one's roof the most shocking array of old metal that one could think of. There will be a Band I, a Band III, an F.M. and a normal broadcast aerial. All of these take on various different forms, and although one might say there is little weight there as the majority of the material is aluminium tubing, there is the question of the wind resistance and also the unsightliness. Why can't all of these be incorporated in one *simple* design? I am by no means a technician, but I have seen a combined Band I and Band III aerial in which the Band I element was folded and it was therefore very little larger than the Band III arrangement. At the other extreme, I saw near Southend a Band III system with 8 elements, on top of which was a Band I with three directors—and the whole thing was leaning heavily, no doubt due to the wind having loosened the moorings. One day it's going to fall on somebody, and surely it is unnecessary. I wonder if technicians do not attempt to research into unexplored avenues, or do they all plough along known lines, with the result that very little new materialises.—F. ARNOLD (S.W.4).

PERSONAL TELEVISOR

SIR,—Re the "Personal Televisor" as published in your November, 1952, issue. The series-connected R.F. amplifiers were recommended to be valves type EF95 (Mullard). The "Mullard" published data for this valve type, however, gives a maximum heater-cathode potential of 90 v. which is somewhat exceeded by the valve occupying position V_2. It may be of interest to others to know that the EF95s tried in this circuit have all withstood the extra h-k voltage, and it would appear safe to run these continuously under these conditions.—R. T. IRISH (Carshalton).

AMATEUR TELEVISION CONVENTION

SIR,—I wonder if you would draw readers' attention to the fact that this year's Convention of the British Amateur Television Club will be held at the Bonnington Hotel, Southampton Row, W.C.1, from 10 a.m. till 7 p.m. on Saturday, October 27th.

In addition to demonstrations of the equipment owned by some of the members, there will be a film show and other interesting displays.

The prices of admission (which do not include the price of lunch) are as follows: Members, 3s. 6d.; Non-members, 5s.

Tickets will be on sale at the door, or may be obtained in advance from the writer.—D. S. REID (4, Bishop Road, Chelmsford).

STRANGE SIGNAL PICK-UP

SIR,—Seeing the letter from Mr. Maguire, I should like to report that I also have had some peculiar signals from time to time on my television receiver. I have heard faint snatches of conversation behind the broadcast, but never loud enough to be able to distinguish what was being said. I have often switched on during periods of no transmission, but the set is then perfectly quiet. The background is not radio or television signals, I am sure, as the conversation always appears to be between two people, and I never hear music or singing. I might add that I have no telephone, and there is no phone near my house. Is it possible to hear neighbours through coupling between aerials, I wonder?—J. K. SIMS (Barnet).

BBC VERSUS I.T.A.

SIR,—It would be interesting if some really independent body could analyse the number of viewers on both existing channels. I notice recently that after a statement by the I.T.A. chief the BBC came out with a disclaimer that the figures were inaccurate. It appears, however, that the body which at present gives the analysis for I.T.A. has made its check on people who have a set which receives both systems, whilst the BBC figures are based on the number of viewers throughout the country. Of course, thousands cannot pick up an alternative, as there is no station in their locality, so the number of viewers of the BBC there must be in the majority. I have made a rough tally amongst my work and domestic circle, and it would appear that the majority view for the greater part of the time to the I.T.A. The news-reels on the BBC still have a great following, but many people prefer a longer play than the I.T.A. generally gives. There are arguments for both sides, but it would be interesting if a really true comparison of viewing figures could be made.—G. F. DE LISLE (W.4).

INCREASING EHT

SIR,—I notice in the October issue Mr. Engelen raises the question of increasing the EHT to obtain a better picture. I had the same problem, feeling that my picture was too dark and finding the EHT was only about 9 kV whilst the tube was rated at 11 kV. I tried increasing the EHT by using a Cockcroft circuit and although I got 2 or 3 kV more the picture was worse. I found that not only was the scanning inadequate, but the modulation produced by the existing video stage (peak to peak swing) was not adequate to give good modulation at the higher EHT. I then *reduced* the 9 kV to just over 7 kV and found that I had a much better, more contrasty picture. True it was overall dimmer and the room lights needed screening, but when the lighting arrangements are suitable the picture is very much better than with the original 9 kV and there is better contrast. I don't know whether it is imagination, but it seems that the regulation and steadiness of the picture are also greatly improved.—J. HART (Reading).

CONVERTER PROBLEM

SIR,—Now that the alternative programme has been available for some time I feel it is time that a really good alternative station selector was available. I have tried out several commercial sets (built for the two stations) and in my own case have tried out several converters with my home-made set. In all cases it is not possible to *switch* from one station to another. A fine tuner, trimmer or similar gadget has to be operated each time one changes, and although in one of my home-built converters I got very nearly the desired results the drift on Band III is such that the trimmer has to be actuated now and again. I wonder if other readers have experienced this trouble and whether anyone has found a circuit which does away with the necessity for trimming on one or other of the bands? In one commercial set I found that the setting held good, but the advantage was offset by the fact that the control was ganged with the on/off switch, and to retain the advantages of switching direct from one to another without retrimming one had to use the mains power plug switch to switch the set on and off and thus avoid upsetting the control setting.—G. TURNBULL (Finchley).

THE GRANADA TV CENTRE

(*Continued from page* 173)

ideas of framing different styles of commercials to appeal to the differing tastes of Lancashire and Yorkshire.

Overall Control

The overall control of the Granada TV Network has the very personal attention of Sidney L. Bernstein, the managing director, who is also the head of the progressive Granada cinema circuit. The general manager of the Network Company is Victor Peers, for many years a film production executive. These two very live showmen head a fine team which is capturing a high percentage of TV audiences to the Granada fold. And to remind their team that they are all still in show business, each office has a small picture on the wall—not of the chief—but of P. T. Barnum, the greatest showman of all time.

As I left the Granada premises, I wondered just what Barnum would have thought about this television business—" travelling eyes," telecines, parlour games, brass-buttons and commercials. But that would make quite a Gulliver's Travels type of TV play in itself.

RF26 F.M. CONVERTER UNIT 88-100 Mc/s

This well-known RF26 Unit is now adaptable for F.M. reception using 2 i.f. stages and separate local oscillator and tuned by a Muirhead graduated vernier drive. Can be converted at low cost of **92/6**. Send 1/6 for 8-page descriptive booklet, containing full wiring instructions, circuits and layout diagrams.

5-VALVE 3-WAVEBAND SUPERHET

16-50 Metres, Short-Wave.
187-550 Metres, Medium-Wave.
900-2,000 Metres, Long-Wave.
Flywheel Tuning.
Negative Feed Back.
Valves: 6BE6, 6AT6, 6BW6, 6X4.
Wave Change and Gram.
Chassis 11" x 7" x 8½".
£9/5/- Carr. 5/-
Manufactured by well-known Manufacturers.
Absolute Unrepeatable Bargain.

U.S.A. INDICATOR UNIT BC/929.A

Complete with 3BP1 C.R. tube and screen, 7 valves—2-6SN7GT, 2-6H6GT, 6G6, 2X2, 6X5G, volume controls, condensers, etc. Ideal for portable 'scope. In black crackle case, size 15½in. 9in. 9in. BRAND NEW. **65/-** carr. FREE.

62.A INDICATOR UNIT

Containing VCR97 with Mu-Metal Screen. 21 Valves—12-EF50, 4-SP61, 3-EA50, 2-EB34. Plus Pots., Switches, H.V. Cond., Resistors, Muirhead S.M. Dial. Double Deck Chassis and Crystal. BRAND NEW ORIGINAL CASES. **67/6**. Carr. free.

PYE 45 Mc/s STRIP TYPE 3583 UNITS

Size 15in. x 8in. x 2in. Complete with 45 Mc/s. Pye Strip, 12 valves, 10 EF50, EB34 and EA50, volume controls, and hosts of Resistors and Condensers. New condition. Modification data supplied. Price **69/6**. Carriage paid.

INDICATOR UNIT TYPE 182.A

Unit contains VCR517 Cathode Ray 6in. tube, complete with Mu-Metal screen, 3-EF50, 4-SP61 and 1-5U4G valves, 9 wire-wound volume controls and quantity of resistors and condensers. Offered BRAND NEW (less relay) at **67/6**. Plus 7/6 carr. "Radio - Constructor" scope circuit included.

WE HAVE OVER 50,000 BRITISH AND AMERICAN VALVES AVAILABLE AT VERY LOW PRICES—SEND FOR LISTS

TRANSISTORS

JUNCTION TYPE (Red-Spot) OFFERED AT LESS THAN HALF-PRICE

Designed for A.F. application up to 800 Kc/s and are suitable for use in amplifiers, Signal Tracers, Local Station Receivers, Radio Control, Oscillators, Transistor Voltmeters, Baby Alarms, Microphone Pre-Amplifiers, etc.

10/- EACH

(Tested and complete with Data & Circuits)

N.B. These Transistors may be used in place of Mullard OC71 or similar Transistors.

R.F. TRANSISTORS (BLUE SPOT) 1.6 Mc/s 15/- each.

"TELETRON" PORTABLE TRANSISTOR SUPERHET

We offer all the Components, including 4 Transistors, I.F.T.'s, Trans., 2 Gang miniature Condenser, Ferrite Rod, 3in. P.M. Speaker, V.C. and resistors and condensers to build this receiver for . . . . . **£6 10 -**

Or as above with Push-Pull Output, 6 Transistors and 6" x 4" elliptical Speaker . . . . . **£9 -/-**

Or with matched pair Mullard OC72's and latest type high resistance P.P. Elliptical speaker, output 200 milliwatts . . . . . **£10 10 -**

Call and hear demonstration models working.

TRANSISTOR SIGNAL TRACER

This circuit is designed for Audio, R.F. and I.F. Frequency and is ideal for the Serviceman for checking all types of sets including T.V. Powered by 9-volt dry battery. Miniature in construction. **Complete Kit with 2 Transistors, Components and 'Phones with Circuit. 42/6.**

TRANSISTOR-PUSH-PULL AUDIO AMPLIFIER (100 MILLIWATTS OUTPUT)

Build this Push-Pull Amplifier which is ideal for Crystal or Magnetic Pick-up Amplification, Baby Alarm, Microphone Amplifier, etc. Powered by 6-volt Dry Battery lasting for months. **Complete Kit of Parts including 4 Transistors and all Components with Circuit** (less speaker), **£4 10 -**.

TRANSISTOR SQUARE WAVE GENERATOR

This arrangement comprises an emitter-coupled multi-vibrator, and provides a square waveform with excellent transient characteristics. The output provides two basic tones and a large number of harmonics spreading through the A.F. spectrum. Ideal for signal tracing. **Complete Kit with 2 Transistors and Components and Circuit. 25/-.**

QUARTZ CRYSTALS

TYPE FT243 fundamental frequencies. 2 pin ½in. spacing.
120 TYPES. 5675 Kc/s. to 8350 (in steps of 25 Kc/s.).
80 TYPES. 5706 Kc/s. to 8340 Kc/s. (in steps of 33.333 Kc/s.).
ALL BRAND NEW **10/-** each.

TYPE FT241A 5th harmonic Crystals. 2 pin ½in. spacing.
80 TYPES 20 Mc/s.—27.9 M Mc/s.
(In steps of 100 Kc/s.)
ALL BRAND NEW **7/6** each.
FT241A 200 Kc/s. **10/-** each.
Crystal Holders for both Types 1/3 each.

SPECIAL REDUCTION FOR SETS OF VALVES

1A7GT, 1N5GT, 1H5GT, 1A5GT (or 1Q5GT or 3Q5GT)	37/6 Set
10 EF50 (Ex-Brand New Units)	5/- each ,,
10 EF50 (Red Sylvania, ex-new units)	6/- each ,,
6K8G, 6K7G, 6Q7G, 5Z4G, 6V6G	35/- ,,
1R5, 1S5, 1T4, 1S4 (or 3S4 or 3V4)	27/6 ,,
TP25, VP23, HL23 DD, P[illegible]N25 (or QP25)	25/- ,,
DK96, DF96, DAF96, DL96	32/6 ,,
6K8G, 6K7G, 6Q7G, 25A6G, 25Z5 (or 25Z6G)	37/6 ,,
12K8GT, 12K7GT, 12Q7GT, 35Z4GT, 35L6GT (or 50L6GT)	37/6 ,,
12SA7GT, 12SK7GT, 12SQ7GT, 35Z4GT, 35L6GT or 50L6GT	35/- ,,

TRANSMITTER RECEIVER SCR 522

Comprising the well-known BC625 and BC624A. Units complete with 17 valves types: 2-832, 3-12A6, 3-12SG7, 3-9003, 9002, 6C6G, 12J5GT, 12AH7GT, 12C8, 6S87. The Complete unit is in very good condition having very useful parts including Relays, Transformers, Condensers, etc.
Less valves, £3 10 -, carr. paid. **With valves, £7 10 -**, carr. paid

Send Stamps for new 1956 28-page catalogue.

HENRY'S
(RADIO LTD.)

CRYSTAL MICROPHONE INSERTS

Ideal for Tape Recording, Gramophone Amplifier, etc. Very sensitive. Guaranteed and Tested. 5/- (ex-units), or **8/6** Brand new and boxed.

1355 RECEIVER

Complete with 11 valves 8-SP61, 2-6C4, VU120, VR92. As specified for inexpensive T.V. In absolute new condition. **27/6**, carr. 5/-. R.F. 24 **10/-**. R.F. 25 **12/6**. R.F. 26 **25/-**. Brand new with valves, carr. 2/6.

CATHODE RAY TUBES

VCR138A WITH SCREEN . . . . . **£1 15 -**
VCR139A. 2in. C.R. Tube. Brand new in original cartons (carr. free) **£1/15/-**
VCR97. Guaranteed full T.V. picture (carr. 2/-) . . . . . **£2 - -**
VCR517C. Guaranteed full T.V. picture . . . . . **£1 15 -**
MU-METAL SCREENS for VCR97 or 517, P.P. 1/6 . . . . . **10/-**
6in. ENLARGER for VCR97 or 517, P.P. 1/6 . . . . . **17/6**
VCR97. Slight cut-off. Carr. 2/- **15/-**
3BP1. Brand new . . **£1 10 -**

GARRARD 3-SPEED MIXER AUTO-CHANGER Model RC110

A.C. 200/250. List price **£14 13 -**. Brand New.
£7/19/6 P. & P. 3/6

B.S.R. 4-SPEED RECORD CHANGERS

Very latest type 4-speed with HGP37 crystal turnover pick-up. Plays mixed records. **£8 15 -**. P.P. 4/6.

MINIATURE TRANSMITTING STRIP "TYPE 81"

Size 7½in. 6in. 3in. Complete with Valves Type CV415, CV309, 2-6AM6, 2-7D9 and Quartz Crystal, 4,860 Kc/s. Fully wired with circuit. **£4 10 -** complete.

MINIATURE I.F. STRIP TYPE "373" 9-72 MEG.

Brand new miniature I.F. Strip size 10½in. 2½in. 3in. high. Valve line-up 2-EF92, 3-EF91 and EB91. With circuit. With valves, **45/-** (less valves **8/-** Post free). This I.F. Strip is part of above equipment.

5, HARROW ROAD, PADDINGTON, LONDON, W.2. TEL.: PADDINGTON 1008-9, 0401

Bandwidth

SOME NOTES INTENDED TO HELP THE BEGINNER TO APPRECIATE THE SIGNIFICANCE OF THIS TERM

By S. C. Murison, A.M.Brit.I.R.E.

MOST beginners can see the significance of a waveform and can understand its dimensions. The illustration shows a pulse and most newcomers could say what its amplitude, duration, time of rise and time of fall are just by looking at it. When it comes to considering bandwidth, what is involved is usually less clear in the beginner's mind.

The bandwidth of a system (say, the video amplifier in a television set) is usually taken to mean the *difference* between the two frequencies at which it starts and finishes to perform its function (amplifying, in our example). For a typical video amplifier in a 405-line television set, the bandwidth (as defined above) would be about 2.5 Mc/s. Such an amplifier

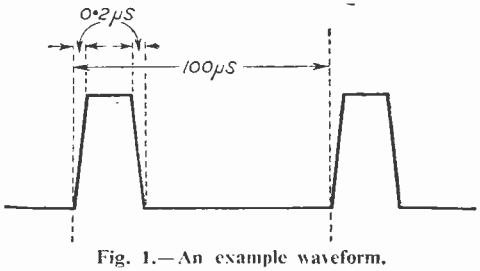


Fig. 1.—An example waveform.

often provides amplifications from D.C. up to about 2.5 Mc/s, so the *difference* between the two frequencies is the same as the upper frequency, in this example. For the sound channel of a typical amplitude modulation television set, the bandwidth provided is often about 300 kc/s or 400 kc/s. In this example, the lower frequency at which the channel starts to respond might be 41.2 Mc/s and the upper frequency 41.7 Mc/s. (The example chosen here is for the Channel 1 frequencies.) The bandwidth provided by such a sound channel is wider than is needed. An amplitude modulated transmitter radiates a band of frequencies on each side of the carrier frequency. The band of frequencies is usually thought of as being in two *sidebands*; the one which is on the low frequency of the carrier is called the *lower sideband*, the one on the high frequency being the *upper sideband*. How this effect arises need not concern us here. What is of interest to us here is how wide this band of frequencies is. The lower sideband extends below the carrier frequency by the frequency of the modulating wave; and the upper extends above the carrier by the same amount. Thus, if a sound of frequency 15 kc/s is being transmitted, the sidebands occupy a band of frequencies 30 kc/s wide centred on the carrier frequency. The highest frequency which can be heard by young people is about 18 kc/s, with older people tending to be unable to hear such high frequencies. Consequently, a bandwidth of 36 kc/s would be adequate for even the most exacting need. The extra bandwidth is provided in most sound channels because to make it any less would introduce extra components and would also mean that the tuning of the channel would have to be more stable.

So far we have only considered bandwidth in terms of frequency; it is often more helpful in seeing what is involved, to think of it as a proportion of the centre frequency. Suppose that we required to transmit the pulse shown on the left. If the time between pulses is 100 micro-seconds, the repetition rate is 10 kc/s. Then the lowest frequency which would be used for modulation would be 10 kc/s, because nothing in the waveform occurs at a slower rate. What is the highest modulating frequency? This question is the same as asking what part of the waveform changes in the least time and how fast is this change. Obviously, the leading and trailing edges are the fastest parts of the waveform; what we need to know is what sort of frequency they represent. Both the leading and trailing edges take the same time to happen—0.2 micro-seconds each. We can think of both the leading and trailing edges as being a part taken from a sine wave. A slope which takes 0.2 micro-seconds to happen is rather like one-quarter of a cycle of a sine wave having a frequency

Source of Modulation	Modulation Frequencies	Carrier Frequency	Approximate Fractional Bandwidth
Teleprinter	5—100 c/s	2,000 c/s	0.098
Speech	300—3,000 c/s	1,000 kc/s	0.0054
Speech ...	300—3,000 c/s	50 Mc/s	0.0011
Speech ...	300—3,000 c/s	200 Mc/s	0.0003
Music ...	20 c/s—18 kc/s	1,000 kc/s	0.036
Music ...	20 c/s—18 kc/s	50 Mc/s	0.0072
Music ...	20 c/s—18 kc/s	200 Mc/s	0.0018
Television Camera ...	25 c/s—2.75 Mc/s	10 Mc/s*	0.55
Television Camera ...	25 c/s—2.75 Mc/s	35 Mc/s*	0.157
Television Camera ...	25 c/s—2.75 Mc/s	50 Mc/s	0.11
Television Camera ...	25 c/s—2.75 Mc/s	200 Mc/s	0.027

* Representative of intermediate frequencies.

of 1.2 Mc/s. A sine wave having a frequency of 1.2 Mc/s takes 0.8 micro-seconds for a whole cycle; so one-quarter of a cycle takes 0.2 micro-seconds. So we now have a reasonable answer to the question of what is the highest frequency in the waveform on Fig. 1. We now know that we must be able to modulate with frequencies between 10 kc/s and 1.2 Mc/s to be able to transmit such a waveform.

If we modulate a transmitter of frequency 20 Mc/s with our pulse, the sidebands will extend from 18.8 Mc/s to 21.2 Mc/s and the bandwidth is 2.4 Mc/s. With a 60 Mc/s transmitter, the bandwidth remains 2.4 Mc/s, but as a proportion it is less—three times less in simple proportion. Sometimes simple proportion is not used to express the bandwidth as a fraction of the carrier frequency. The geometric mean of the upper and lower frequencies can be taken and used as the denominator of a fraction whose numerator is the bandwidth. The term "geometric mean" need not cause any concern; all that is involved is multiplying the two frequencies together and taking the square root of the answer.

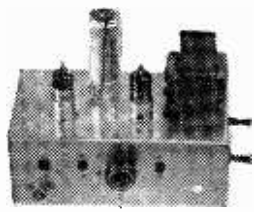
Applying this to the two examples above, we get: For the 20 Mc/s carrier, a geometric mean of $\sqrt{18.8 \times 21.2}$, which is almost exactly 19.95. Using this as a denominator of a fraction, whose numerator is the bandwidth, we get $\frac{2.4}{19.95}$ or about 0.12.

Doing the same thing for the 60 Mc/s carrier, we get a geometric mean of $\sqrt{58.8 \times 61.2}$, which is 59.99 Mc/s. The fractional bandwidth then becomes $\frac{2.4}{59.99}$ or about 0.04.

All of these results are in close agreement with those obtained by using the carrier frequency rather than the geometric mean of the outer sideband frequencies, and the reader will see that an appreciation of what is involved can be had by using simple proportion. The table shows some typical fractional bandwidths occupied by the sidebands of various carrier frequencies when amplitude modulated by various sources. The fractional bandwidth shown in the table assumes that both sidebands have to be accommodated.

Two Examples

It is not the purpose of this article to do more than familiarise the reader with the term bandwidth; design techniques for obtaining bandwidth are outside the scope of the article. However, it may be of interest to conclude by considering two numerical examples of tuned circuits. The bandwidth of a tuned circuit depends on the ratio of the reactance of either the inductor or capacitor and the losses. Below about 20 Mc/s almost all the losses are due to the resistance of the inductor's wire. This ratio is called Q. The bandwidth of the circuit is arrived at by dividing the resonant frequency by the value of Q. A typical value of Q for a medium-wave coil is 100, although higher values are attainable. At 1 Mc/s a tuned circuit using such an inductor would have a bandwidth of about 10 kc/s. Typical tuning inductors for television sets have values of Q (before any damping resistors are connected) of between 100 and 200. Assuming a Q of 150 for an inductor used in a tuned circuit resonant at 45 Mc/s, the bandwidth would be 300 kc/s.



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

Suitable for London, Birmingham and Northern Transmissions

£2 - 5 - 0 post free.

A highly successful unit (*BC World* circuit), incorporating variable oscillator tuning, Midget BVA valves, etc. Chassis size 7 x 4 x 2½in. Thousands already in use. Suitable for most types of T/V sets. TRF or Superhet. Kit of parts 45/-. Blueprint 1/6, Power pack kit 30/-. Switch kit (Band 1—Band 3 Ae switching), 6/6—all Post Free. Wiring and aligning of above 20/- extra.

Full range of Band 3 aerials in stock. Adaptors from 7/6 per set. Indoor dipoles, 6/6. Outdoor with cable 13/9. Band 1—Band 3 cross-over filter unit, 7/6. Variable attenuators 6 db—36 db, 7/6. BBC Break-through Filter, suitable for BBC pattern rejection, 8/6.

Volume Controls

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

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

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

80 ohm CABLE COAX

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

8d. yd.

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

9d. yd.

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

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

50 OHM COAX CABLE 8d. per yd. ¼in. dia.

TRIMMERS, Ceramic, 4 pf.—70 pf., 9d. 100 pf. 150 pf., 1/3; 250 pf., 1/6; 500 pf., 1/9. **PHILIPS** Beehive Type—2 to 8 pf. or 3 to 30 pf., 1/3 each.

RESISTORS—Pref. values 10 ohms 10 megohms.

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

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

3w. LAB COLVERN, Etc. Standard Size Pots. 2¼in. Spindle. High Grade. All Values, 100 ohms to 50 K., 5/6; 100 K., 6/6.

W/W EXT. SPEAKER CONTROL 10 Ω. 3/-.

CONDENSERS.—Mica or S. Mica. All pref. values. 3 pf. to 680 pf., 6d. ea. Ceramic types, 2.2 pf.-5,000 pf. as available, 9d. each. **Tubulars**, 150 v., Hunts and T.C.C. .0005, .001, .005, .01 and .1 350 v., 9d., .02, .05, .1 500 v. Hunts, TCC, 1/-. .25 Hunts, 1/6. .5 Hunts, 1/9. .1 1,500 v. T.C.C. (Simplex), 3/6. .001 6 kV. T.C.C., 5/6. .001 20 kV. T.C.C., 9/6.

SILVER MICA CONDENSERS—

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

STANDARD 3 WAVEBAND COIL PACK. Size 2¼in. x 2¼in. x 1¼in depth, 4 pos. Switching. Long, Med., Short, Gram. Dust-core coils prealigned for 465 Kc/s I.F. Complete with trimmer, ready to use. A very sensitive and efficient Coil Pack.

Manufacturer's Surplus. Bargain Offer, 27/6.

ALUMINIUM CHASSIS.—**18 s.w.g. Plain, undrilled, folded 4 sides and riveted corners lattice fixing holes. Strong and soundly constructed with 2in. sides. 7in. x 4in., 4/6; 9in. x 6in., 5/9; 11in. x 7in. 6/9; 13in. x 9in., 8/6; 14in. x 11in., 10/6; and 18in. x 13in. x 3in., 16/6.**

SPECIAL OFFER.—Goodmans 12in. P.M. Speaker Audiom 50. Brand new, boxed and guar. **FEW ONLY. £4/10/-.** Carr. 5/-.

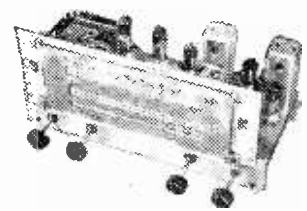
BRIMISTORS.—CZ1 for .3a heater chains, 3/6. CZ2 for .15 a., or .2 a., 2/6. CZ3 (Pilot Lamp), 1/6.

COPPER ENAMEL WIRE.—¼ lb. 14 to 20 s.w.g., 2/-; 22 to 28 s.w.g., 2/6; 30 to 40 s.w.g., 3/6.

SWITCH CLEANER Fluid.- 10 oz. tin 3/9.

3 VALVE AMPLIFIER

With variable Tone and Volume controls. 3 Midget BVA valves. 4 watts output. Neg. feedback. Chassis isolated from Mains. A.C. 200/250 v. A quality amplifier at an economical price. **PRICE £3.19.6.** Carr. 2/6. Wired and tested. 15/- extra. Circuit and instr., 1/6, free with kit.



ALL WAVE RADIOGRAM CHASSIS
3 WAVEBANDS, 5 VALVES

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

Brand new and guar. A.C. 200/250 v. 4 pos. W/C sw. short-medium-long-gram. P.U. socket. High Q dust core coils. Latest circuit technique, delayed AVC and neg. feedback. O/P 4 watts. Chassis size, 13½ x 5½ x 2¾in. Dial 10in. x 4½in. Hor. or vert. station names. Walnut or ivory knobs to choice. Aligned and calibrated ready for use. **Sensitivity and Quality at Low Cost.**

Double wound mains trans. **BARGAIN PRICE £9.15.0**
Carr. and ins., 4/6.
8 or 10in. speakers to match, from 21/6.

7 Valve De Luxe, push-pull version
7 watt output, £12.10.0. Carr. & ins., 5/-.

BARGAIN VALUE IN AUTO CHANGERS

3 speed auto change mixers for 7in., 10in. & 12in. records. Lightweight Xtal P.U. with turnover. Duo-point sapphire stylus for Hi-Fi reproduction. Latest models—Modern styling. All brand new, boxed and guar. A.C. 200/250 v. only.

PLE88SEV. **£8 10/-.** BSR MONARCH, 81 gns. GARRARD RC110. **£8 19 6.** COLLARO RC54, **£10/10/-.** All suitable or above Radiogram chassis.

QUALITY FLUORESCENT FITTINGS

Ideal for home or workshop. 4ft., 220-250 v., complete with tube, ballast unit, etc., ready for use. Famous manufacturer's surplus offered at approx. half price. Starter switch type, **42/-**. Quick start type, **47/6**. Carr. and ins., 7/6 extra.

FEW ONLY NOW LEFT.

NEW BOXED VALVES ALL GUARANTEED

1R5, 1T4	7/6	DAF96	10/-	ECH81	12/6
1S5, 1S4	7/6	DF96	10/-	ECL80	12/6
3S4, 3V4	8/-	DK96	10/-	EF41	10/6
5Z4	8/6	DL96	10/-	EF50	10/-
6AT6	8/6	EA50	2/-	EF50	Equip. 5/6
6CH6	10/6	EB91	7/6	EF80	12/6
6H6M	3/6	EBC41	10/6	EF85	10/6
6K7	6/6	EBC33	8/6	EF85	10/6
6K8	9/-	ECC81	12/6	EF86	13/6
6Q7	8/6	ECC84	13/6	EF91	8/6
6SN7	9/-	ECC85	13/6	EF91	8/6
6V6	7/6	ECF80	12/6	EL41	11/6
6X4	8/6	ECF82	13/6	EL84	12/6
6X5	8/-	ECH42	10/6	EY51	12/6

EZ40	10/-	PCL83	12/6	U25	12/6
EZ80	11/-	PL81	12/6	UABC80	12/6
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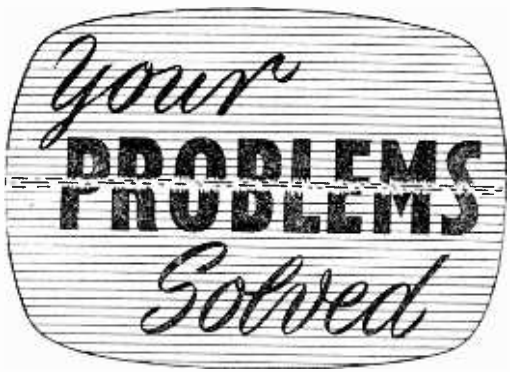

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MARCONIPHONE VC69DA

When I switch on the picture does not fill the screen —there is a gap at the top and bottom of about 5in. ; after about 15 minutes it will fill the screen completely, but there are lines flashing across for most of the evening's viewing. I have looked through past editions of " Practical Television " and in the July, 1955, issue I see an article on servicing the H.M.V. 1814-16, but I cannot find my symptoms described.—J. Barlow (Bolton).

This is a fault in the LN152 frame timebase valve. This is situated approximately in the centre of the chassis, underneath the envelope of the picture tube. Preferably, it should be checked by substitution.

H.M.V. 1828

Suddenly, for no apparent reason, the width of the picture is reduced and is now only about 3in. wide on a 14in. screen. Altering the width control has a little effect, but not much ; height of picture is O.K. and so is the sound. I have changed over the Z77 valves, but to no effect. Could you please give me some directions as to the positions of components I should test ?—R. G. Lacey (Niton).

Suspect a short in the line output transformer. Check the N339 and the U329 valves. Low H.T. voltage often causes this symptom, due to a faulty metal H.T. rectifier, though the effect is gradual, as distinct from the sudden occurrence in your case.

EKCO T161

My Ekco television set model T161, which I purchased in 1952, has developed a fault in sound. The sound output is at the highest and control knob will not lessen its volume. The picture is quite in order.—J. T. Hope (Cheshire).

The volume control is actually a gain control fitted in the cathode circuit of the first sound (10F1) I.F. amplifier valve. This is the centre valve of the three on the right side of the chassis. The control is a 25 KΩ wire wound, which should be inspected ; this would be rendered inoperative if the .003 μF capacitor which is wired from cathode to chassis were to become short circuited.

BUSH TV43

I have a Bush TV43 which every time I switch on is off tune on the I.T.A. I have changed the two valves on the converter side, but this has no effect. —A. D. Banks (Birmingham).

A certain amount of tuning drift occurs on most sets on Band III. The purpose of the fine tuner is to correct this easily. If the effect is excessive in your case, though, a capacitor may be at fault in the tuner unit. You would be advised to let your dealer investigate the trouble for you and, if necessary, remove the tuner for examination at the factory.

I.T.A. CONVERSION

I would be grateful if you could suggest a cure for the fault I have come across in converting my set for I.T.A.

The converter I am using is the Teletron Mark II cascode, which has been modified for band pass coupling as suggested in " Practical Television."

The set is a G.E.C. B.T.4541 T.R.F., which has been realigned to try to check the fault.

On aligning the converter, I found that I could get good sound, or vision, on rocking the oscillator core half a turn, but cannot get sound and vision together. —A. H. W. (Cambridge).

For correct conversion it is necessary for the converter's oscillator to work below the signal frequency. In your case it would appear that the oscillator is working above the signal frequency. This, of course, provides sound or vision conversion, but not simultaneous conversion of both sound and vision.

MARCONIPHONE VT53DA

I am endeavouring to service a Marconiphone VT53DA of which I have the circuit diagram. The trouble appears to be in the frame timebase as the raster is sharply divided. The upper half has clear line structure and answers to brilliance control, but the lower half remains bright all the time and is very blurred and milky. I have not attempted lining up for picture until I get a good raster. The frame oscillator and O.P. valves are O.K. I would be extremely obliged if you could give me a clue as to which defective components are likely to produce this symptom.—J. H. B. (S.E.17).

Hum in the vision channel is a very likely cause of this trouble. Check the picture tube for heater to cathode leakage, and also the valves in the vision channel, particularly the vision interference limiter diode and the video amplifier. Check the smoothing electrolytics.

FERRANTI 14T4

I get a thin line to a 2in. patchwork picture in the middle across the screen. The whistle seems to be extra strong, and does not always work. Touching base sets it going. I also get a kind of flash in neck of tube screen ; it will flash (not big), then screen gets brighter. I have changed PL81, ECL80, PV81, without effect. I have a chart.—G. P. (Hayes).

We are not clear on the symptom. It would help if you let us have a rough sketch of it, also indicating whether the sound channel is affected.

The flash in the tube almost certainly indicates that the tube is faulty and in need of replacement. We would not recommend replacement with a 17in. tube.

FERGUSON 996T

The trouble is no picture, blank screen. EHT seems O.K., line whistle present, but when set is on for a few minutes PL81 line output valve gets hot and grid and plate of this valve go red. I have replaced this valve with new one, but still same results. If anode connection from tube is disconnected, valve goes back to normal. I have checked line and frame output transformer and these seem O.K.—T. L. H. (Liverpool 5).

Try making the following modification to the tube base wiring. Tube pins numbered 1-12 (counting absent pins) from locating spigot clockwise. Remove lead from pin 2. Disconnect strap from tag 7 and connect to tag 2, i.e., tag 2 is now strapped to tag 11. Remove lead from tag 10 and place on tag 7. Connect original lead from tag 2 to tag 10.

MARCONIPHONE VC55

I wish to convert Model VC55 to I.T.A., and would like your advice on the matter, as being a regular reader of your journal I realise that a " turret tuner " is the best way of doing this ; so could you let me know if there is one made for this model, or is there an alternative that could be fitted, and could you give me some information on how it could be done ?—F. C. (E.16).

Yours is a superhet type receiver having a vision I.F. of 14 Mc/s and a sound I.F. of 10.5 Mc/s, with the oscillator below the signal frequency. A turret tuner is not available for this model ; a superhet type add-on converter is generally favoured, for example, the Aerialite Type MC. Alternatively, the Valradio Type TP adaptor is suitable ; this has an output at I.F. When ordering this latter type the I.F.s must be stipulated. Instructions for fitting are supplied.

ULTRA VA72

After the set has warmed up, there appear on the left hand side of screen four white vertical lines which appear to be wavy, otherwise picture quality seems to be quite good, Can you advise how to correct fault ?—E. C. (Stratford).

This may be caused by flashover in the line output transformer during the line flyback period. This is most likely if the vertical lines are composed of short irregular horizontal lines in columns. If the lines are clear cut, however, ringing in the line amplifier may be responsible. In this case you should check the condition of the reclaim diode (part of PZ30). Also check the condition of associated capacitors.

EKCO TS146

My set is an Ekco TS146. It has run trouble free for 10 years but for four days I had the following failing. When I first switched it on I had a perfect, bright, clear picture, good enough for daylight viewing. After approximately six or seven minutes the picture would commence to go darker, very gradually, till finally, inside half-an-hour, very little was distinguishable of the picture and the screen was almost black. Sound, focus, line hold and frame hold, all continued normal. I could not advance the contrast beyond a certain point or the picture went negative in a very dull way. I have switched all the vision 6F13s to the sound strip one at a time, and on switching No. 6 valve I advanced the contrast a little when the picture was going dark, and after approximately 10 to 15 seconds the brightness seemed to flow back like a valve heater getting hot. I have had no further trouble since, but I would like to know the cause. P61 and U22 + UU8—have all been time-tested O.K. I cannot think the No. 6 valve is faulty as it now works very well on sound. Could you please localise the fault for me?—R. H. (Slough).

Your description is that of an intermittent heater short in the picture tube. You do not mention how long the present tube has been in service, but if it is the original it has, indeed, done very well.

MURPHY V118C

When switching the set on one 500 mA fuse blows (top one). I have replaced the smoothing condenser 32μF and UU8 rectifying valve, also I have checked H.T. volts, these appear normal. The H.T. smoothing choke has a resistance of 75 ohms, the two 75 ohms resistors in series with the H.T. windings are O.K. When the 500 mA blows the UU8 rectifying valve goes fluorescent.—P. D. (Hillingdon).

Your description indicates conclusively that a short-circuit exists on the cathode side of the UU8—this may be of an intermittent nature. Make sure that the replacement valve is in good order, for it has been known for new ones to possess an internal short. If the valve is in good condition, then you will have to check systematically the H.T. line with an ohmmeter with respect to chassis, in an endeavour to locate the source of the short, bearing in mind, of course, that it may actually be in a transformer or coil.

ETRONIC ETV1536

The fault was some weeks ago; the Brimistor was broken and it had two ½-watt resistors in parallel with it. These had gone o/c. I couldn't tell what they should be so I put a 500Ω 3-watt and a Brimar CZ1 in. The set then worked all right for about six weeks. Then the fuse blew. On checking I found the PZ30 faulty. Pins 1 and 7 o/c, but pins 5, 6 and 7 shorted internally. Replaced valve and fuse and set then worked at full contrast and nearly full brilliance. If I turn any of these controls down severe sparking occurs in the line transformer from the EHT filament winding to the windings, and this sometimes sparks also into the PZ30. Also, when transmission is on and I take the aerial out sparking will occur without touching the controls. Turning the R.F. gain down also causes the sparking. I have checked the EHT and it is 7 kV, but rises when I turn the brilliance control down and then it sparks. I have the circuit but it doesn't give any voltages and any ohms readings for the transformer. I have changed 470K R31 in EHT line as it was high resistance and also C31 .5μF condenser. I also have a loud hum on sound at full volume only. I have tried replacing the ECL80 sound output and line drive valve, PL38 line output, EBC41 sound detector and bias rectifier.—J. H. (Hove).

The EHT sparking may be due to inefficient soldered connections and these should be inspected and, if necessary, remade with well-rounded blobs. Also it may be necessary to reposition the EY51. The inclusion of a 7 kV metrosil " bleeder " resistor in the EHT circuit would help matters. The loud hum on sound at maximum volume is probably due to inefficient screening of the A.F. cables or of the control itself and due to this the circuit is picking up the frame timebase hum frequency.

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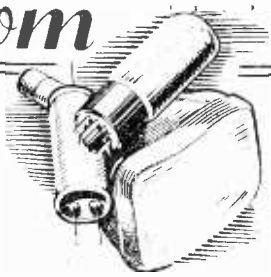
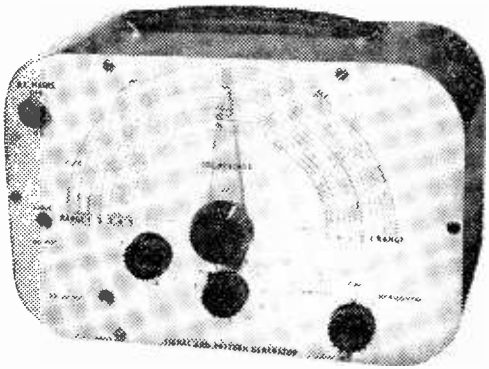


RADIO and TV Components of Acton announce a new Generator which is illustrated below. The frequency coverage is from 7.6 to 210 Mc/s in five switched ranges. Modulation is at 400 c.p.s., 81 kc/s or the output may be used unmodulated. The audio voltage is available at a separate output socket. The single attenuator controls both the R.F. and the A.F. output. The front panel contains the mains on/off switch, the audio output socket, and



The Radio and TV pattern and signal generator.

the R.F. output socket. The frequency range switch is marked 1 to 5 to correspond with the scale markings and the output attenuator is marked 0-10. The modulation switch selects the frequency of modulation, and in the "vertical" position the signal is modulated at 81 kc/s and will show eight vertical lines on the screen of a TV receiver which should be evenly spaced if the receiver is correctly adjusted. In the "horizontal" position (400 c.p.s.) eight horizontal bars will show. The lower range from 7.6 Mc/s upwards may, of course, be used for aligning I.F. stages and F.M. receivers. The case is finished in grey and the price is £6 19s. 6d. (plus 5/6 for post and packing).—Radio and TV Components (Acton) Ltd., 23, High Street, Acton, W.3.

Egen Aerial Triplexer

A NEW Aerial Triplexer, Type 163, has been introduced by Egen Electric Ltd. to combine or separate aerial signals in Bands I, II and III as required in almost any arrangement of aerials and television and V.H.F. radio receiver sockets.

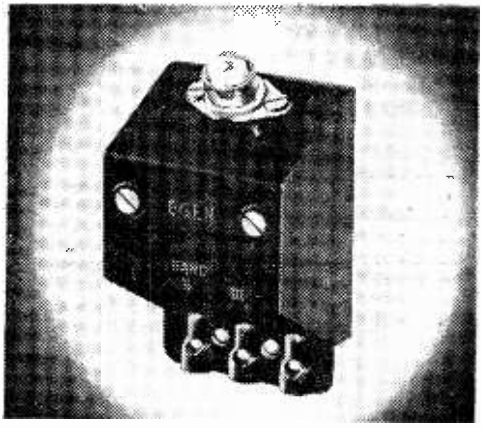
In addition to providing all the known advantages of the conventional Band I/III diplexer, the Egen Triplexer also covers Band II, allowing signals from separate Band I, II and III aerials to be fed to a TV/V.H.F. radio receiver with a single aerial socket, or signals from a combined Band I, II and III aerial to be fed to separate sockets.

Other features of this new component include easily accessible screw terminals, cable clamps gripping both the insulation and braiding of cables, and inductances wound on nylon formers with factory pre-set cores. The Triplexer is finished in attractive "hammer-bronze" enamel. Egen Electric Ltd., Charfleet Industrial Estate, Canvey Island, Essex.

New Grade of Plessey Magnetic Material

THE range of "Caslox" magnetic materials, manufactured by The Plessey Company Limited for use in television receiver focusing magnets, has been extended by the introduction of a new type known as "Caslox" Grade III.

Basically, this material, like earlier "Caslox" grades is a non-metallic magnetic ferrite for use in geometrical configurations where metallic magnets are unsuitable. It has a high stability which results from a high value of coercivity and a permeability only slightly greater than unity.



The Egen "Triplexer."

It consists of a powered magnetic ferrite which is bonded into the shapes desired by the addition of a small quantity of resinous binder. This technique enables tolerances of ±0.005in. to be achieved.

A wide range of different shapes can be produced. When "Caslox" is used in scanning coils and ion traps, the magnets can be very compact, featuring high magneto-motive force and very low-leakage flux.—The Plessey Co. Ltd., Ilford, Essex.

QUERIES COUPON

This coupon is available until NOVEMBER 21st, 1956.
and must accompany all Queries.
PRACTICAL TELEVISION, NOVEMBER, 1956.

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