AN INEXPENSIVE RECEIVER

PRACTICAL TELEVISION

AND TELEVISION TIMES

1/-

EDITOR F. J. CAMM

A NEWNES PUBLICATION

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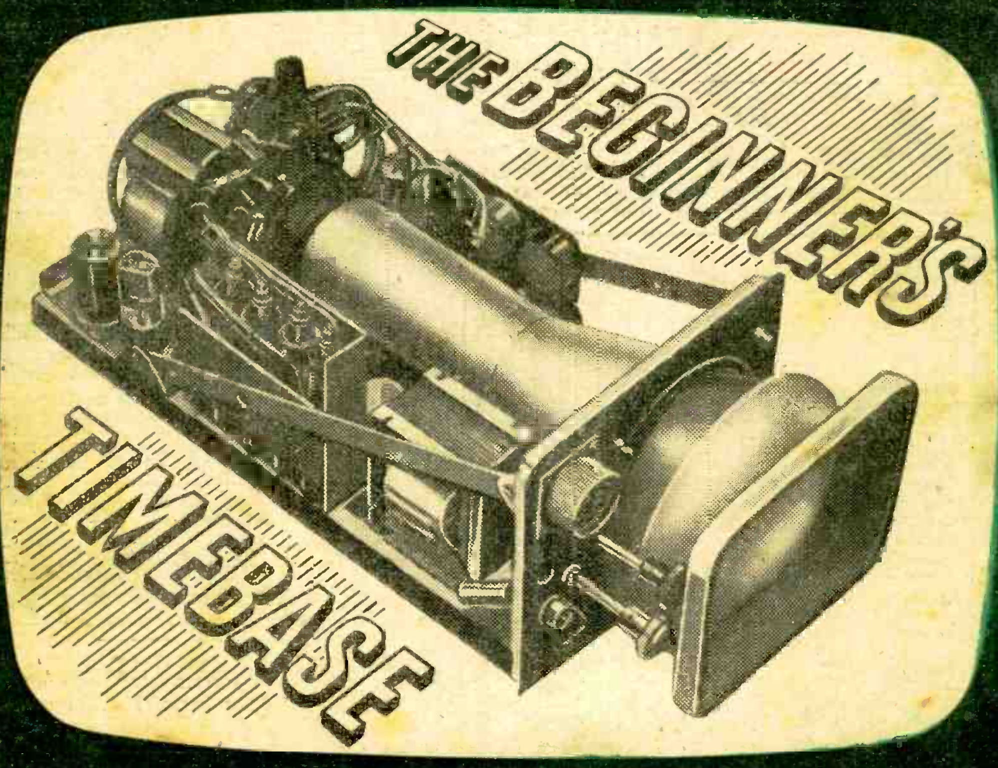

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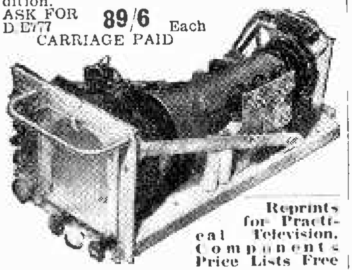

Reprints for Practical Television. Components Price Lists Free on request.

The "Beginner's Receiver," modifying the R3170A, April to July ...	1/6
Economy Televisor, modifying Ind. 62	1/6
Argus Televisor, data and blueprint	2/6

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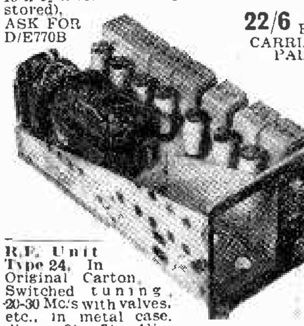

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PRACTICAL TELEVISION

& "TELEVISION TIMES"

Editor: F. J. CAMM

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TELEVIEWS

The Interference Problem

THE greatest problem associated with television to-day is not concerned with transmission or reception as such but with interference caused by electrical apparatus such as the ignition system of motor cars, hair dryers and vacuum cleaners. As from July this year it has been made compulsory to fit suppressors to all new motor cars, but as there are more old cars than new on the road, this move can only be considered as a partial measure. Bearing in mind the cheapness of suppressors it is surprising that the Act was not framed to make it compulsory for *all* motor cars to fit them. Owners of TV receivers are always complaining about interference, forgetful of the fact that their own receiver *may* be interfering with the broadcast reception of their neighbours. This form of interference is far more widespread than is generally supposed. For example, in the last issue of the "General Post Office Return of Interference Complaints," radiation from television receiver timebases heads the list of offenders, after inefficient aerial and earth systems, or interference due to loose wiring in the house or to receivers which are themselves faulty—the well-known causes. Owners of TV sets who complain of interference are therefore urged to make quite sure that their receiver is not interfering with broadcast reception.

We are glad that the R.I.C. has appointed an Interference Suppression Sub-committee who are embarking on a campaign to reduce interference with broadcast reception and particularly interference caused by timebases. We give our support to it and urge every one of our readers to ascertain whether their sets are offending in this respect.

It must not be inferred from this that home-constructed television receivers as such are more liable to give rise to this form of interference than commercial receivers. There are between 300,000 and 400,000 home-built TV receivers in this country at the present time. Most of them are well designed and those parts which are prone to cause interference are well shielded. All of the receivers sponsored by this journal have been laboratory-tested to ensure that they are interference free. You will be helping the R.I.C., if you are operating a home-built receiver, by ensuring that all parts likely to give rise to interference are properly shielded. The operation can be simply and quickly carried out.

The British Standards Institution have appointed a technical committee on radio interference suppression and a sub-committee on radio interference susceptibility of receiving equipment. Its report examines the problems very thoroughly and we hope to publish it in a later issue.

Slot-machine TV Films

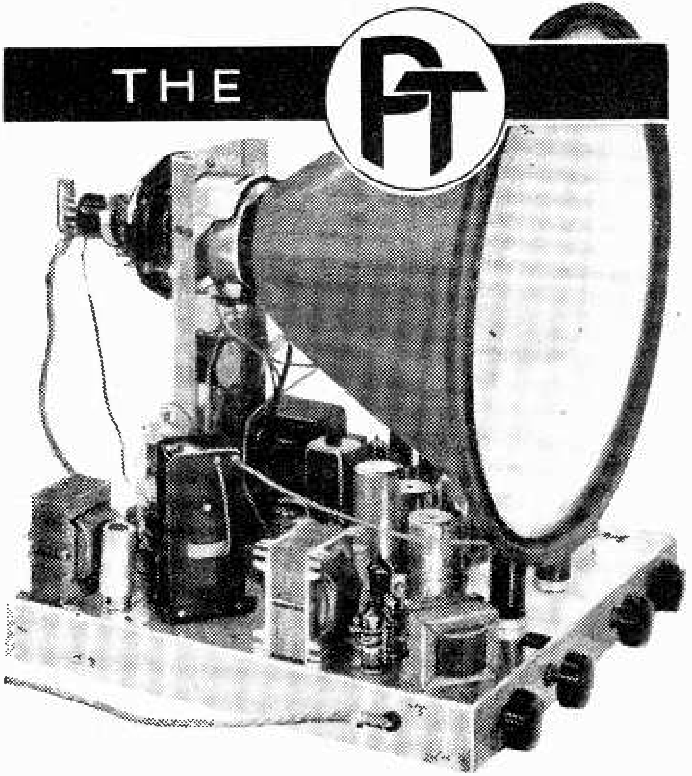
IT is obvious that TV is affecting the cinema, some hundreds of which will have to close in this country alone unless counter-measures are taken. Hollywood has already embarked upon a militant campaign to offset the competition of the new form of entertainment. The system is known as the Tele-Meter under which you pay as you view. We are told that all a viewer does is to drop a prescribed fee in a box attached to his TV set. This resembles the Phono-Vision system demonstrated many years ago in which you dialled the telephone company to ask for a particular picture. The operator then plugged you into a film broadcast to your home set. The telephone company put the charge on your monthly telephone bill. The experiment was entirely successful but it failed to attract the support of the telephone companies and Hollywood itself turned the idea down. No doubt now it bitterly regrets it.

TV Aids the Police

FOR the first time in the history of television the screen was used to show a picture of a man whom the police are anxious to trace as possibly being able to assist them in their inquiries into a murder case. This was on Thursday, 1st October.

Radio was first used in the same way in tracing Crippen and Ethel LeNeve who had fled the country by boat. The captain of the ship recognised them from the broadcast description and they were arrested as they disembarked.—F. J. C.

THE PT SUPER-VISOR



FINAL DETAILS OF OUR NEW RECEIVER, TOGETHER WITH THE LATEST IMPROVEMENT

VARIOUS points were raised by readers who visited our stand during the Radio Show, and queries were asked regarding the construction and use of this receiver, which many saw working after the electricians had finally provided us with a power supply on the stand. One of the queries concerned the base connections to the valves, as references to B7G and similar holders confused quite a few constructors. Accordingly, we give on the opposite page a chart which not only gives the pin connections of the various valves used in this receiver but also the valve base with the official designation. Another point concerned the blueprint which will subsequently be issued, and several complained that they did not like the long lapse of time between the publication of details in our pages and the issue of the appropriate blueprint. There is a reason for this delay and it is this. On publication of the appropriate data in the pages many readers will proceed with construction. Those who cannot work from the small diagrams and are not sufficiently familiar with circuit diagrams, etc., must wait for a full-size blueprint. Obviously, therefore, this group of constructors will be unable to unravel any slight difficulty or obscurity in the wiring plan, whereas the more experienced who can work from a theoretical diagram may come across small details which, whilst perfectly clear to the designer, need stressing or emphasising to the constructor who is following the article. Such points, if they arise, can, if a period is permitted to elapse before the final blueprint is prepared, be incorporated in the blueprint and thus the beginner's problems are solved for him. Another point which sometimes arises is that a large number of prospective constructors ask for some change in the circuit and the change, if thought desirable, can be incorporated in the blueprint.

Flyback Suppression

Such a change has arisen in connection with this receiver. Many visitors to the show asked whether the design incorporated frame flyback suppression, which was a feature emphasised on a number of stands. In the prototype this feature was not introduced, but it appears popular experiments have been carried out to see the simplest form of introducing it, and it has been found possible to give suppression in a most simple manner in this particular design. All that is required is a .002 μF condenser (ordinary paper tubular of 500 v.w.), which is connected between the anode of the frame output valve and cathode of the picture tube. This feature will, therefore, be included in the final blueprint, although it will not be found in the wiring diagrams already published. It may be wired at any convenient point, either on the tube valveholder, or under the chassis.

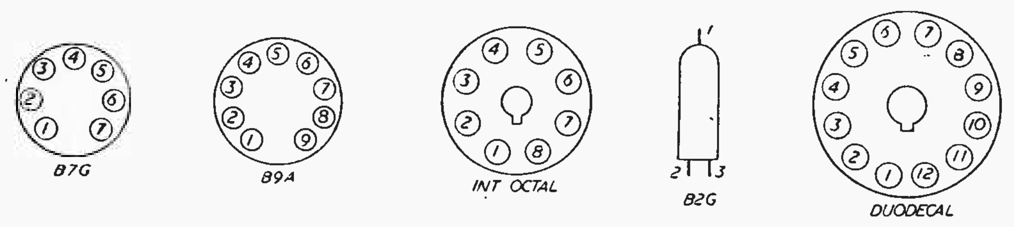
Working Voltages

Another query which was raised concerned the publication of test voltages in our designs. We are of the opinion that these can often be of more trouble than use, as they will vary with the normal tolerances of components, valves, etc., as well as with the type of test-meter which is used. It should be remembered that normally resistors will have a tolerance of 20 per cent. unless a lower tolerance is specified, and where two resistances occur in a circuit taking current (the anode load and decoupler resistors in any valve circuit, for instance), the two resistors may both be high to the limit of that tolerance, or both low, or one high and the other low. Where the current in the circuit is of any magnitude, therefore, there will be three different readings possible, and according to the values of the resistors and the current flowing the variations may be quite considerable. Furthermore, the valves themselves are subject to variation which will still further tend to provide a variation in the reading, and the meter which is used may have an internal resistance of 500 or 50,000 ohms per volt to provide yet another variable factor.

Provided, therefore, the constructor bears all these factors in mind and regards any published figures as being only a guide, we give a list of the voltages measured on the prototype at the points indicated. The meter used by us had a resistance of 10,000 ohms per volt, and unless a note is given to the contrary, the meter was set to the 500-volt range. The reading will, of course, vary on the same meter if set to the 10,000-volt range. The better the meter the higher will be the reading, and vice versa.

Pin No.	1	2	3	4	5	6	7	8	9
V1 ...	—	—	—	—	120	—	125	—	—
V2 ...	—	—	—	—	175	—	175	—	—
V3 ...	—	—	—	—	160	—	175	—	—
V4 ...	—	—	—	—	150	—	150	—	—
V5 ...	—	—	—	—	150	—	150	—	—
V6 ...	—	—	—	—	110	—	100	—	—
V8 ...	50	—	—	—	—	135	—	—	—
V10 ...	—	—	—	—	175	—	135	—	—
V11 ...	—	—	—	—	—	—	70	—	—
V12 ...	—	—	—	—	160	—	150	—	—
V13 ...	—	—	—	—	30	30	30	—	—
V15 ...	50	—	—	—	—	50	—	—	—
V16 ...	—	—	—	—	200	—	220	—	—
V20 ...	175	—	—	—	—	115	—	—	—

These readings were taken with Focus controls midway, and Contrast and Sensitivity Controls backed right off. No other voltages should be measured.



B7G								B9A		INT OCTAL				B2G		DUODECAL	
Z77		N78		D77		DH77		12AU7		6CD6		6U4		R12		CRT	
1	G1	1	G1	1	K1	1	G	1	A1	2	H	3	K	1	A	1	H
2	K	2	K/G3	2	A2	2	K	2	G1	3	K/G3	5	A	2	H/K	2	G1
3	H	3	H	3	H	3	H	3	K1	5	G1	7	H	3	H	10	G2
4	H	4	H	4	H	4	H	4	H	7	H	8	H			11	K
5	A	5	A	5	K2	5	D1	5	H	8	G2					12	H
6	G3/S	7	G2	6	S	6	D2	6	A2	TC	A					MC	A
7	G2			7	A1	7	A	7	G2								
								8	K2								
								9	H(ct)								

A–Anode D–Diode G–Grid H–Heater K–Cathode MC–Metal cone S–Screening ct–Centre tap

Valve base data for all valves in the Super-Visor.

BBC New Mobile Units

THE British Broadcasting Corporation has ordered four complete television outside broadcasting units from Marconi's Wireless Telegraph Co. Ltd. It is the largest single order for television equipment which the Marconi company has yet received from the BBC.

Three Cameras

Each of the units will be equipped for any type of outside broadcast, with five cameras to each, and with controls and mixers for both vision and sound. Three cameras will normally be used for programme purposes, one will be kept ready as a spare if needed, and one as a pool of spare parts for maintenance.

Every channel consists of a Marconi image orthicon television camera, camera control unit and ancillaries. There will be separate sound and vision mixers, and the sound has been specially designed for use with television.

Interior of Vehicles

The interiors of these vehicles will be planned to allow the maximum space and comfort for the engineering and production staff who may have to work long hours. They will be laid out with this aim in view, and the walls finished in light-coloured plastic which can easily be cleaned.

The new vehicles will be self-propelled with the body, cab and engine all built on to the one chassis. They will have an overall length of about 22ft., a height of 10ft. and a statutory width of 7ft. 6in.

Servicing Television Receivers

USEFUL DATA ON THE STANDARD PLESSEY CHASSIS

THIS chassis has been used in various televisors, such as the Regentone, The Defiant, The Argosy. It comprises a total of 14 valves in very efficient circuit arrangements.

Like all modern chassis the superhet principle is used, the sound I.F. being given as 10.5 Mc/s and the vision as 14 Mc/s. Actual alignment information will not be given as this is set-up at the factory and will not require adjustment under normal conditions. The London frequencies are vision 13.5 Mc/s. and sound 10 Mc/s.

Vision and Sound Circuits

The aerial is fed to the first L1 coil via an attenuator comprising the network R1, 2 and 3. In areas of low signal strength and in the fringe the attenuator will not be found necessary and can be bridged out. All three resistors can be taken out and the tags across which R1 is connected should be short-circuited. In some cases it will be found that no resistors are fitted, as these are normally installed, if required, by the service engineer.

It will be noted that each leg of the aerial socket is isolated by means of C1 and C2 to prevent the aerial becoming alive should the mains plug be connected round the wrong way.

It is as well to point out at this stage that the usual precautions should be taken when servicing this televisor as the chassis may be "alive" due to the method of power supply. No earth should come into direct contact with the chassis, and the mains plug should be connected so that the "earth" side of the mains is the chassis side of the televisor.

Circuit Description

From L1 the signal is passed to the first R.F. valve V1 whose gain can be varied by the potentiometer VR4, which is labelled the "R.F. Gain Control." This is the second preset control on the back of the chassis.

The output of V1 is fed into the oscillator and mixer valve V2 via the R.F. transformer comprising L2 and L3.

The local oscillations are produced in the screened grid circuit of V2, L4 forming the oscillator coil. The slug of L4 is available for trimming, access being gained from the top of the chassis. It will not normally be necessary to adjust this coil and it should therefore be left alone except when the receiver is being converted from one channel to another.

The output of the mixer contains both vision and sound signals and these are fed to V3 via the coil L5. It is at the output of V3 where separation of the two signals is accomplished, L6 and L8 (with the coupling coil L7) passing the vision signal to V4; the sound signal developed across L9 is passed on to the first sound I.F. valve V7. VR2 in the cathode circuit forms the contrast control and is brought out to the front panel.

V4 is the second vision I.F. valve and it has a rejector coil L10 in its cathode circuit to enable the correct frequency response to be maintained. The output of the valve is fed to the first half of a 6D2 valve which acts as the detector, via L11 and L13 with the coupling coil L12.

The signal is passed to the video output valve via a compensating network of which L14 forms a part. Direct coupling to the cathode of the C.R.T. is taken from the anode of this valve (V6), and across the circuit is connected the second half of the double diode V5 which acts as a spot suppressor. The degree of spot suppression can be controlled by the switch S2; it is advised that this switch is not left in the maximum spot suppression position as it is inclined to degrade the picture. It will not normally be found necessary to advance the control beyond the second position except in exceptionally bad localities.

Tone compensation of the picture is effected by the switch S3, which varies the capacity across V6 bias resistor. Some increase in gain is effected when the switch is in its maximum position though this will only be required in the fringe areas. Under normal conditions the switch should be left in the position of maximum quality.

The first sound I.F. (V7) is also the last, the signal being passed on to the sound detector V8 via the transformer L16, L17. The first half of the valve V8 forms the detector, while the second half functions as a noise suppressor.

The output of this valve is taken via a potentiometer VR1 to the sound output valve V9, which is a Mazda 6P25 tetrode. VR1 forms the volume control and is brought out to the front panel; the on/off switch is coupled with this control.

The output of V9 is fed to the output transformer T1 and the secondary of this transformer is wired to the socket "B." A plug fits into the socket to take this output to the loudspeaker, the other pins of the socket being used to convey current to the energising coil.

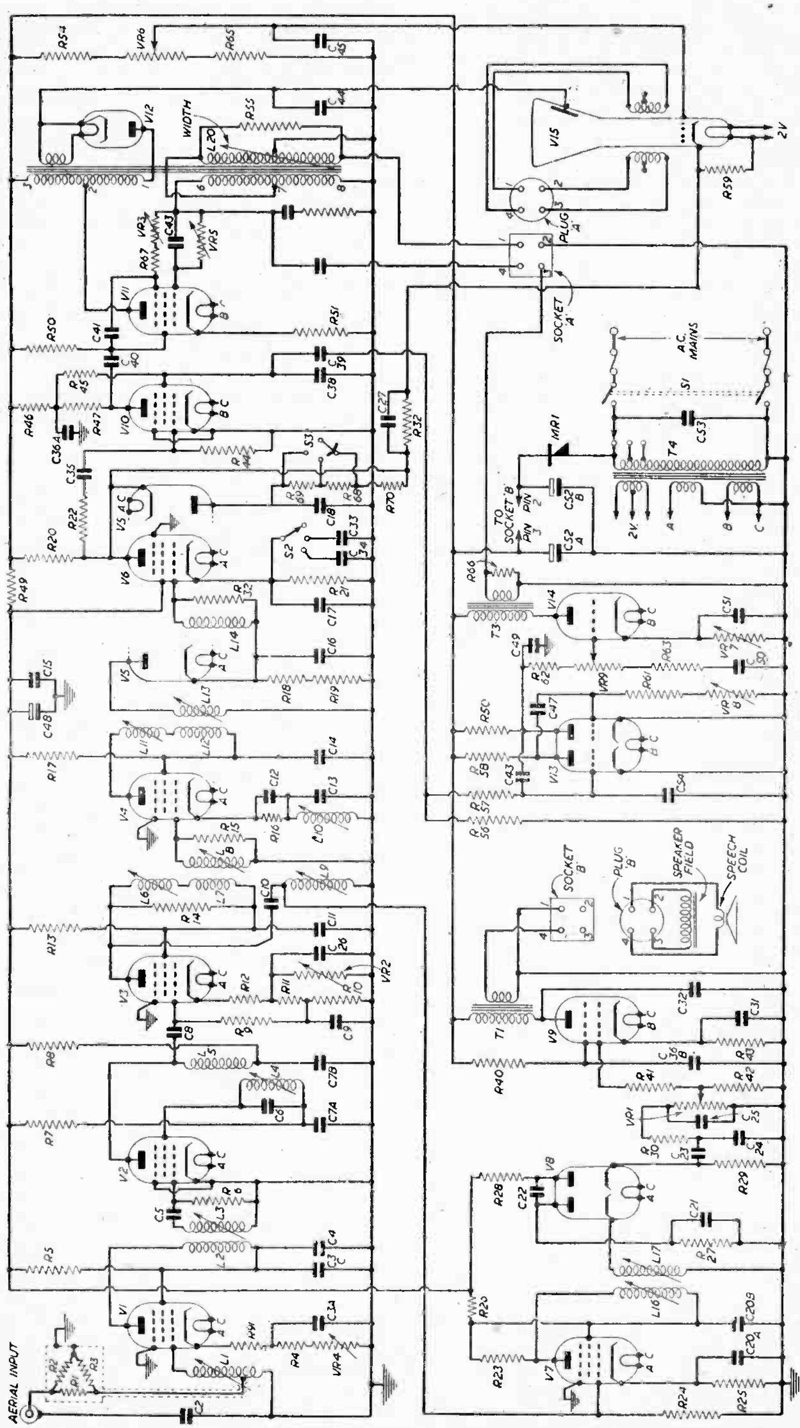
Sync Separator and Time Bases

The sync separator valve is V10 and it is fed from the anode of the video valve via the coupling condensor C35. As the cathode of V10 is connected directly to earth and the anode and screen voltages are carefully adjusted it is not necessary to have a separate D.C. restorer as the valve performs its own D.C. restoration.

Line sync pulses, suitably shaped in the coupling network, are fed to the line sawtooth current oscillator V11 from the anode of V10.

V11 is a Mullard EL38 and functions in a very efficient circuit. The key of the whole operation lies in the highly efficient transformer T2, which not only carries out the functions of building up the sawtooth oscillations in blocking oscillator fashion but also provides E.H.T. for the C.R.T.

Oscillations are built up in the grid circuit of the valve, the time constants of VR5, C43, C50 and R52 determining the frequency of the oscillations. VR5 is a variable control and is labelled "Line Hold". This is a preset control and is the third control on the preset panel at the back of the chassis.



Complete circuit diagram of the Plessey chassis, which forms the basis of a number of popular commercial receivers. A complete list of components cannot be supplied by us, neither can we supply values of resistors, etc. Many of these are self-evident or may be ascertained by reference to circuits published in these pages.

The feedback circuit to the suppressor grid via R67 and VR3 applies correction, and VR3 forms the linearity control being labelled "Line Linearity"; it is the first control on the preset panel at the back of the chassis.

It is not possible to obtain control over width by directly varying the amplitude of the output of V11 by means of feedback or cathode control because this would affect the value of the E.H.T. produced and consequently spot size. Width control is therefore obtained by inserting a variable inductance directly in the line coil circuit and this forms part of the transformer unit.

Variation of width is performed by altering the position of the movable iron slug, access being obtained at the top rear side of T2.

T2 is overwound in the popular fashion and the resultant high voltage obtained from the flyback is rectified by the EY51 diode V12 which is included in the transformer unit. C44 is the smoothing condenser and the voltage thus obtained is fed directly to the final anode of the C.R.T.

Bias for the C.R.T. is obtained from the potentiometer network R54, VR6 and R65, VR6 being variable and thus forming the brilliance control. This control is preset and occupies position 4 on the rear preset panel.

The frame sawtooth oscillator is a multivibrator using a duo-triode, a 6SN7 valve. Sync pulses are taken from the screened grid of the sync separator V10 via the shaping network. VR8 forms the frame hold control and it is brought out to a control on the back of the chassis; it is not on the preset panel. It should be noted that the oscillator is of the "distant control" type. It will not produce a raster in the absence of a picture signal. The latest model has been modified so that it is "self-running."

The output of the oscillator is taken to the frame amplifier V14 via the shaping network and variable control VR9. This control acts directly upon the input to V14 and consequently forms the height control. This control, like the frame hold control, occupies a separate position on the back of the chassis.

V14 is a Mazda 6L1B and is a triode valve. The bias is made variable by the control VR7 which thus alters the operating point of the valve on its characteristic curve, it thereby controls the linearity of the scan and is labelled "Frame Linearity." This control is the last control on the preset panel.

The output of V14 is fed to the frame coils via the output transformer T3.

Both frame and line coils mounted on the neck of the tube are connected to the chassis via a plug and socket "A."

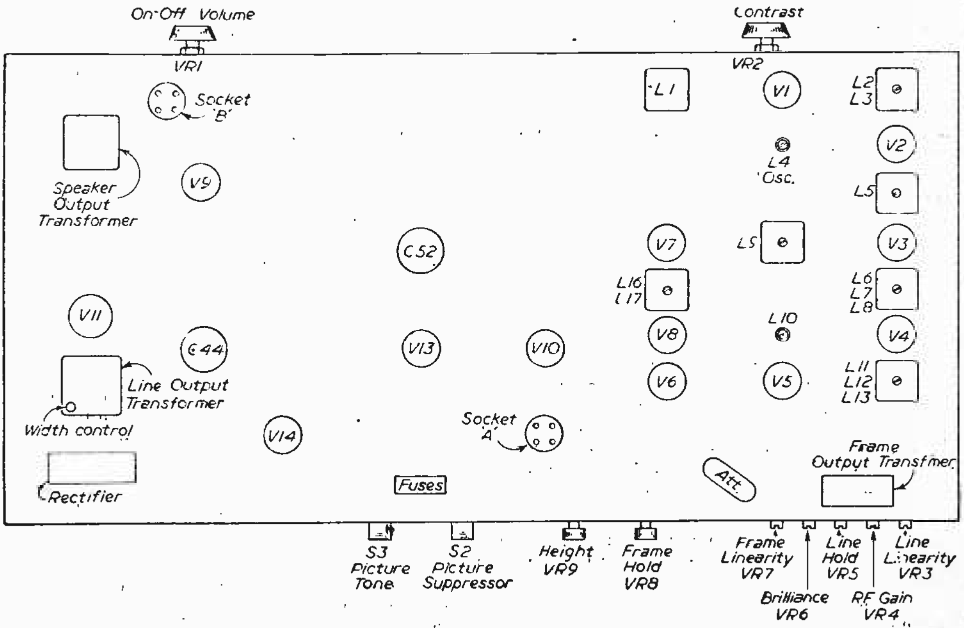
Power Supply

This follows modern methods by employing direct rectification of the applied A.C. for the H.T. rail. The A.C./D.C. principle has, however, been confined to the H.T. supply as the heaters are fed by means of a separate transformer, a single item providing current for the C.R.T. as well as for the rest of the valves, though the C.R.T. supply is effected on a separate winding.

C52A/B are the smoothing condensers and instead of employing a separate smoothing choke the field coil of the loudspeaker is used.

Fuses are supplied in the main feed to the chassis.

Focusing is accomplished by the use of a permanent magnet mounted on the neck of the tube, and this magnet is provided with an auxiliary movement for fine focusing which is controlled by a knob brought out of the back of the receiver.



General layout plan of the Plessey chassis.

Adjustments

As indicated when dealing with the frame oscillator a "raster" is not produced on the screen unless a picture signal is being received; it is necessary, therefore, to make all adjustments during reception periods and the best period is during the radiation of Test Card "C."

Focus

The fine adjustment for focus is made with the milled knob on the back of the televisor. The knob should be turned with care and, if it is not possible to obtain finely focused lines within the limits of its travel, the three retaining screws of the permanent magnet should be adjusted.

The best method of adjusting these is to screw up or unscrew each screw in turn about three turns observing the effect on the screen. It is most unwise to attempt to turn any screw a large number of times, otherwise the magnet may bear on the neck of the tube and cause a fracture.

It will be found that the position of the screws affects the position of the raster and they should therefore be adjusted not only to ensure correct focus but also to centralise the raster on the screen.

The frame and line coils should be pushed forward on the tube neck as far as they will go to ensure freedom from cut-off.

If the picture is tilted to either side correction can be made by slightly rotating the line and frame coils on the neck of the tube.

Contrast and Brilliance

The contrast and brilliance controls are complementary to each other; the ideal position of the brilliance control is where the raster just disappears from the screen with the contrast control at zero. However, this is rather difficult to attain in practice as no raster is apparent when the contrast control is at zero—only a white line is left on the screen. If this white line is reduced with the brilliance control until it is on the faint side, the contrast control can then be advanced until the picture is received, any further adjustment being made with the brilliance control to ensure correct ratio between light and shade as indicated on the Test Card "C."

It is important to note that the suppressor circuit should be at the minimum position while adjusting brilliance as it has some effect on the peak brightness of the picture.

Once preset the brilliance control can remain undisturbed, any further alteration in values of picture tone being made by the contrast control.

R.F. Gain

In areas of high signal strength it may be found that, in spite of the attenuators, too much gain is obtained. In bad cases it will be found that the contrast control cannot be reduced sufficiently.

To overcome this trouble the R.F. gain control should be operated and the best position is generally where no picture is received with the contrast at zero.

The R.F. gain control also effects the sound signal.

Once set to the optimum position there is no need of further adjustment of this control.

Line Hold

This control found on the back control panel should be set so that the picture is correctly resolved. At the limit it will be found that the picture falls into a series of lines across the screen and the lines can be gradually resolved into a picture by the operation of the control. The best position is found by carefully inspecting the picture so as to observe that all the lines making up the picture are locked; if the line hold is not set quite correctly it will be observed that the top few lines tend to wander slightly.

Once set this control requires no further adjustment.

Line Linearity and Width Controls

It will be found that there is some interaction between these controls. The width is adjusted by moving the slug in the line transformer by means of the yellow wire protruding from the top. When the width has been set the line linearity should be adjusted to correct any maladjustment in the horizontal appearance of the picture so that neither side appears cramped.

With the form of control used in this circuit the interaction is not so great as with some other forms of control.

It may be found that adjustment of the width control causes the picture to collapse into lines. This should be corrected by readjustment of the line hold control.

Both picture width and line linearity controls can be locked once the adjustment has been made.

Frame Linearity and Frame Height

These two controls interact with each other rather closely, adjustment of the one requiring readjustment of the other. Careful alignment of the two controls using Test Card "C" will enable correct height to be obtained without distortion of the top or bottom half of the picture.

Frame Hold

This control requires very careful adjustment to obtain the optimum position for good interlace. The ideal method is to adjust the control while observing the position of the lines through a powerful magnifying glass. However, generally this is not practicable due to the tube face being remote from the control. A near approximation to the optimum position can be obtained by increasing the height control to maximum, so that the lines of the picture open out, and then adjusting the frame hold until the lines are observed to interlace correctly. The height control should then be reduced to its correct position.

Picture Tone

The best position for this control will be decided by the personal taste of the user; some slight increase in gain is obtained with slight deterioration in picture quality when the control is at maximum.

Picture Suppressor

This control should be used as little as possible. If it is really necessary then it should be adjusted while the ignition interference is present so as to obtain minimum-sized interference spots consistent with picture quality. It will be noted that in the limit the suppression, though very good, will slightly degrade the highlights of the picture. This is usual with spot suppressors.

Timebase Design by Time Constant

THE SERVICEMAN AND STUDENT WILL FIND THIS ARTICLE OF CONSIDERABLE INTEREST

By D. W. Thomasson, A.M.Brit.I.R.E.

THE circuit shown in Fig. 1 occurs in many different forms in the timebase section of a television receiver. It looks simple enough, but the usual academic treatment of its operation is surprisingly involved. Many people are content with the knowledge that the capacitance charges up in "exponential fashion" when the switch is closed, perhaps noting at the same time that the voltage across the capacitance reaches 63 per cent. of the supply voltage after CR seconds have elapsed.

It is possible to go a lot further into the matter without bothering about any but the simplest mathematics, however. One simple rule gives the key:

"The voltage on the capacitance is always changing at such a rate that if the rate were maintained constant the charging process would be complete in CR seconds."

The value of CR, found by multiplying the capacitance in farads by the resistance in ohms (or the capacitance in microfarads by the resistance in megohms), is known as the time constant of the circuit. A similar but less well-known rule applies for the circuit of Fig. 2:

"The current in the inductance is always changing at such a rate that if the rate were maintained constant the current would reach the final value in $\frac{L}{R}$ seconds."

Here, of course, the inductance is taken in henries and the resistance in ohms and, once again, the answer is in seconds.

Practical Cases

How can these rules be used? First of all, make sure that you understand exactly what they mean. Fig. 3 shows the general case for the capacitance charging up or the inductance with rising current. Time is plotted horizontally in terms of the time constant, and voltage or current vertically in terms of the eventual steady value.

Perhaps it will be easiest to consider the specific case of a supply voltage of 100 volts, a capacitance of 1 microfarad, and a resistance of 1 megohm, which will give a time constant of 1 second. The vertical scale can now be read directly in volts and the horizontal scale in seconds.

When the switch is closed, the capacitance being previously discharged completely, the voltage starts to rise at a rate of 100 volts per second. Ten milliseconds later (one-hundredth of a second) it has reached nearly 10 volts, but is now rising at only 90 volts per second, for only 90 volts remain across the resistor, and the rate must be such that these would disappear in 1 second.

And so it goes on. The rate of rise slows down more and more, and the charging process will always appear to be going to be complete in 1 second more, but never does reach the final value. After the process has gone on for a full second, the voltage has risen to 63 volts, but after 2 seconds it is only at the 90 volt level. Three seconds charge bring it to about 96 volts.

It is quite easy to draw the curve on squared paper by starting with a line from the bottom left corner to a point CR seconds to the right on the upper line, then drawing in another line from a point a little way up the first to a point on the upper line CR units to the right, and so on. The final curve is the underside of all the approximate lines. Fig. 4 shows the idea, but more approximate lines would be needed to give good results.

The curve can be used for any practical case. For example, to find how long it would take a 0.01 microfarad condenser to charge to 70 volts when fed from a 200 volt source through a 100,000 ohm resistor, the time constant must first be worked out (0.001 sec. or 1 millisec.) and it can then be seen that a charge of 70 volts out of 200 (35 per cent.) will be built up when the time elapsed is about 0.45 times the time constant, or in this case 0.00045 sec. (450 microseconds).

Again, an inductance is connected to a 200 volt supply by means of a 100,000 ohm resistor. What

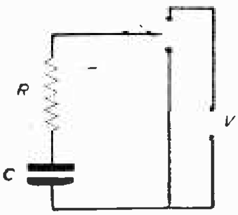


Fig. 1.—A simple R-C circuit.

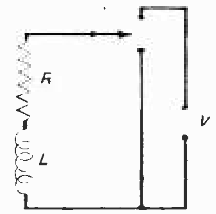


Fig. 2.—A basic R-L circuit.

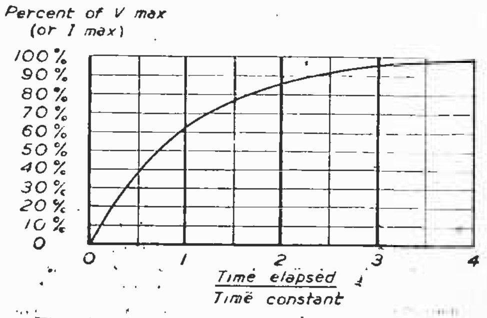


Fig. 3.—A generalised time-constant curve.

will the current be after 2 microseconds if the inductance is 1 henry? The final current will depend only on the resistance and supply voltage, and will be 2 milliamps. The time constant is 10 microseconds, and from the curve the current will reach about 18 per cent. of the final value after one-fifth of the time constant has elapsed. The current will thus be 0.36 milliamp (360 microamps). Note that in the inductive case a large resistance means a short time constant: the final current is lower and is, therefore, reached more quickly. Note, also, that the internal resistance of the coil or choke must be taken into account in the value of the series resistance.

Small Changes

In many cases, the period of charge or discharge is very short compared with the time constant, and there is no need to refer to the curve at all. For example, take the input circuit of the commonest type of sync separator (Fig. 5). The sync pulses arrive at least every 100 microseconds, and the time

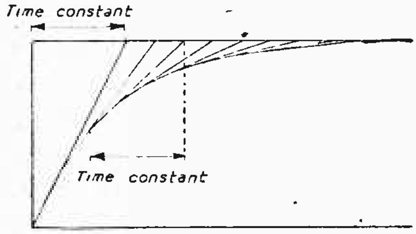


Fig. 4.—Method of constructing the curve in Fig. 3.

constant of the grid leak and grid coupling capacitor must be large enough to ensure that the bias generated by grid current does not fall off appreciably during that period. What components must be used?

To begin with, the value of the resistor must be enough to keep the average grid current within bounds. The signal will have to be large enough in amplitude to ensure that 30 per cent. of the peak white level cuts the valve off. The mean level during an all-white picture will, therefore, be 20 to 25 volts, and it will be unwise to make the grid resistor less than 500,000 ohms. The time constant with a 0.01 microfarad coupling capacitor will then be 5 milliseconds, and the bias voltage will start to fall at a rate of about 20 to 25 volts in 5 milliseconds, or 0.4 to 0.5 volts during the line period. This is rather high, and with the other values quoted a 0.1 microfarad coupling capacitor would be better.

This is a good illustration of the way time constant methods of calculation make it easy to check the suitability of component values. An even more important application arises in saw-tooth generators of the blocking oscillator type (Fig. 6).

The Blocking Oscillator

Immediately after the completion of the oscillatory cycle, the grid of the valve is at a negative potential roughly equal to the peak voltage of the oscillation across the grid winding of the transformer, and is starting to rise towards the standing voltage applied to the grid return resistor. This is normally a positive voltage, and if the difference between the negative voltage level from which the rise starts and the bias voltage is V volts, then V is the source voltage from which the grid capacitor is being charged through the grid resistor and the source resistance of the bias supply.

Taking a practical case, the valve may cut off when the grid is 10 volts below cathode potential, the oscillation on the grid winding of the transformer may reach a peak of 30 volts, and the bias supply may be +50 volts. The grid potential must rise by 20 volts before the next blocking cycle, and is trying to rise 80 volts. To a rough approximation, the rise will take about a quarter of the time constant of the grid components. For a frame timebase the rise must take about 20 milliseconds, and the time constant required is about 80 milliseconds (e.g., 0.1 μF, 800,000 ohms). For the line timebase the rise must take about 100 microseconds, and the time constant must be about 400 μS (e.g., 0.005 μF, 80,000 ohms).

It is interesting to work out how the values required vary with applied bias, and it is also good practice in this type of calculation. Don't forget to allow for the impedance of the bias supply, which may well make up an appreciable part of the 80,000 ohms required in the line timebase.

In some circuits the sawtooth voltage is taken directly from the grid capacitor, a different connection being used. The amplitude and linearity of the waveform can be determined from the calculation outlined above in that case, but in the circuit shown the sawtooth is generated separately, and further calculation is necessary.

The valve is cut off entirely between blocking cycles, and shows an infinite resistance, so that the capacitor across the output charges up from the H.T. supply through the anode feed resistance. With a line timebase, a 0.1 μF capacitor, and a 100,000 feed resistor, the time constant is 10 milliseconds, and the capacitor will only charge up by 1 per cent. of the difference between the initial voltage and the line voltage.

When the blocking cycle begins, the valve goes to the zero grid voltage condition immediately, and then presents a resistance a little higher than its stated anode impedance. For a 6SN7 or 6J5 the effective resistance is 10,000 ohms, for example. With the values quoted above, the time constant is 1 millisecond, and if the zero grid voltage phase lasts 10 microseconds, the charge on the capacitor will drop by 1 per cent. If, as is more likely, the grid is at zero volts for only about 2 microseconds, the capacitor voltage will drop by only 0.2 per cent. (The small H.T. feed current is ignored.)

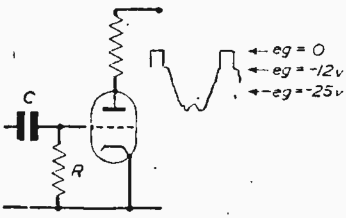


Fig. 5.—A sync separator circuit.

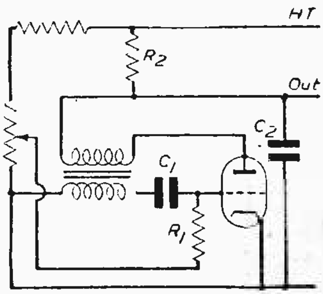


Fig. 6.—A typical blocking oscillator circuit.

For a stable condition, the rise and fall must be equal. For the 2 microsecond discharge period, 0.2 per cent. of the capacitor voltage must equal 1 per cent. of the difference between that voltage and the H.T. supply voltage. In other words, the capacitor voltage must be five-sixths of the H.T. supply voltage.

Definite voltages can now be worked out. Taking an H.T. supply of 180 volts for convenience, the mean capacitor voltage is 150 volts. The peak-peak amplitude of the sawtooth is 0.3 volts, and the linearity would be excellent, since the rate of charge would only change by 1 per cent. between start and finish.

Unfortunately, the output amplitude is too small. How can it be increased? By reducing the time constant? Yes, but caution is necessary. Suppose the objective is a peak-peak output of 10 volts. This will be one-third of the charging voltage—the difference between the initial capacitor voltage and the line voltage, 30 volts in this case—and the linearity will be not so good, the rate of rise varying 30 per cent. between start and finish.

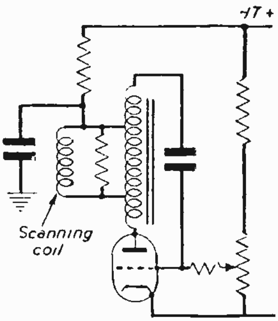


Fig. 7.—A sawtooth current generator.

The mean capacitor voltage must therefore be reduced, and this can only be done by increasing the series feed resistance. Suppose we want a 10 volt peak-peak output between 130 volts and 140 volts, with a 180 volt supply, which will give a 20 per cent. change in rate of rise over the scan. The valve, with its 10,000 ohm resistance, must discharge the capacitor as much during 2 microseconds as the anode resistance charges it during 100 microseconds (98, to be exact). Roughly speaking, $\frac{R}{50} = \frac{10000}{140} \times \frac{100}{2}$; each resistor is divided by the charging voltage with which it is associated, and the time factor is taken into account by a separate fraction. The result is R = 180,000 ohms, and this value of series resistance will give the desired output.

Note that this calculation really ought to be carried out before the calculation of grid constants, as the mean capacitor voltage will affect the valve cut-off voltage, which will be given by 1.2 times the anode voltage divided by the valve amplification factor. (A useful rule to remember.) Using a 6J5 or ½6SN7 the cut-off in this case will be $1.2 \times \frac{140}{20} = 8.4$ volts, and this value must be used in the grid component calculations.

Sawtooth Current Generators

The circuit of Fig. 2 is the basis of sawtooth current generators, and some figures relating to a low-power generator of this type may be of interest. The ubiquitous 6SN7 was used, one half forming a sync amplifier, and the other half generating a sawtooth of 20 mA p-p in the deflection coil.

Fairly good linearity was required, but with 200 volts H.T. and a valve impedance of 10,000 ohms, the maximum current through the valve could never exceed 20 mA, and a transformer coupling had therefore to be used to step up the current.

In this type of circuit the valve conducts only during the flyback, while the current builds up to a maximum level. The valve is then cut off, and the current in the inductance circulates through a shunting resistance, giving the forward stroke. Assuming that the maximum current reached is nearly 20 mA, the maximum drop that can be allowed without excessive non-linearity is about 30 per cent., to 14 mA.

To ensure that the change to the maximum current is nearly completed, the time constant of the flyback condition must be not more than a quarter of the flyback period. To allow a margin the time constant selected was 2.5 microseconds, giving a flyback time of 10 microseconds instead of the maximum 15 microseconds. From the second rule, the inductance required was equal to the resistance multiplied by the time, or 25 millihenries. As such an inductance is bound to be associated with a measure of internal resistance, a rather smaller value (about 22 millihenries) was chosen for the practical circuit.

To reduce the current by 30 per cent. during the scan, the time constant had to be made three times the scan period, or 270 μS. This meant using a shunt resistance of about 100 ohms, which was largely provided in practice by the series resistance of the loop circuit through the scanning coil and transformer winding, plus an external resistance for adjustment.

Since the actual current change in the circuit was only 6 mA, the required 20 mA change demanded a transformer ratio of 10-3, and this made the reflected inductance of the scanning coil $\left(\frac{10}{3}\right)^2$ or about 11 times its actual value, which was very nearly 2 mH. The inductance of the transformer itself was therefore made high so that the reflected inductance of the scanning coil provided the required 22 mH.

The final form of the circuit is shown in Fig. 7. It was not reached without a due amount of trial and error, but the figures worked out above gave an invaluable guide to the general order of the values required. The transformer has a single tapped winding, the section in the middle forming the secondary, the lower two sections together forming the primary, and the topmost section being added to allow the valve to be used as a self-running blocking oscillator. The inductance of this section of the winding was made large enough to slow down the blocking cycle so that it lasted the requisite 10 microseconds.

In all the above calculations it has been assumed that the source voltage is constant. In some cases, however, the source voltage varies, and some linearity circuits are good examples of this. They employ two charging circuits, one charging from the other, or some arrangement to keep the resistor voltage fairly constant during the charging process (e.g., the "bootstrap circuit").

The fundamental rules and the basic method of constructing the charging curve remain unaltered, but the approximating lines now have to be drawn to a varying level representing the changing source voltage. An example of particular interest is that for a sinusoidal input. The resulting curve not only shows how the charging circuit attenuates the signal, but also shows the transient component which displaces the output sinewave during the first few cycles after switching on.

An Inexpensive Receiver

COMBINING A "PYE" STRIP, A 62 UNIT AND A 1355 RECEIVER TO MAKE A SIMPLE BUT EFFICIENT TELEVISION RECEIVER

By J. H. Almond

SOME time ago the idea of building a television set came to mind and, faced with a very limited amount of cash, I set about searching the surplus market for suitable material with which to begin. Three important points had to be borne in mind :

(a) Economy ; I had hoped the total outlay would not be much greater than £20.

(b) Experience ; I had never tackled television before, and I had very little knowledge of it. It was hoped, therefore, to have as little of the detailed construction work to do as possible. For example, although I had already built several radio sets, I have still not discovered the secret of making a neat soldered joint—the professional type, so to speak. Coil winding had never been very successful and, bearing in mind that in television liberties taken in the construction thereof are likely to lead to all sorts of trouble, I decided that the conversion of ready assembled ex-Service equipment would be more practical and produce better results in the long run.

(c) Time ; Only a limited time was available for building the set, and this also favoured the use of assembled units.

I live some 90 miles from the Holme Moss transmitter, and although reception is usually good many sets employ pre-amplifiers. It was decided at the outset to use sufficient material in the set to ensure powerful enough amplification without any further aids. In doing this I would avoid trying to produce a good picture without the essential "boost." Hence, I made sure the units used had sufficient valves to give the required amount of drive to the tube. At the same time, for simplicity, it was decided not to restrict the space in which the set was built. Guided by previous articles in PRACTICAL TELEVISION, the following units of ex-Government equipment were purchased.

1 62 indicator unit with VCR97 & valves	£5	10	0
1 "Pye" 45 Mc/s strip with valves ...	3	0	0
1 1355 receiver—25 R.F. unit with valves	3	0	0

Other items purchased were :

1 E.H.T. transformer, 2.5 K/Volt ...	1	0	0
1 T/B transformer (425-0-425 v.) ...	2	10	0
1 Receiver transformer (250-0-250) for 1355	1	0	0
3 rectifying valves	1	5	0
1 Speaker		10	0
Resistors, capacitors, etc. (approx.) ...	2	10	0
Total (approx.) ...	£20	5	0

The complete units were all brand new, and doubtless economies could be effected by wise purchase of used material. Since, however, most of the equipment had to be obtained by mail it was decided to avoid any risk of receiving faulty material.

The actual conversions of the units were fairly straightforward and have been already fully dealt with in previous editions of PRACTICAL TELEVISION. However, it was found that in my case various alterations and adaptations of previous ideas produced better results. VCR97 tubes, for example, show considerable variations in their characteristics, and living outside the fringe area introduces difficulties not normally encountered in the service areas.

General Assembly

The 62 unit was completely stripped, with the exception of the tube and holder and EA50 diode, and the resistor network at the front of the chassis with its associated potentiometers. The potentiometers in the metal panel above the tube were removed, although the panel was retained. On the left side of the tube, i.e., looking towards the front of the unit from the back, were mounted the cathode

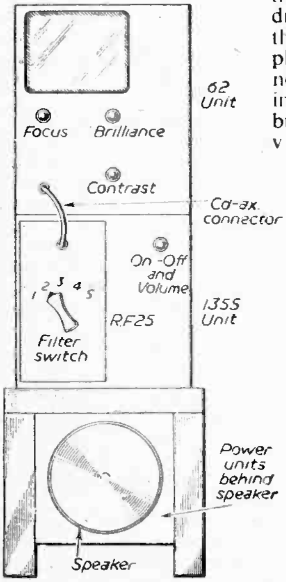


Fig. 1.—Arrangement of the Units.

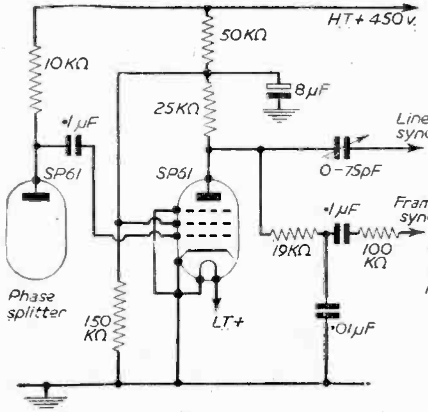


Fig. 2.—The sync separator circuit.

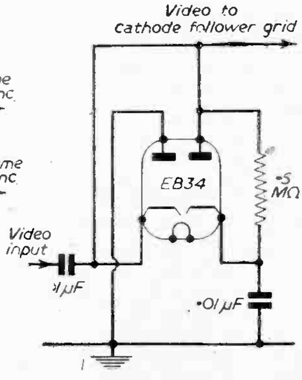


Fig. 3.—D.C. restorer and noise limiter.

follower, sync separator and timebase valves. The under part of the 62 chassis was completely stripped and the "Pye" strip fastened upside-down there. Unfortunately, the chassis was not quite deep enough to accommodate the strip comfortably, but by attaching wooden runners of about ½in. depth to either side of the chassis a space was made which allowed sufficient clearance below the EF50 valves. The top of the 62 case was removed (I found the domestic tin-opener ideal for this) and a wooden one substituted so that the whole unit could be lifted out easily. A rectangular opening was cut in the rear of the metal case to allow the various leads from the timebase and C.R.T. network to pass through. The metal panel above the VCR97 was used to accommodate the various potentiometers associated with the timebase.

The 1355 receiver and its R.F. unit were placed underneath the 62 unit, and below that the power units were housed for the timebase, C.R.T. and "Pye" strip. I was fortunate in discovering a discarded bathroom stool which was ideal for mounting the units, arranged as in Fig. 1.

Timebase

This was the most difficult part of the whole set to be built, and was conventional as described for the PRACTICAL TELEVISION "Argus." However, at first the results were not too satisfactory and I made various alterations as follows.

(1) The anode load to the line oscillator valve was reduced to 45 K Ω, and the screen resistor dropped to 25 K Ω. Likewise both resistors were similarly altered on the line amplifier valve. The tube was rotated through 90 deg. and the connections to the X and Y plates reversed. These alterations produced a considerably larger raster.

(2) The sync separator circuit was considerably modified. Using the original circuit good interlacing ensued, but it lacked steadiness. Experimenting with various circuits I eventually found the most satisfactory to be as in Fig. 2. This is a variation of a type used in certain Ferguson receivers. The results are

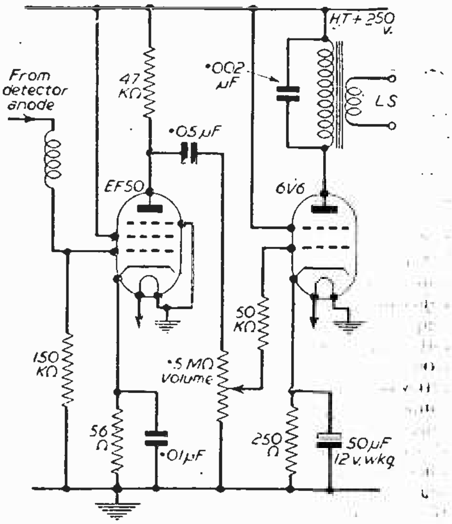


Fig. 4.—Conventional output stage from Pye strip to 6V6.

excellent, the frame holding firm over a wide variation of the "framehold" control, and a very steady interlace is obtained.

(3) The D.C. restoring diode. For this I used half of one of the EB34 valves from the 62 unit. The other

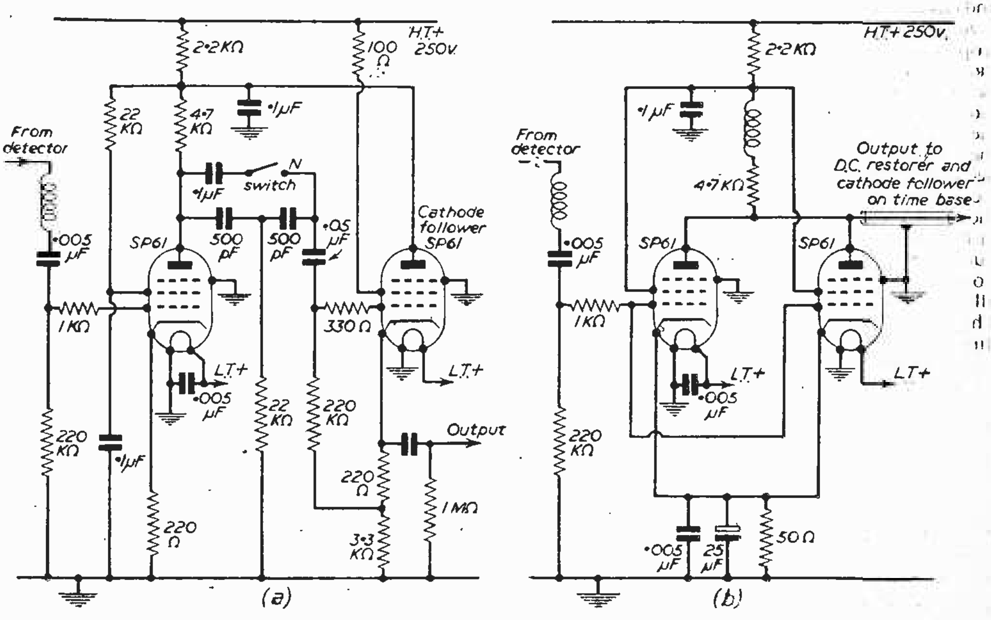


Fig. 5(a).—Original output stage of 1355 receiver and (b) modified output stage showing two SP61 valves wired in parallel.

half of this valve, the second diode, was used in a fairly effective vision noise-limiter circuit (Fig. 3).

(4) The Power Supply. The full size of the raster was only obtained when the H.T. voltage was over 450 volts. A 425-0-425 volt transformer was essential, and to avoid any voltage drop due to excess current drain, the power to the vision and sound units was taken from separate power packs. Some trouble was experienced with electrolytics breaking down, even though they were rated at 550 volts D.C. working, but by inserting 100 Ω resistors directly in series with the condenser leads further trouble has been prevented. The power pack is conventional, although one of the 6.3 volt windings on the transformer is used for the heaters on the " Pye " strip.

The Sound Receiver

For this I decided to use the " Pye " strip. It was housed upside-down underneath the 62 chassis. By adjusting the tuning slugs of the coils, the sound frequency of Holme Moss can be readily tuned in (little adjustment is necessary). However, for sound alone, it was decided that 6 EF50s was far too extravagant, and therefore the first two stages were combined to amplify both sound and vision channels. This was simply a question of adjusting the slugs of the first two grid and anode coils to a position where a large amount of the vision signal could be heard superimposed on the sound signal at the output of the strip when a pair of earphones were used. The vision signal was removed at the anode of the second EF50 and passed to the input of the vision receiver by co-axial cable. The last valve of the " Pye " strip was obviously unsuitable as an audio output stage, but by changing the anode load resistor to 47 K Ω and adding a grid leak of 150 K Ω the signal was amplified sufficiently to drive a 6V6 output valve connected conventionally, as in Fig. 4, and mounted on the 62 chassis.

A description of the " Pye " strip has already been given in PRACTICAL TELEVISION for use as the vision receiver. The modifications carried out to the rest of the strip were similar; the sound reject or circuits become vision rejectors. The " contrast " control was omitted, the audio signal being controlled in the conventional way on the output valve. As already mentioned, the tuning slugs were all right for the sound channel. The H.T. supply was obtained directly from ½-wave mains rectification. A suitable smoothing choke was obtained from the 400 cycle power unit in the 1355 receiver.

The Vision Receiver

The modifications carried out here were as follows. (i) The Power Pack. The 400 cycle 80 volt power pack was removed, and a conventional 50 cycle one inserted in its place on the chassis.

(ii) The last valve of the unit (the cathode follower) was arranged to act as a second video output valve wired in parallel with the preceding valve. Fig. 5. This was an idea seen in PRACTICAL TELEVISION and it was found to give a considerably better result than when using one SP61 as the video amplifier. The cathode bias resistor was reduced to 50 Ω, and two bypass capacitors, a .005 μF and a 25 μF were inserted in parallel across the resistor. A 3 Mc/s boost choke was inserted in the anode circuit.

The EA50 detector valve is already wired to give a positive signal at the anode of the video stage, and this was passed on via co-axial cable to the cathode follower in the 62 unit.

The I.F. coils were stagger-tuned to enable the required bandwidth to be passed, and a contrast control of 5,000 Ω was connected between pin 3 on the front right-hand W plug and earth. The switch on the lower right-hand corner of the front panel was switched to position " N."

The R.F. 25 unit covers the sound frequency channel, but for vision it was necessary to remove one turn from each coil. The first R.F. stage was discarded, the vision signal from the " Pye " R.F. stage being passed via a 40 pF condenser on to the tapping of the mixer-grid coil. The 5-position switch on the unit was retained. It was found that by tuning the unit close to the sound frequency the best definition was obtained, but at the same time a large amount of interference (mainly from H.T. pylons in the neighbourhood) was introduced. This interference tended to vary with the weather, but by arranging the tuning on each position of the switch to be slightly different, a useful form of filter was incorporated. Thus, for example, on position 1 the picture would probably lack fine detail, but would be free from interference, whereas on position 5 the picture would have more detail, but there would be more interference. In dry weather, however, position

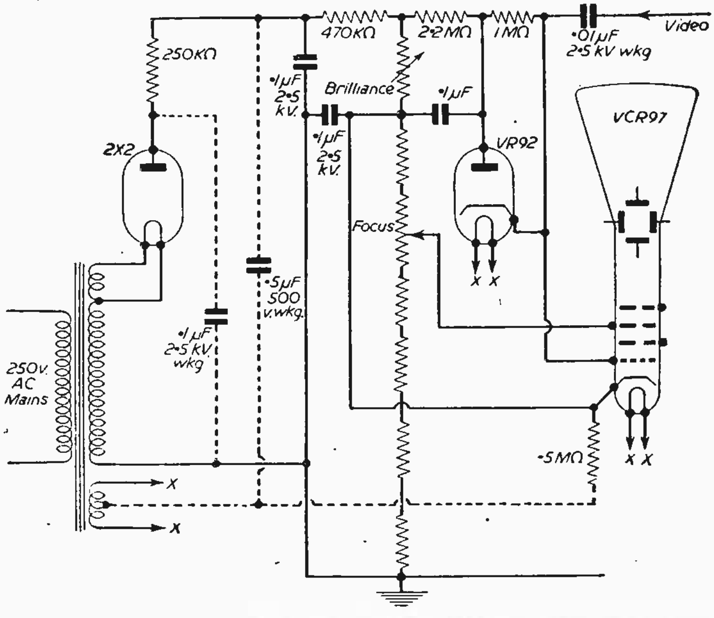


Fig. 6.—Modifications (shown dotted) carried out on tube network to reduce hum on picture.

5 would give an extremely good picture. Sound rejectors proved unnecessary on the vision receiver, the 2 Mc/s bars being clearly defined on Test Card C, with no evidence of sound break-through. In passing, I may say that the interference from the overhead grid system in our area is considerable, but so far, despite numerous complaints, nothing seems to have been done about it.

C.R.T. Network

Like the timebase, the C.R.T. network required building, and the circuit used closely followed that of the "Argus." The E.H.T. transformer and rectifier were mounted on the main power pack, and the heater leads and E.H.T. negative supply were transmitted through E.H.T. polythene insulated copper wire. Sparking plug leads used in motor engines were not suitable. Although I originally used this sort of cable, I discovered that when the room was in complete darkness a blue glow could be seen all the way down the leads, and although it did not appear to affect the picture it was obviously not safe to use. I also found that ceramic insulators are not always reliable, and wherever possible the E.H.T. wiring was made directly to the tube base. Hum presented quite a problem. This manifested itself on the screen as alternate *shades* of light and darkness. Many factory built sets appear to exhibit this fault although it is not always noticeable if the picture is moderately bright, but strictly speaking there should not be sufficient hum present on the grid or cathode of the tube to lock the raster when no signal is present. In my case it was necessary to use several capacitors and resistors to eliminate the trouble. The problem became more difficult because of the earthed E.H.T. positive, and the fact that the heater and the cathode of the tube were at a high negative potential relative to the chassis. However, by making the following modifications hum was reduced virtually to nil, and the picture considerably improved.

(1) The cathode of the tube was separated from the heater and connected via a 470 K Ω resistor to the centre tap of the heater winding on the transformer. (E.H.T. cable had to be used.)

(2) A 500 volt D.C. working capacitor was connected between the heater winding centre tap and E.H.T. negative.

(3) The negative E.H.T. line was passed through a 250 K Ω resistor and decoupled to chassis via a .1 μF capacitor.

Picture Focus

It was found that with the timebase switched off a truly circular spot could not be obtained on my particular tube. By experimenting I found that a small horse-shoe magnet placed at a certain point on the mu-metal screen effected a considerable improvement: the spot was made circular, and the resultant picture focus was much better. No doubt this method of improving picture quality will be frowned on by the theorists, but in my case it appeared to work satisfactorily.

General

The aerial used is a folded ½-wave dipole with reflector and director, mounted on a 16ft. pole on the main chimney. Originally I had used a close-spaced H aerial, but the results from the new aerial have amply compensated for the extra cost involved. Reception conditions vary from day to day, but generally speaking the picture I obtain compares very favourably with most of the factory built sets I have seen. Taking my original factors, economy, lack of experience and the time taken to build the set into account, I have been more than satisfied with the results. What I had originally thought was going to be extremely difficult I discovered was comparatively simple and absorbingly interesting.

New Underwater Camera

A PERISCOPIC lens has been designed for use with the Marconi-Siebe, Gorman underwater television camera which is controlled remotely from the ship above and can be made to "shoot" in any direction within a hemisphere whether the camera is moving below the surface or not.

Poor Weather Conditions

It overcomes many of the difficulties of televising underwater when weather conditions are poor and the apparatus is swinging with the tide, and allows the camera to scan a large area of the sea bed without having to move it either from above, or with the aid of a diver.

The prototype lens has successfully undergone a number of tank tests, and Admiralty marine experts were present on some of these occasions.

In their search for an improvement on the old type of rigid lens, which could only "shoot" in the direction of the camera, the designers studied many optical systems before they found an answer. This even included the partial dismantling and examination of a periscope from a former German submarine in Marconi's works at Chelmsford.

The new lens operates quite simply. The tube containing the lens arrangements passes through a brass plate inside the watertight pressure casing, which is fixed between the front of the camera and the viewing dome. The tube can rotate through a complete circle: its "eye"—the front portion—is pivoted to the tube and is able to elevate through 90 deg.

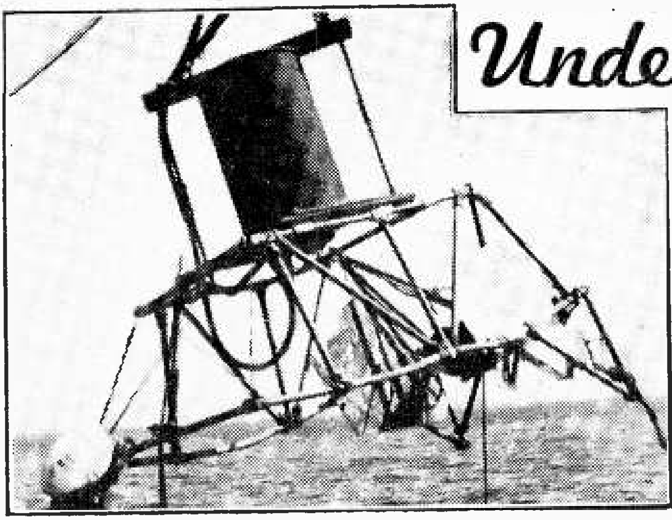
In this way the "eye" can be made to look straight ahead, to the side, or at any angle within this arc. By control of both rotatory and elevatory movements, the lens is adjusted to look in the required direction within the hemisphere.

These movements are operated by servo-motors clamped to the brass plate and camera, and controlled by the operator on board by switches in his control unit. The unit is connected to the camera through the watertight camera cable.

Viewing Dome

A "fish-bowl" viewing dome of inch-thick Perspex now replaces the former window for viewing. This has the same refractive index as water so that it does not distort the image, and scratches on its surface are not shown on the monitor screens.

The periscopic lens is part of a scheme to modernise the whole of the Marconi underwater television apparatus. Already Siebe, Gorman & Co. Ltd., the underwater specialists, have redesigned the pressure casing, making it smaller, lighter and more streamlined.



The complete underwater television apparatus. The camera is contained in the cylindrical section, while underwater lights are situated in the tubular construction below the camera.

Underwater Television Aids Fishing

By Eric Hardy, F.Z.S.

THE rapid developments in the post-war application of electronics to new fields of industry and research have made underwater television the subject of experiment by the fishery authorities of several countries. Combined with the extremely successful use of electronics as depth recorders and fish locators and indicators, it has a future with the larger and more extensively equipped trawlers. At present, however, its value is considered to lie mainly in the research work on fish life. The fishing industry in Britain and America is closely following this application of electronics in Canada, Germany, America, Russia and other countries.

The chief difficulty facing its use to locate fish shoals is that at present the fish have to be comparatively near to the boat to be seen, and they can be picked up there on an echo sounder or the German Fische-Lupe or fish lens. The Marconi-Siebe Gorman underwater television camera, in a pressure case and gantry with eight adjustable lamps, the camera itself able to swing through 90 deg. vertically, is the type which has been used successfully to screen fish such as dogfish swimming at 210ft. Ever since TV was used to locate the lost submarine *Affray*, fishery biologists have been seeking possible uses for it to study the action of various designs of nets and trawls under water. There, it is essential to see the position taken up by the gear in operation, which is at present carried out with underwater film cameras—how the lines behave and the shape of the meshes during a trawl. Also the behaviour of fish in the nets and normally in the sea, their spawning and shoaling activities, and the identification of fish previously located by echo sounding recorders.

This would mean that instead of waiting to develop an underwater film, or descending in the limited use of a bathysphere or pressure chamber, fishery biologists could sit in the cabin of a research vessel and choose the type of gear in accordance with the sea floor screened before them, or locate obstructions like rocks and wrecks before a trawl is caught in them. Material has been studied on the screen in much more detail and reliability than from samples brought up by collecting apparatus, and, of course, a TV camera can work under water longer and deeper than a diver. It can be raised and lowered more quickly because it does not suffer from pressure changes.

The underwater TV can give viewable pictures by natural light at 80ft. depth. Pye's underwater TV camera operates at 1,000ft., with built-in facilities for remote control changing of lenses, lens aperture and focus, with a visual field up to 70 deg. The image orthicon of the Marconi-Siebe camera is sensitive enough to get a reasonably good picture by the light of a single candle power. It can thus "see" in light conditions too poor for the diver's eyes, or those of a man in a bathysphere to function properly.

The Scottish Marine Biological Association is using an underwater TV camera of the CPS Emitron type, made at the EMI Research Labs. under a Government grant. It is mounted in a strong steel case with a glass window in front of the operative lens. The camera cable is brought through a water-tight gland through the steel cover-plate. The idea of underwater TV was first mooted scientifically in 1939, although not until the 1951 *Affray* affair was it given prominent practical test.

Applications

The applications of TV to fishery work are rather more specialised than the use of TV in ship salvage and harbour repair work. In the latter its success lies mainly in its advantages over the diver's limitations. In the former it depends upon how much more efficient it is than the present apparatus used for bringing samples of marine life and sea-bed to the deck for laboratory study; how much better than going down into the limited depths available for working like Prof. Beebe in his famous bathysphere; also in being able to identify fish better than echo sounders and electronic Fische-Lupes. All this it must do in a way to repay its heavy cost in an industry which so often loses money.

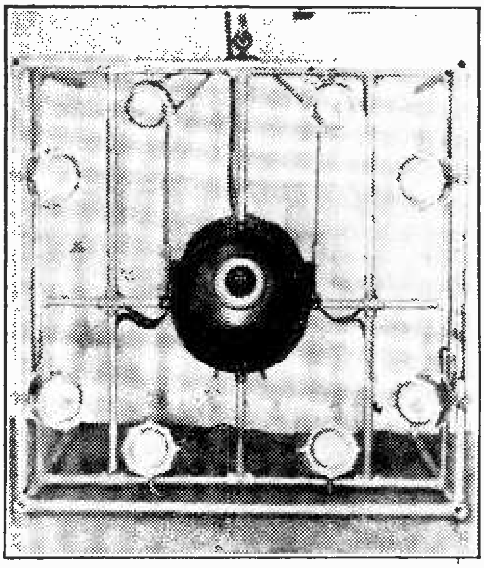
It has its use for the exact charting of new fishing grounds like those now being explored off Greenland and in colonial waters. It has been advocated for the study of the extent of oyster and scallop beds, the most valuable of the shellfish, and especially to study the way in which a trawl of any design moves whilst working under water. It could overcome some of the difficulties of this study which was begun some time ago with frogmen filming the trawl in action.

The German Elac Fische-Lupe, or fish-lens, linked to an echo sounder, is not, of course, television: but a "light-sounder" using the cathode-ray tube is its essential component. It can follow the lowering of 8in. dia. glass trawl-floats on a line down to the bottom at 60 fathoms, and two small piked dogfish could be separately identified down to 20-25 fathoms. This fish detector sends out to the sea-bed sound impulses like echo sounders, receiving the reflection from the sea-bed or any intervening shoal of fish. It does not "see" the fish like a TV camera, but instead of recording the reflected sounds as a tracing on a paper, it shows them as a light trace corresponding on the scale to the depth of the fish. It can then be focused on a horizontal stratum of water where the fish are swimming, and ignore the empty water above and below this. Then the signals or echoes are magnified and the different types of light traces can be distinguished—dense, fine horizontal lines of herring and more widely spaced, bolder traces of bigger fish like cod. The single traces of individual fish can also be detected in this magnification, and the size of the shoal estimated for the value of the impending haul. By keeping his eye on this screen, the skipper can with experience fish spirally inwards to the centre of the shoal for the maximum catch where the fish are densest. The Fische-Lupe has a maximum indication at 300 fathoms. It has two small oscillators for transmission and reception, a rotary converter, a pulse generator unit and a control unit.

Range

When used for the initial general underwater survey, the tube shows the full range of 300 fathoms as a vertical light line. This is deflected horizontally by anything intervening, and the picture is clarified by the sensitivity control. A clockwise rotator brings the deflection marking the sea-bed into position with a red mark so that it can then be read off on a scale to calculate true depth. To scrutinise a fish shoal, the diameter of the tube "face" is reduced from 300 fathoms to 45ft. so that the whole line now represents the former fish deflection mark. The depth of this shoal can likewise be read on the screen to within a few inches.

It is interesting to note that the United States lags behind Britain in the progress of underwater TV application to the fisheries and it is still regarding it



The new Marconi underwater television camera in its special Siebe, Gorman pressure case and adjustable lighting gantry. The camera is remotely controlled and the port—through which the camera "shoots"—is seen in this front view. For downward vertical "shots" the gantry and camera case can be swung through 90 deg. on the trunnion.

more as a possible research tool than a fishery aid. "It does not seem likely that this device could be of practical help in locating menhaden (herring), for example. . . . Despite this, however, television offers highly interesting possibilities of indirect assistance to the fishing industry, by providing a powerful new instrument to scientists," stated C. P. Idyll, of the University of Miami Marine Laboratory, at a recent National Fisheries Institute convention in Washington.

Swiss O/B Units Ordered

THE Swiss broadcasting authorities (P.T.T.) have ordered a complete television outside broadcasting vehicle from Marconi's Wireless Telegraph Co. Ltd. for delivery within nine months, so that the European Football Championships can be televised from Berne, in June, 1954.

The programme will not only be televised over the small experimental station at Zurich, but to viewers on a system linking Italy, Germany, France and possibly Holland so that they can see how their own teams are faring in the championships.

This television O.B. unit is the second stage in the Swiss authorities' plans to provide the country with television, of which the Zurich station is the first.

One "zoom" lens will be provided for use with any one of the cameras.

This new order brings the company's export total of television equipment since the war to well over £900,000, and studio equipment—including O.B. units—amounts to nearly 80 per cent. of it.

Pages from a TELEVISION ENGINEERS Notebook

10.—VIDEO AMPLIFIER PHASE CHARACTERISTICS

WE have seen from last month's notes that the gain of an uncompensated video amplifier is given by the expression

$$\frac{g_m R}{\sqrt{1+(f/f_o)^2}}$$

if $R=1/2\pi f_o C$. Now the phase shift in such an amplifier as a signal of frequency f passes through it can easily be shown to be

$$\phi = -\tan^{-1} 2\pi fCR = -\tan^{-1}\frac{f}{f_o}$$

where the negative sign indicates that the phase delay is greater for the higher video frequencies than for the lower. It is seen that this *delay* is due only to the presence of reactance in the anode load circuit, and that there is no delay in the valve itself at these comparatively low frequencies, the valve merely reversing the phase of the applied input voltage.

The phase shift and time delay for several stages of video amplification is the sum of the individual delays, whereas the gain of several stages is the product of the individual stages. As the most usual arrangement in a television receiver involves only a single stage of video amplification, however, this point need not be pursued further.

In Fig. 1 is shown a typical graph of the phase delay and gain plotted against f/f_o for a single uncompensated stage. It will be noticed at once that the phase delay does not increase linearly with frequency, hence the time delay is not constant over the video band.

Now for a stage which employs a compensating inductance in the anode circuit as previously described, the phase delay expression is rather more complicated. It is

$$\phi = +\tan^{-1}\frac{1}{4}\left[\left(\frac{f}{f_o}\right)^3 + 2\frac{f}{f_o}\right]$$

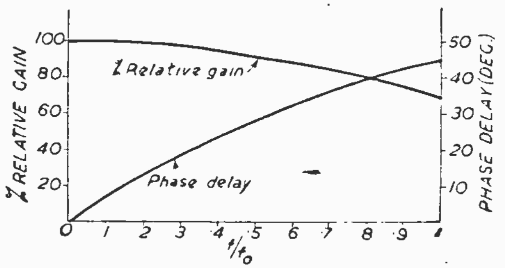
and the time delay is

$$t = +\frac{1}{2\pi f}\tan^{-1}\frac{1}{4}\left[\left(\frac{f}{f_o}\right)^3 + 2\frac{f}{f_o}\right]$$

It is seen here that both phase and time delays for a given frequency f are dependent only on the upper frequency limit f_o, and are completely independent of the values of R, L and C which have been calculated to maintain an even gain characteristic up to the frequency f_o. Fig. 2 shows the phase delay of such a compensated stage plotted against f/f_o. Here again the non-linearity of the phase characteristic will result in a non-uniform time delay curve.

It is possible to proportion the component values in the anode circuit of the amplifier to produce a constant time delay throughout the video range, but this cannot in general be achieved without upsetting the flat gain characteristic.

In order to give an idea of the magnitude of the anticipated time delay and its effect upon the displacement of the picture elements along the scanning lines, Fig. 3 is drawn from actual experimental results and gives the total time delay due to a single stage amplifier compensated for a constant gain up to 2.75 M/cs. The figure also includes the curve of the actual horizontal displacements of the picture elements at the different video frequencies. The detector load in this particular experiment was also compensated to give a constant impedance up to 2.75 Mc/s, and its contribution to the total delay is included. The circuit system is therefore equivalent to two stages of video amplification fed from an uncompensated detector. The calculation of element displacements



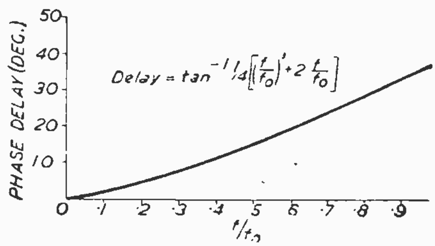


Fig. 1 (left). — Gain and phase delay characteristics for a single uncompensated stage. Fig. 2 (right). — Phase delay characteristic for a single-stage compensated circuit.

is based on the 405-line scanning system, the image being 13in. wide on a 16in. tube.

It should be noted that the total time delay (in this case 0.045 μsecs) is not significant, as it is the *difference* in time delays for the various frequencies in the band with which we are concerned. If the time delay were constant, all the picture elements would be displaced by the same amount, and no distortion would be detected. As the actual example shows, however, the picture elements corresponding to the limits of the video band, 30 cycles and 2.75 Mc/s, will be shifted by about 0.009in. at the lower end and 0.01in. at the upper end. The relative shift, therefore, is only 0.001in. which is negligible in relation to the width of the line.

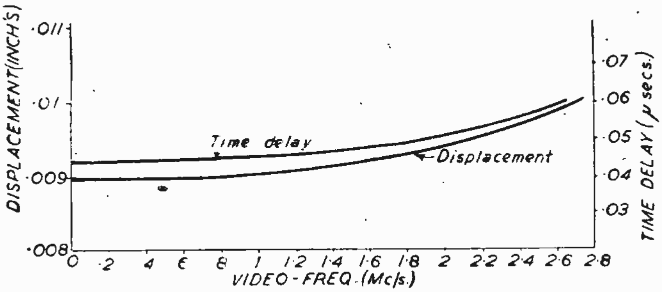


Fig. 3.—Curve of the actual horizontal displacements of the picture elements at the different video frequencies.

Measurement of Phase Delay

Unless the gain characteristic of a stage is known to be flat over the desired frequency range, the measurement of phase-delay characteristics is best made with an oscilloscope having both vertical and horizontal amplifiers which are useful up to at least 3 Mc/s. The system then operates on the principle that if two voltages of the same frequency are simultaneously applied to the X and Y axes of the 'scope, the resulting pattern will depend for its configuration upon the relative amplitudes and phase relationship of the applied voltages. At zero and 180° phase difference, the trace is linear, but (assuming equality of amplitude) at 90° the trace becomes circular. At all other phase relationships, the pattern is elliptical, and the required phase angle can be found graphically from the actual measurements of the major and minor axes of the ellipse, or, more accurately, by the use of a resistance-capacity network to shift the phase of one of the voltages until the trace becomes linear. The required angle is then computed from the parameters of the R.C. network.

Because there is capacitive reactance in the anode circuit of the amplifier, the output voltage will lag the input voltage in time-phase, and so the R.C. network, if this system is used, must be set up so that the phase of the input voltage is delayed before it is applied to the oscilloscope, or, conversely, the phase of the output voltage must be advanced. Fig. 4 shows a system to provide the delay to the input voltage, and a linear trace is obtained when the phase shift in the R.C. network is equal to the phase shift in the amplifier. As shown, the angle $\phi = (90° - \chi)$, where χ is the angle between the input voltage E_g and the current i through R and C.

The latter capacity includes, of course, the input capacity of the oscilloscope.

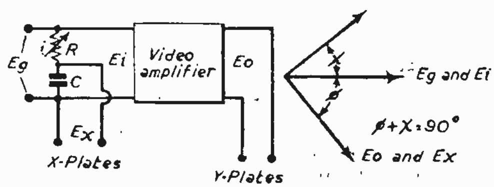


Fig. 4.—System providing the delay to the input voltage.

The oscilloscope amplifiers need be identical only in their phase characteristics, and similar gain characteristics are not necessary.

Book Received

PRINCIPLES AND PRACTICE OF RADAR. By H. E. Penrose and R. S. H. Boulding. 795 pp, 569 diagrams and 8 half-tone plates. Demy octavo. 50/- net. Published by George Newnes Ltd.

This is the fourth edition of the most authoritative work on radar yet published. Indeed, it has become accepted in the Services and in industry as a standard text book. The authors claim that the book assembles and co-ordinates the principles upon which radar systems have been developed. In this thoroughly revised edition the introductory chapters on the basic principles of radio practice have been summarised and now form a single chapter. This saving in space has enabled the authors to amplify those parts of the book of most practical use to students, operators and technicians. The section dealing with equipment has been enlarged and among the techniques to which detailed consideration is given are pulses and pulse-forming circuits, calibration and applications of microwave technique to transmitters, receivers, and feeder and aerial systems. A completely revised chapter discusses the resident cavity magnitron in the light of present knowledge.

Special appendices deal with transmission line theory, wave guides and cavity resonators. The book is very adequately indexed.

Increasing Average Brilliance

SOME CIRCUIT SUGGESTIONS FOR DAYLIGHT VIEWING

By J. S. Kendall

FOR viewing in daylight, methods of increasing the average brilliance of pictures have been brought to the fore. The usual method of placing a dark screen in front of the picture has the effect that the actual brilliance of the picture is actually reduced, whilst the ambient light from the room falling on the face of the tube is reduced twice. For example, if the amount of reduction of the screen brilliance by the screen is two then the amount of ambient light reflected from the screen is four. This gives an increase in contrast of two to one. Whilst this is quite good if the screen brilliance could be increased a little more, a filter giving a higher contrast ratio can be used. One firm—Mullard, Ltd.—have been experimenting with a method for increasing the average brightness of tubes for projection receivers, and there is no reason, as far as the writer can see, why the same method cannot be used with the normal direct viewing receiver.

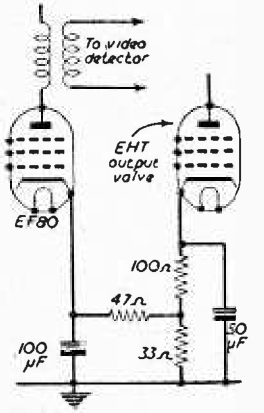


Fig. 1.—Basic circuit of the suggestion.

The general principle of the method is to take an auto gain control voltage from the cathode circuit of the line output valve and apply it to the last video amplifier valve. This has the effect of reducing the contrast on peak whites. On peak whites the average anode current through the line output valve is increased through the falling of the dynamic resistance of the anode load of the valve through the E.H.T. current being increased.

The Circuit

The basic circuit is shown in Fig. 1. Here it will be seen that there are two large electrolytic condensers, one of 50 μF and the other of 100 μF. The object of these is to stop the ripple due to the line output. In the projection receiver this is 1,000 cycles, and if the line frequency is not filtered out in the normal type of line output circuit the sync circuit can be upset. It is, of course, not necessary to point out that the 100 μF. condenser should be bypassed by a small mica or ceramic condenser, as the condensers of the electrolytic type have considerable inductance.

There are three cathode circuits for the line output valves, and these are shown in Figs. 2a, 3a and 4a, whilst the modified circuits recommended by Mullard, Ltd. for their projection circuits are shown in 2b, 3b and 4b. It will be appreciated that the modification is in all cases simple.

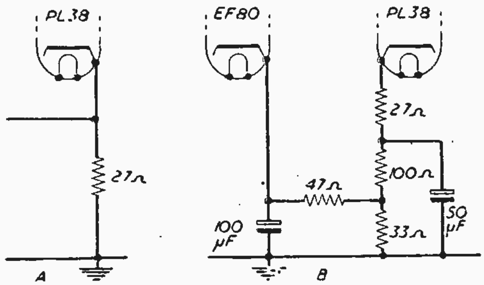


Fig. 2.– Simple modification.

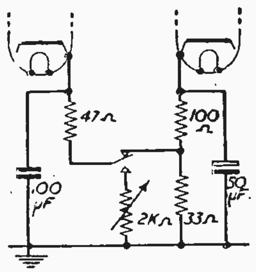


Fig. 5.—A comparative circuit.

Fig. 5 gives a circuit for those who wish to make a contrast between the old circuit and the modification. The new circuit can be switched in, out and in at will; the 2,000Ω variable resistor is for the setting of the contrast to the critical point without the auto gain control circuit. It is possible, therefore, with this circuit to show just how good the circuit is, and thus judge if the modification is desirable in any particular receiver.

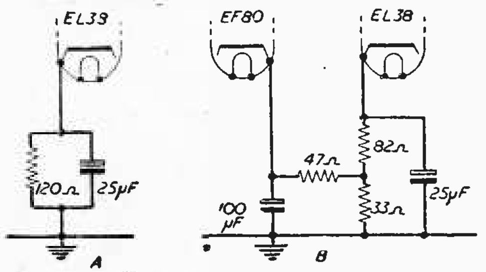


Fig. 3.—Further modification.

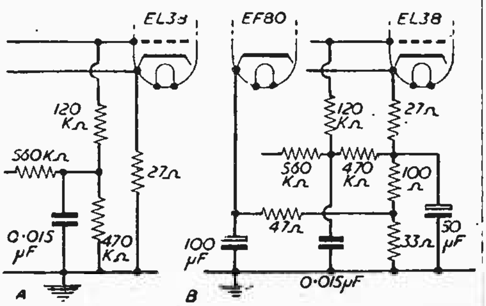


Fig. 4.—A Mullard modification.

THE BEGINNER'S TIMEBASE—3

DETAILS OF THE CONSTRUCTION OF AN INEXPENSIVE UNIT FOR ELECTROSTATIC TUBES

By B. L. Morley

(*Continued from page 198 October issue*)

IT should be noted that R42 has been omitted from the circuit. This resistance valued 1 megohm should be connected between pin 7 of V3 and earth.

Stage III.—Testing

It is now possible to make a complete test of the work done up to this point.

A temporary flex lead is connected to the inners of the on/off switch for connection to the mains. The wiring should be very carefully checked with that given in the diagram ; any loose bits of solder should be removed from the chassis.

Now wire a 4 v. flash-lamp bulb temporarily across the C.R.T. heater terminals (pin 3 and 4). Insert the rectifier valve V8 and plug in the mains lead. Switch on !

Watch the 4 v. bulb which should glow brightly, and also the rectifier heater.

Leave the unit switched on for two or three minutes and then switch off. The bulb can now be removed—if it has blown, then a fault obviously exists and it should be traced.

Assuming that all is in order, then put the C.R.T. in, ensuring that the base is making firm contact in the holder. Wait two minutes and then switch on again with the brilliance and focus controls turned midway.

After allowing the tube to warm up a green spot of indeterminate dimensions should appear somewhere on the tube face. Operation of the shift controls should bring the spot to the centre. Operation of the brilliance control should fade the spot right out and operation of the focus control should focus it to a fine degree. Usually by operation of these two controls it should be possible to make the spot a minute pin-head to as large as a penny.

Note that it is very important to keep the brilliance control turned well down when the spot is very small or the screen of the C.R.T. will be damaged.

Having tested the controls to check that they function correctly, then listen around the chassis very carefully to detect any " sizzling " type of noise which will indicate leakage of E.H.T. It is sometimes very useful to scan the chassis in complete darkness to check if any sparks are present.

It is not uncommon to get a leakage at some point, the main difficulty is in determining its location ; one cannot put one's ear too close to the chassis without endangering that member ! A good tip if arcing over is suspected is to make a tube of stiff paper and use it as a stethoscope ; the actual source of leakage can be discovered by this method.

If all is in order then work can commence on the next stage after removing tube and valve.

Stage IV.—Power Supply Circuit

The power supply circuit should be wired in accordance with the diagram in Fig. 8. There is

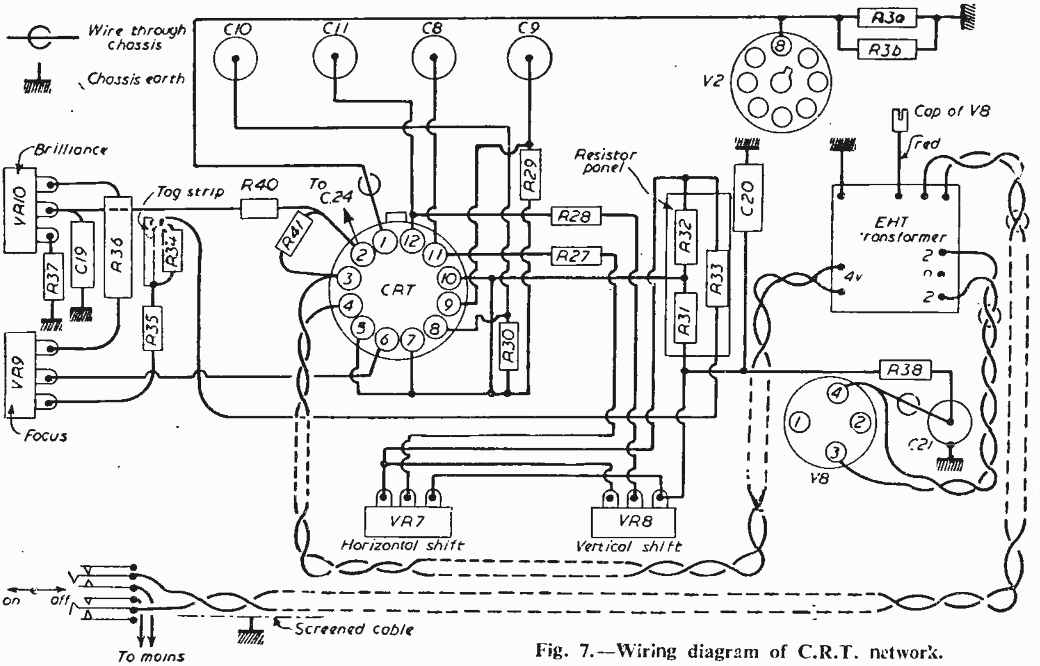


Fig. 7.—Wiring diagram of C.R.T. network.

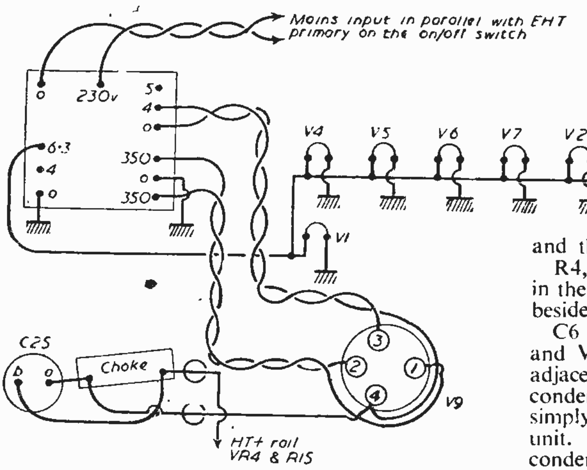


Fig. 8.—Wiring diagram of power supply.

nothing complicated in this part of the circuit and no tests will be required.

Proceed to Stage V.

Stage V.—The Line Oscillator

The line circuit is wired in accordance with Fig. 9.

The line hold control is mounted on the front panel and the linearity and width controls are mounted on the potentiometer panel in the positions shown.

It will be found convenient to wire up the amplifier V5 first.

HT+common is taken from the smoothing choke to the linearity control (tag nearest the choke), then to the nearest tag on the width control. C7, the linearity condenser, is mounted on the top deck of the chassis underneath the linearity and width controls; one side goes to the centre of VR4 and the other side through the chassis to pin 4 of V5.

R11 is covered with P.V.C. insulation and is mounted on the metal strip under the extension rods of the brilliance and focus controls. It should be mounted between the strip and the chassis.

R4, 13 and 15 are mounted on the main tag strip in the first three positions. R14 and 16 are mounted beside V5 valveholder.

C6 is mounted under the chassis adjacent to V4 and V5 valveholders. C4 and 5 are mounted flat, adjacent to V4 valveholder. C4 is actually two condensers in parallel the reason for this being simply to make use of components available in the unit. (Labelled C4a and C4b.) Actually, a single condenser of the total value of C4a and C4b could be used if desired.

R12 is connected directly to pin 7; V4 and R8, 9 are connected in series between chassis and C4. Here again two components are used to employ items surplus in the unit. If desired, a single resistance the total value of R8 and R9 could be used.

When the wiring has been completed in accordance with the diagram then a check should be made to ensure that no errors have occurred. It is now possible to check the work completed so far.

We now come to stage VI and before making the actual test on the line circuit, it is advisable to check on the C.R.T. to ensure that nothing has been displaced in that circuit. Complete testing instructions will be given in the next issue.

(To be continued).

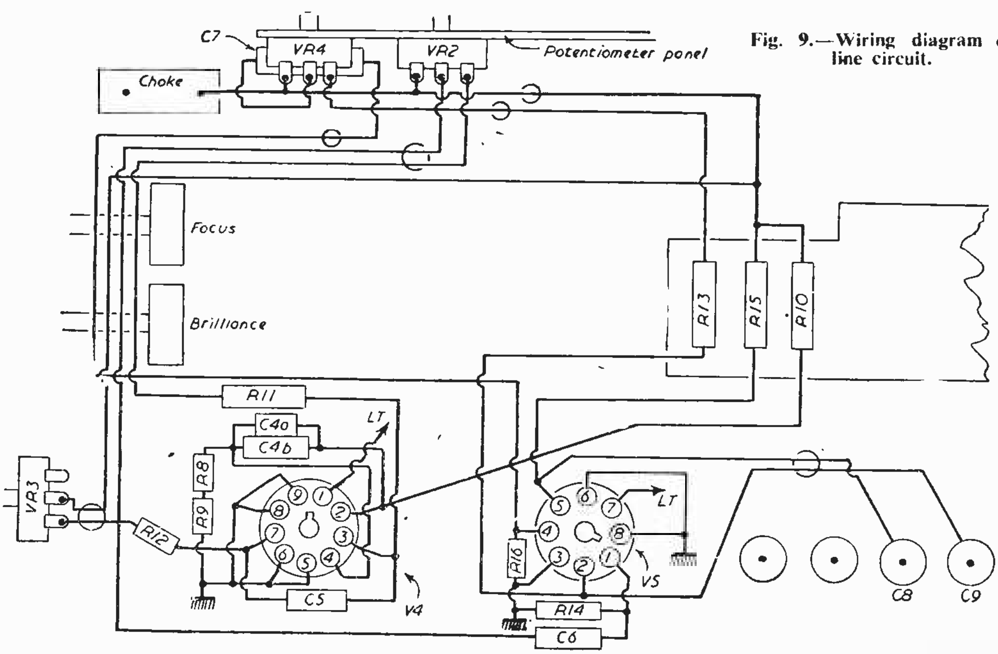


Fig. 9.—Wiring diagram of line circuit.

A Combined Magnifier and Visor

A USEFUL ADDITION TO A TELEVISION SET

By L. Taylor

ORIGINALLY made for a Cossor 10in. table model 916, this unit has proved so successful that details are given below, which can be adapted to any make of receiver. Using inexpensive materials it nevertheless makes up a smart looking addition to the set.

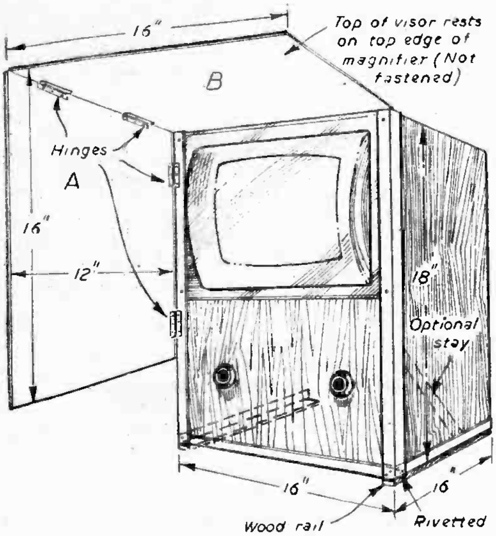


Fig. 1.—Constructional details of the magnifier and visor.

Fig. 1 is a table-level view of the completed apparatus as used with the set. It is a sliding fit under the set cabinet without fastenings, and the visor portion is folded back against the side of the cabinet when not in use.

Using a 12in. magnifying lens, the frame is made up of five pieces of 1in. angle aluminium, as used for the edge of motor-car running boards. This has one fluted ornamental side, and this side is kept to the front view in the make-up.

Make the two side L-shaped pieces of framework, riveting with two aluminium rivets at the junction. The size of the magnifier flat back decides the length of the front bottom piece of the framework which is riveted to the side L pieces with four more rivets and the aluminium framework is then placed in position in front of the set, for marking off the magnifier position central to the TV picture frame. At the same time cut two pieces of wood 2in. wide and the depth of the cabinet, and thickness just to be a sliding fit under the sides of the cabinet, against the wooden bearers already fitted by the makers of the set under their cabinet. Aluminium frame in position resting on the projecting sides of the wooden strips, is then marked off for screwing to the wooden strips. When screwed up the complete framework should just slide under the set cabinet with the side wooden rails running alongside the underbearers of the set. Then bolt the magnifier lens to the upright legs of the L members.

The "Visor"

Made of ordinary hardboard cut to the full width of the flat part of the lens, and 12in. deep, two pieces are cut alike. These are hinged together at the top edge like a book back, and then one long side is hinged again to whichever side of the TV magnifier aluminium framework is nearest to the daylight window side of the set. In the author's case this was the left, but, of course, it could be on the right.

This visor normally is folded in two and the whole swung back away to the side of the cabinet. It is only necessary to swing the visor out, lift up the half side hinged at the top, and rest this on the top of the set or top edge of lens, giving just the shade necessary for comfortable daylight viewing. When fastening the side hinges to the upright aluminium, take care to mark so that the top horizontal piece of the visor is dead level for the sake of appearances.

Where the wooden bearers are not provided under the receiver they can, of course, easily be made and screwed to the base. Note that the larger 12in. lens was chosen to allow of side clearance of the aluminium bottom rails. If desired the visor could be further improved for awkward light, by using another piece of hardboard hinging against the opposite side of the top portion, to hang down on the other side of the cabinet. The extra side folding under the top piece, so that this extra side will then be in the middle of the complete *folded* swung-back assembly. In my case the extra side is not required.

In the original, the lens flat back made the whole assembly so rigid with the double riveting of the aluminium which were cut quite square, that extra sideways supports running from the uprights to the bottom side pieces, were not essential. They will only be required against any looseness at the riveted junction.

FAULT SYMPTOMS

THE CAUSES OF COMMON FAULTS, AND METHODS OF CORRECTION

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

(*Continued from page 207, October issue*)

Intermittent Loss of Focus and Alteration in Picture Size

THIS effect is manifested mainly on receivers using the R.F. E.H.T. system. What happens is that the E.H.T. suddenly falls in voltage, and as a result of this the comparatively lower velocity electron beam within the picture-tube is influenced more easily by the controlling magnetic fields than when the correct potential is present on the final anode of the tube. This means that the beam will be deflected over a greater angle, thereby producing a picture out of proportion to the diameter of the tube screen, while at the same time, the magnetic focusing field will be in advance of that necessary for optimum beam focus, and thus an out of focus picture will also result.

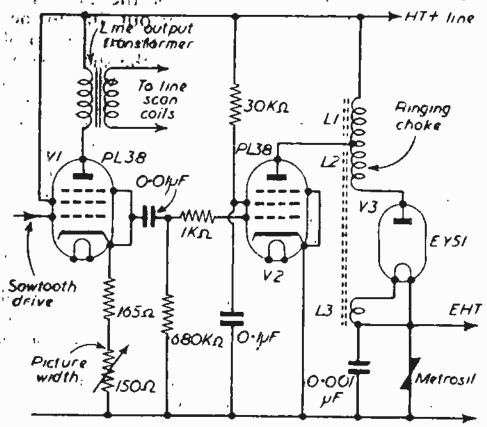


Fig. 14.—A typical "ringing" choke E.H.T. system by Invicta (Model T102).

This fault can generally be traced to an intermittent oscillator tuning capacitor (C1), or a similar defect in a capacitor that certain manufactures employ connected in parallel with C1, for, as has already been mentioned, the precise oscillator frequency has a large bearing on the E.H.T. potential.

E.H.T. Derived from a "Ringing" Choke

Sometimes a portion of the line sawtooth voltage is tapped from the line output valve and fed to a separate power pentode valve, of which the anode load comprises a tuned auto-transformer resonating at approximately 150 kc/s. Such an arrangement is termed a "ringing" choke E.H.T. system, and Fig. 14 depicts the commercial representation of this system which is used in the Invicta Model T102 series.

Here V1 is the normal line output valve, the anode load circuit of which caters only for supplying scanning power to the line coils by reason of the simple two winding line output transformer. The sawtooth voltage appearing at the cathode of V1 is A.C. coupled to the control grid of the E.H.T. generator valve so that pulses of anode current at line frequency flow in the winding L1 of the "ringing" choke. These pulses cause the choke to oscillate at its resonant frequency, and owing to the rapid change in current quite a large voltage appears across the winding.

Because of the step-up ratio L2/L1 an even greater induced voltage appears across L2, and the sum of both voltages is thus applied to the anode of the E.H.T. rectifier valve V3. It will be observed that this system is precisely the same in function as the flyback derived E.H.T. method, apart from splitting the system and using each section solely for its individual purpose of E.H.T. generation and line scanning. It has been claimed that one of the main advantages of the "ringing" choke circuit as compared with the flyback system is the fact that since the line output transformer has only the power employed for scanning to deal with it is considerably easier and cheaper to produce.

From the servicing aspect this anode of E.H.T. production appears to yield fewer problems—probably because a lot of guesswork is avoided in wondering whether the line output transformer *is* the cause of no E.H.T. A defect in the line timebase will, of course, result in no E.H.T., but this can be easily checked by the headphone test. With the 'phones connected between the control grid of the E.H.T. generator valve and receiver chassis quite a large signal at timebase frequency should be heard. Checks in the E.H.T. section proper resolve mainly to those we have already considered, and little trouble should be presented in establishing whether the "ringing" choke itself is at fault.

The Metrosil (a non-linear resistive element), connected across the E.H.T. smoothing capacitor, provides—to a degree—a stabilising feature to the E.H.T. supply by virtue of suppressing voltage surges.

If used independently of the main television receiver the "ringing" choke E.H.T. circuit requires two valves, the first being a pulse generator valve, whilst the main valve takes the form of that employed in position V2 of Fig. 14. Most projection television receivers employ this type of "ringing" choke circuit

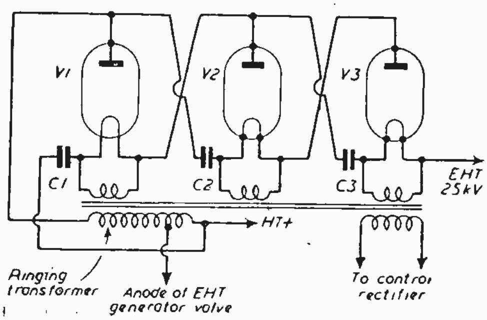


Fig. 15.—A cascade multiplier as used in projection E.H.T. receivers.

used with a tripler rectifier arrangement so that the D.C. output is equivalent to approximately three times the input voltage, an output of 25 kV. being obtained.

E.H.T. Cascade Multiplier (Projection TV)

A tripler circuit after this style is illustrated by Fig. 15, and is sometimes known as the half-wave cascade multiplier. 25 kV. E.H.T. units for projection tubes usually embody three rectifiers as shown, which are immersed together with the " ringing " transformer in a specially sealed oil-filled can. Rectifier replacement in units of this nature is, therefore, rendered rather difficult, for once the oil seal has been broken little can be done by the experimenter to re-make it, and assistance from the manufacture is generally necessary.

The general function of the system is quite straightforward, and as will be seen the high-voltage pulse output from the " ringing " transformer is connected directly to the anode of diode V1. Since the pulse is positive going V1 conducts and C1 charges to nearly the peak value of the input ; and during the pulse intervals—when V1 is non-conductive—the charge across C1 is maintained so that the potential of the following pulse adds to this charge, and V2 conducts to charge C2 to nearly twice the pulse input voltage. This, of course, is added in turn to the pulse input voltage to charge C3 to nearly three times the pulse input voltage to provide the necessary E.H.T. potential at the cathode of V3.

Facility for Constant E.H.T. (Projection TV)

Four additional windings are also usually included on a " ringing " transformer, three of them are simply used for energising the heaters of the rectifier valves, and the other one is an automatic E.H.T. voltage control winding arranged in conjunction with a diode valve (or triode strapped as a diode), to provide a D.C. voltage for biasing the E.H.T. generator valve. This would mean, then, that should the E.H.T. tend to reduce in voltage owing, say, to an excessive beam current (a large peak white content in picture, for instance), the E.H.T. generator bias would also reduce, and the valve would be pushed harder in an endeavour to make good this undesirable reduction in E.H.T. In this way, therefore, a fairly steady E.H.T. voltage is made possible, irrespective—within limits—of beam current.

Faults in E.H.T. circuits of this type are normally not difficult to diagnose as the circuitry involved is independent—apart from, perhaps, the H.T.—of any other section of the receiver. Absence of E.H.T. should first lead to a check of the pulse generator valve and associated components, the 'phone check may again be used in this connection, but extreme care should be taken to ensure that they are adequately isolated by suitable capacitors as previously described. It is as well to remember that the " ringing " choke or transformer in this style of circuit does not normally emit a high pitched note as expected from line output transformers, although a lower pitched note is usually in evidence when the system is working correctly. This is, of course, due to the lower working frequency of the pulse generator as compared with the line frequency.

Picture Focusing and E.H.T. (Mainly Projection TV)

Although we shall have a lot more to say about various servicing aspects of projection television receivers as we progress, it may be advisable at this stage to mention that the projection type picture-tube is extremely fussy about a constant E.H.T. supply—hence the usual embodyment of a constant E.H.T. control facility. For instance, with a 9in. direct viewing picture-tube, requiring, say, 5 kV. of E.H.T., a five per cent. reduction will only represent 250 volts, whereas the same magnitude of reduction at 25 kV. represents 1,250 volts—a lot of E.H.T. ! A voltage reduction in this region usually affects first of all the focusing of the picture, for as we have already seen (" More About the Cathode Ray Tube," PRACTICAL TELEVISION, October, 1951, and " Scanning Amplifiers," PRACTICAL TELEVISION, May, 1952), the optimum focusing field is dependent on beam velocity—E.H.T. Probably the focus control is found to be hard over on one of its stops, and yet the picture is still not in perfect focus—it wants just that little more movement for optimum results ! The fault may, of course, be in the focus network proper, but it is not advisable to tear the circuit down, or indeed, waste a lot of time on it, until the E.H.T. has been checked normal.

It often happens that this fault is due to one of the E.H.T. rectifier valves loosing emission only slightly, it is surprising the effect it has on the focus control setting. A wandering focus setting or, in fact, any focusing fault, which has no obvious pointer to a defective control circuit, should be investigated first from the E.H.T. aspect.

(To be continued)

New C.R. Tube Factory

AS a result of the ever-increasing application in industry of electronic devices and electronically controlled instruments, coupled with the very considerable increase in television, the Mullard company has decided to establish a new factory for the manufacture of cathode ray tubes.

The present manufacture of these tubes is mainly concentrated in the company's factory at Mitcham, London, and following discussions with the Board of Trade it has been decided to transfer the manufacture to a new factory to be built under the facilities provided by the Distribution of Industry Act in the North-west Lancashire Development Area.

The factory will be one of the largest and most modern television tubes factories and will provide employment for many hundreds of workpeople. It will provide a valuable addition to the diversification of industry in the textile towns of north-east Lancashire.

Transfer of Work

The transfer of the work from Mitcham will make much-needed space available for the manufacture of other electronic devices and this will absorb the workpeople at present employed on television tubes there.

The new factory will be within easy reach of the company's existing factory at Blackburn, which will be responsible for providing certain materials and component parts and services to the new factory. It is confidently expected that the provision of these services, together with increasing demand for existing and new products of the Blackburn factory, will require an expansion of that factory's labour force.

TV for the Beginner—6

THE FINAL ARTICLE OF A SERIES EXPLAINING THE PRINCIPLES OF RECEPTION FOR THE NEWCOMER TO TELEVISION—THIS MONTH WE DEAL WITH THE USE OF EX-GOVERNMENT APPARATUS

By "Alpha".

(*Concluded from page 210 October issue*)

WHERE mains transformers are used for E.H.T. supply the regulation is very good, as quite a heavy current can be drawn without the voltage falling too low. R.F. supplies, on the other hand, have poor regulation, the applied voltage decreasing rapidly to zero if a heavy load is applied.

The practical results are two-fold. A poorly-regulated supply will tend to vary the spot size with picture content: a bright part of the picture will draw more current from the E.H.T. supply, the spot size will increase and a small degree of focus will be lost. This symptom is often referred to as "de-focusing on whites." The mains supply does not suffer from this defect.

On the other hand, if accidental contact is made with the R.F. E.H.T., then the voltage immediately falls to a low, safe figure and beyond a nasty jolt, no harm is done. With mains E.H.T. the voltage does not fall so rapidly; an accidental contact is, therefore, much more dangerous.

Using Ex-Govt. Units

The cost of many ex-Govt. units appears very attractive to the beginner and our Query Department receives a constant flow of enquiries on the suitability of this or that type of apparatus for TV work.

Some confusion arises on the make-up of the different types of units and the following information is designed to assist the beginner should he desire to make use of this type of apparatus.

Items which are suitable for TV work fall into the three main classes; (a) indicators, (b) I.F. strips, (c) V.H.F. or U.H.F. receivers.

An Indicator, or display unit as it is sometimes termed, comprises a cathode-ray tube with various valves and other components. These units can form the picture display unit of a televisor and are usually modified to contain the timebase, E.H.T. supply and C.R.T. Some indicators such as the 62 and 62A can be converted into a complete televisor containing vision and sound receivers as well as the timebase and C.R.T.

The Indicator 62 formed the basis of an inexpensive televisor called the "£9 Televisor," details of which were published in PRACTICAL TELEVISION some time ago. Reprints of the article are still available, but the televisor cannot be built for that low figure now, due to the fact that prices have been increased.

The data has not been designed for use by the real beginner as a certain amount of theoretical knowledge is required, no wiring diagrams being supplied.

Indicators 62A are a later issue of the above unit and use EF50 valves instead of the SP61's of the Indicator 62. No conversion data is available, but the data for the £9 Televisor could be used.

There are other Indicator units available, but those which are in the greater supply are too small to accommodate a complete television receiver. They are all equipped with a cathode-ray tube and can generally be used as a picture display unit complete with timebase.

One of the most popular types is the 182A, which contains a cathode-ray tube type BCR517 and 8 valves. This tube provides quite a good picture and the colour varies from a pale green to a buff. There are a series of 517 tubes, all of which have different characteristics and some of them have a medium persistence screen which makes them unsuitable for picture reception.

It is advisable to have this type of tube tested on an actual picture, before purchase if at all possible, as the afterglow of the screen detracts from the quality of the picture.

The 517c generally suffers from this defect, though the tubes appear to vary from one to another.

The tube contained in the Indicator 182 is usually quite suitable for TV use.

Indicators Type 6 have been made in a series, the actual modification being determined by the letter following the number (e.g., Indicator 6H). These units contain a VCR97 tube (green screen, short persistence) which has proved to be very suitable for television. The tube is capable of providing a very good quality picture. The Indicator can be used as timebase and C.R.T. network and data for their conversion is now being published in these pages.

I.F. Strips

Undoubtedly the most popular I.F. strip is the Pye 45 Mc/s. This strip is sometimes sold by itself or complete with the receiving portion of the circuit called the R3583.

As the coils in this unit are tuned to 45 Mc/s it can be used for the Alexandra Palace transmitter with very few circuit modifications. It can also be used for any other channel if the coils are modified.

When converted it forms a very powerful T.R.F. receiver with 5 R.F. stages, using EF50 valves.

Modification data is available (usually from the dealer), but ability to read a theoretical circuit is essential.

The 194 strip is another very useful unit. The coils have to be rewound to cover the TV bands. When modified it forms a very powerful T.R.F. receiver containing 6 R.F. stages using SP61 valves. Modification data is available, usually from the supplier.

Both the foregoing units are very suitable for use as a vision receiver. The 194 strip can be used as a combined sound and vision receiver; modification data for this has been published in PRACTICAL TELEVISION and reprints are available.

The R1124A receiver is still available and can be modified for reception of TV sound. It is very easily modified for the Alexandra Palace transmitter, but no modification data is available.

V.H.F. and U.H.F. Receivers

There are quite a few of these units available and they can be used for receiving TV sound and vision.

One of the most popular types is the R3170A and conversion details for this have recently appeared in PRACTICAL TELEVISION. It is not difficult to modify and makes a very powerful sound and vision superhet.

The R3094A is a similar unit and can be modified in a similar manner, though no detailed data is available.

Perhaps the most popular unit of all is the R1355. By itself it forms an I.F. unit comprising five I.F. stages and an output stage which can be modified for vision or sound.

The chassis has a space which will accommodate an R.F. unit designed specifically for the R1355, and the complete set-up forms a most powerful receiving unit, eminently suitable for really long-distance reception.

The I.F. stages employ SP61 valves and are tuned to 7.5 Mc/s. A V.H.F. diode detector is included and the output stage is easily modified as a video amplifier.

Four R.F. units are available for use with this unit. The RF24 tunes by five switched stages from 20-30 Mc/s and can be modified to cover any channel. It uses SP61 valves.

The RF25 can be tuned directly to Alexandra Palace (Channel 1) and can be modified to tune in the other four channels. It uses SP61 valves.

The RF26 is, perhaps, the most useful unit of the four, as when jacked into the R1355 it will cover all five channels without wiring modifications. It is a very powerful unit using one EF54 R.F. stage, one EF54 mixer, and one EC52 oscillator. It can be tuned over the 50-65 Mc/s band by means of a tuning dial.

When used unmodified it will cover Sutton Coldfield transmitter and, by retrimming, Holme Moss and Kirk O'Shotts can be covered. Alexandra Palace can be obtained by fitting iron cores to the tuning coils (this is also sometimes necessary to obtain Holme Moss), while the Wenvoe transmitter can be obtained by fitting brass cores to the coils.

The RF27 covers the range 65-80 Mc/s and thus will tune Wenvoe directly. It is very similar to the RF26 and can be modified for most of the channels.

Although the RF26 and 27 are much more powerful than the RF24 or 25, they appear to suffer from trouble with I.F. breakthrough, stations transmitting on the intermediate frequency coming through on the sound and vision receivers. This can be cured by fitting a simple rejector circuit in series with the aerial or by fitting a pre-amplifier.

Pre-amplifiers containing one or two valves can be used with the units to extend the range.

It has not been possible to describe all the units available at the present time, but we have mentioned those which readily lend themselves to conversion and which are still advertised.

One very important point to observe is that these units have been in stock for some considerable time, and while the resistances which they contain are usually above reproach, the same cannot be said of the condensers. It is advisable to check the condensers before putting them into use, and this is especially important for timebase circuits as even slight leaks can give very puzzling faults.

Cathode-ray Tubes

The supply of cathode-ray tubes which are suitable for TV use is becoming exhausted, and the constructor who is intending to make himself an inexpensive televisor using one of these tubes is advised to buy now. Supplies of the deservedly popular VCR97 are becoming erratic ; they are not likely to disappear suddenly but will become increasingly more difficult to obtain.

VCR97's are capable of providing very good pictures, though the constructor should ensure that the tube he buys is free from cut-off. By cut-off is meant the cutting of the edges of the picture by deflector plates inside the tube, and nothing can be done to remedy it satisfactorily.

In this connection it may be of help to know that the rubber mask which is available for use with this tube has a height of 4in. and some tubes suffer from cut-off in one direction only ; if the cut-off allows a raster of at least 4in. in one direction and 5in. in the other it can be used for TV.

VCR517's can be used for TV but are inclined to be medium persistence, which becomes annoying on panning shots. Some constructors prefer them to the VCR97.

The 5CP1 is still available and can provide a very clean picture, though the overall size is not as great as the VCR97.

VCR140's are 12in. in diameter and require magnetic deflection. They are not suitable for TV due to their very long persistence.

Those are the tubes most generally available. It is not possible to include a complete list, but it will be found that other ex-Government tubes in good supply are of the smaller type with screens of about 3in. in diameter. The tubes make very good oscilloscopes.

Valves

Most of the valves on the ex-Government market are quite suitable for TV where their civilian equivalents are used. The SP61 (VR65) has been designed for V.H.F. reception, but suffers from one drawback —a very heavy heater current is required.

EF50's (VR91) are available in large quantities. When these valves are used the pins should be thoroughly cleaned with emery cloth and spring clips used on the valveholders. They are prone to cause trouble due to poor contact between valve pins and the holder.

EF54's (VR136) are very useful for R.F. or I.F. amplification, though they too suffer from poor contact trouble.

6AM6's are glass-based valves of the miniature type, which can be used in lieu of any of the above types. Their use enables compactness in design to be obtained.

Once again it is not possible to enumerate all the types available, but the foregoing are chosen as representing the most popular types used for R.F. and I.F. amplification.

The chokes and transformers found in ex-Government units are generally of the high cycle type and are unsuitable for direct use on 50 cycle mains. The beginner is advised not to use them.

It is possible to rewind the transformers if the necessary knowledge and skill is available.

SPECIAL! SPECIAL! SPECIAL!

AVO MODEL 40 UNIVERSAL TEST METER

A special purchase enables us to make this unique offer of these world famous testers. Completely self contained, it provides 40 ranges of AC/DC current, voltage and resistance. Every instrument has been thoroughly checked and tested, and is GUARANTEED IN PERFECT WORKING ORDER. An ideal opportunity to acquire a first grade tester at low cost. ONLY **£9-19-6d.**

R 1355 RECEIVER, as specified for "Inexpensive Television," a copy of which is supplied. Complete with 8 valves SP61, and 1 each 5U4G and VU120 or VU111. Used, excellent condition. ONLY **29/6d.** (carriage, etc., 5/6d.).

RF UNITS FOR USE WITH THE ABOVE.—Type 24, complete with valves and details of mods for all TV Channels, ONLY **25/-**. **TYPE 26**, for Sutton Coldfield, Holme Moss and K.O.S., complete with valves and BRAND NEW IN MAKER'S CARTONS, ONLY **59/6d.** **TYPE 27**, for Wenvoe, complete with valves and BRAND NEW IN MAKER'S CARTONS, ONLY **59/6d.** Postage, etc., **2/6d.** per unit, please.

INDICATOR UNIT TYPE 95. Contains VCR 97 Tube, 16 valves, SP 61, 2 of EB34, 4 of EA50. Built on a double deck chassis, this is exactly the same as the Type 62 indicator, but is for 50 cycle use. In new condition. ONLY **59/6d.** (carriage, etc., 7/6.).

RECEIVER R 3118.—A further supply of the very popular unit we sold out of a few months ago. Ideal for conversion to TV having a built-in A.C. Mains Power Pack for 180-240 volts. Is tremendously powerful, employing 7 I.F. stages of 12 mc/s with 4 mc/s band-width, and has 16 valves: 6 of VR65, 4 of VR92, 2 of VR136, and 1 each VR137, P61, 5Z4 and Y63 "Magic Eye." In new condition, **ONLY 97/6.** (Carriage, etc., 7/6.)

TRANSFORMERS.—Manufactured to our specifications and fully guaranteed. Normal Primaries. 425-0-425 v. 200 ma. 6.3 v. 4 a., 6.3 v. 4 a., 5 v. 3 a. **ONLY 50/-**; 350 v.-0-350 v. 160 ma., 6.3 v. 5 a., 6.3 v. 3 a., 5 v. 3 a., **ONLY 42/6**; 250 v.-0-250 v. 100 ma., 6.3 v. 6 a., 5 v. 3 a., **ONLY 32/6.** 350 v.-0-350 v., 150 m.a. 6.3 v. 5 a., 5 v. 3 a. **ONLY 32/6.** The above are fully shrouded, upright mounting. 5.5 kV. E.H.T. with 2 windings of 2 v. 1 a., **ONLY 72/6**; 7 kV. E.H.T. with 4 v. 1 a., **ONLY 82/6.** PLEASE ADD 2/- POSTAGE FOR EACH TRANSFORMER.

E.H.T. TRANSFORMER FOR VCR97 TUBE.—2,500 v. 5 ma., 2-0-2 v. 1.1 a. 2-0-2 v. 2 a. (post 1/6), **37/6.**

VCR97 TUBE, Carriage paid. **45/-**.

VALVES.—EF50 (VR91), **6/6**; 5U4G, **10/-**; 6V6, **10/6**; EB34 (VR54), **3/6**; EF36 (VR56), **7/6**; SP61 (VR65), **4/6**; EA50 (VR92), **3/6.**

POTENTIOMETERS.—Less switch, **3/-**; with switch, **4/6.**

VALVEHOLDERS.—I.O. or M.O., **6d.**; B9G, **10d.**; Diode, **6d.**

RESISTORS.—¼ w., **4d.**; ½ w., **5d.**; 1 w., **6d.**; 2 w., **9d.**; 15 w., 2.5 k., **2/-**.

COIL FORMERS WITH SLUGS.—⅜in., **8d.**; ½in., **10d.**

CONDENSERS.—Mica and Silver Mica, **6d.** Tubulars: .1 mfd., **1/-**; .01 mfd., **9d.**; .05 mfd., **9d.**; .005 mfd., **9d.**; .5 mfd. **2/-**; .03 mfd. 2.5 kv., **2/6**; .1 mfd. 2.5 kv., **4/6.**

ELECTROLYTICS.—8 mfd. 450 v., **2/6**; 8 x 8 mfd. 450 v., **4/9**; 16 x 16 mfd. 450 v., **7/-**; 25 mfd. 25 v., **1/6**; 50 mfd., 12 v., **1/6.**

TRIMMERS.—0-30 pf., **7d.**

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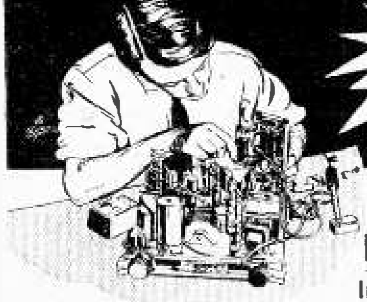

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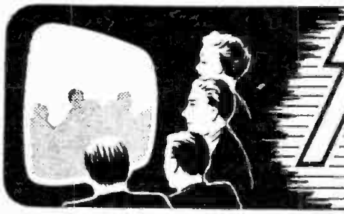


TELENEWS

Viewing Before Gas

A RESIDENT of Godshill, a small village on the Isle of Wight of just over a hundred houses, has pointed out the ironic situation that will arise when the new television transmitter is erected on the Island.

In spite of the fact that Godshill is only five miles from the site of the aerial, all lighting in the village is by gas only with little or no hope of electricity for some time to come.

Commercial Station

ALTHOUGH commercial television is still only a wishful thought for some people, a London advertising firm is to construct a station near Walton-on-Thames, Surrey.

Television Licences

THE following statement shows the approximate number of television licences issued during the year ended August, 1953. The grand total of sound and television licences was 13,056,689.

Region	*Number*
London Postal ...	798,240
Home Counties ...	286,261
Midland	521,343
North Eastern ...	302,496
North Western ...	334,684
South Western ...	92,441
Wales and Border ...	105,389
Total Eng. and Wales	2,440,854
Scotland	93,364
Northern Ireland ...	4,885
Grand Total ...	2,539,103

Council Lessons

SURREY County Council are introducing a series of lectures on the maintenance and adjustment of a television receiver.

The series is included at evening classes in Kingston and Hinchley Wood.

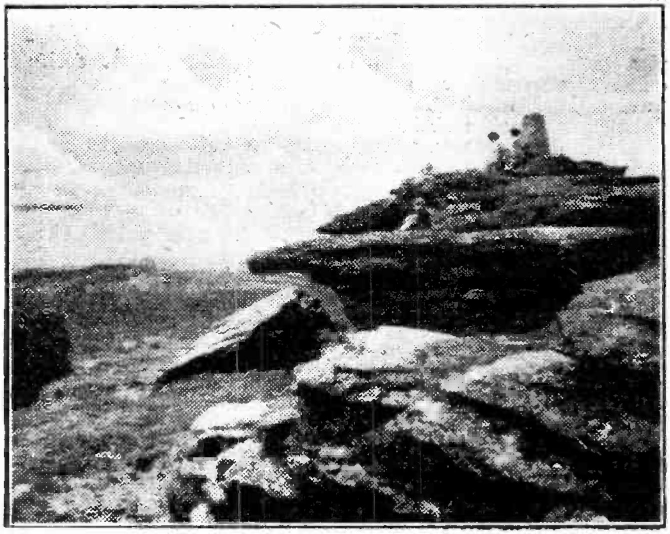
Servicing Certificate

THE Radio Trades Examination Board and the City & Guilds of London Institute have announced the results of the 1953 Television Servicing Certificate Examination. Of the 135 candidates who attended the examination, 64 were successful, including 24 who were referred in the Practical Test in 1952. Thirty-six candidates passed the written papers and were referred in the Practical Test, and 35 were unsuccessful.

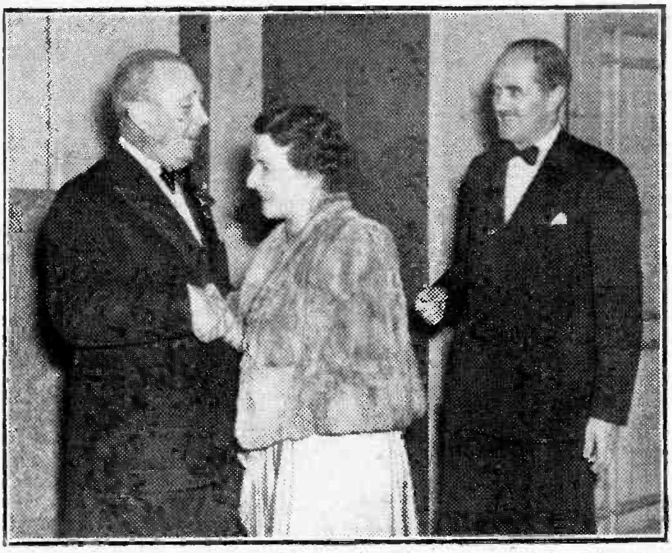
The next examination will be held on May 10th and 12th and June 19th, 1954, and the closing date for entries is January 15th. Entry forms and regulations may be obtained from the Secretary, Radio Trades Examination Board, 9, Bedford Square, London, W.C.1.

On the Farm

BY participation in a novel enterprise sponsored by Petbow, Ltd., E. K. Cole, Ltd. are proving that Ekcovision can be installed in isolated farms and smallholdings where no mains electricity is available. A mobile demonstration unit is now touring the country and visiting some of the principal agricultural shows to provide rural dwellers with practical evidence of Petbow generating sets.



North Hessary Tor, a prominent feature of the Dartmoor National Park. Opposition was so strong against the BBC scheme to erect a television station with a 750ft. transmitting mast on the Tor, that a special public inquiry was held. Transmission tests have also been made by engineers on King's Tor, a few miles from Princetown Prison.



Sir George H. Nelson greets Mr. H. Bishop, director of BBC Technical Services, and Mrs. Bishop at a dinner and dance in honour of delegates who are in London from all parts of the world for the VIIth Plenary Assembly of the International Radio Consultative Committee.

Reception in Buses ?

MR. J. OLDROYD, a radio and television mechanic from Cudworth, Yorks, has been experimenting with TV reception in vans and cars and believes that the day is not far off when passengers will be able to watch transmissions in buses.

Mr. Oldroyd has obtained clear pictures in a stationary van and quite good results even when travelling at 30 m.p.h. This is the first time that mobile TV has been achieved in this country, although the Americans conducted experiments in the same way. A normal commercial receiver was used with slight modification and very little aerial.

No BBC Cameraman

WHEN the Queen and the Duke of Edinburgh leave for their tour of Australia at the end of the year, their trip will not be covered for Television Newsreel by a BBC cameraman.

The reason given for this is the high cost of the trip which the BBC cannot afford. TV Newsreel will depend on the cinema newsreel companies for a pictorial record of the royal visit. These companies, however, will probably insist that the films are not transmitted before they are available for cinema audiences.

European Link-up

FOLLOWING a two-day conference in London, representatives from European countries have arranged for a European Television Week next June. Programmes will be interchanged between Britain, Belgium, Holland, France, Italy, Germany, Denmark and Switzerland.

Each country is to decide the type of programme it will offer to viewers of the other countries. It is expected that Italy will feature opera and that Switzerland and Germany will contribute sport.

Most Powerful

THE TV transmitter to be built at the Crystal Palace on Sydenham Hill is expected to be the most powerful in the world, the BBC claims.

The transmitter will be completed by 1956 and will have a range of 50 to 60 miles, being situated 1,000 ft. above sea-level.

Cabaret Televised

SIR GEORGE H. NELSON, chairman of the English Electric group of companies, of which Marconi's Wireless Telegraph Co., Ltd., and The Marconi International Marine Communication Co., Ltd., are members, was host to some 800 guests at a dinner and dance at the Dorchester Hotel recently in honour of delegates who are in London from all parts of the world for the VIIth Plenary Assembly of the International Radio Consultative Committee.

The dinner was followed by a cabaret which was televised throughout Britain by the BBC using Marconi cameras and equipment, with Helene Cordet, Jean Sablon, Hall, Norman and Ladd, and Ronnie Boyer and Jeanne Ravel.

Too Many Cowboys

SPEAKING recently on "The Impact of Television" at the Coventry Rotary Club, Mr. M. Gordon, psychology tutor at Birmingham University, told members that the BBC would do well to cut down the number of Western films shown in children's programmes, as they contain too large a degree of violence.

"Taken in small doses," he said, "murders, violence and crime on television will provide a healthy outlet for the savage instincts which are very predominant in children."

"But if the programmes show little else than a distorted and sadistic view of life, it will certainly affect their minds and give them a wrong view of right and wrong."

"TV Eye"

A NEW television development in America is a camera fixed on a tripod with a lens in front and a cable leading from the back to a TV receiver.

Known as the "TV Eye," it is being sold in the States for use in the home. Advertisements show the camera pointed at a sleeping child and the parents sitting in another room looking at a picture of the child on a screen.

Range Difficulties

MR. F. C. McLEAN, deputy chief engineer, BBC, has stated that if and when colour television transmissions are introduced, the range of the transmitting station is liable to be affected with considerable fading in fringe areas.

Less Travelling

ONE of the reasons given by Lord Latham, retiring chairman of London Transport, for the decrease in travelling on buses, tubes and suburban railways is that more people are staying at home to watch TV instead of going out for their entertainment.

HENRY'S

SETS OF VALVES

Ten EF50 (Ex-Brand New Units) 6/- each 50/- Set
6K8G, 6K7G, 6Q7G, 5Z4G, 6V6G (or KT61) ... ... 37/6 ..
1R5, 1S5, 1T4, 1S4 or (3S4 or 3V4) ... ... 30/- ..
TP25, HL23 DD, VP23 PEN25 (or QP25) ... 25/- ..
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 37/6 ..
PX25, KT33C, KT66, GU50 ... ... 12/6 each
(PX25's Matched Pairs 25/-pr.)
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Wearite IFT's "800" 15/- pr.
Wearite IFT's 501A-502 10/- pr.
Plessey Permeability 8/6 pr.
2 Gang Condensers .0005, 2¼" x 1¾" x 1½" 5/-
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5Z3	8/6
5U4	8/6
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6C4	8/6
6C5GT	5/-
6C6	6/6
6D6	6/6
6F6G	8/6
6G6G	6/6
6H6GT	5/-
6H6M	8/6
6J5GT	5/-
6J5M	8/6
6J6	9/-
6AK5	9/-
6J7G	6/6
6J7M	8/6
6K6	9/-
6K7G	6/6
6K7M	7/6
6K8G	9/-

6K8GT	9/-
6L6G	8/6
1622 (6L6)	11/-
6L7	7/6
6N7GT	7/6
6Q7GT	8/6
6SJ7GT	8/6
6R7	8/6
6X5G	8/6
6SA7GT	8/6
6SQ7GT	8/6
6SG7	7/6
6SH7M	7/6
6SK7GT	7/6
6SL7GT	9/-
6SN7GT	9/-
6SC7	10/-
6SS7	7/6
6V6GT	7/6
7C5	8/6
7A7	8/6
7C7	8/6
7H7	8/6
7B7	8/6
7S7	10/-
12A6	7/6
12C8	7/6
12H6	8/6
12K7GT	8/6
12K8GT	8/6
12Q7GT	8/6
12SA7GT	8/6
12SQ7GT	8/6
12SG7	7/6
12SH7	7/6
12SJ7	8/6
12SK7	8/6
12SR7	7/6

14A7	8/6
25Z6GT	8/6
25Z5	8/6
35Z4GT	8/6
25A6	8/6
35L6	8/6
50L6GT	8/6
42	8/6
43	8/6
75	8/6
78	8/6
80	8/6
866A	15/-
9001	6/-
9002	6/-
9003	6/-
9004	6/-
9006	6/-
954	6/-
955	6/-
958	6/-
1299A	7/6
TZ40	37/6
931A	50/-
EA50	2/-
EF54 (VR136)	6/-
EF55	12/6
EB34	3/6
EBC33	8/6
EF36	6/6
EF39	6/6
EK32	6/6
EF91	9/-
EL32	7/6
EF50	8/6
EF50 (Red. Syl.)	10/-

EF50 (Ex-Units)	5/-
SP2	8/6
VP2	8/6
TDD2A	8/6
DK40	9/-
UL41	9/-
UY41	9/-
4D1	4/-
8D2	4/-
9D2	4/-
15D2	10/-
R3	8/6
D41	5/-
D42	5/-
D63	5/-
KT2	5/-
KT61	8/6
KTW61	7/6
U52	8/6
U17	10/-
U19	10/-
Y63	8/6
P2	4/-
MU14	8/6
PX25	12/6
KT33C	10/-
KT66	12/6
GU50	12/6
XP(1.5)	4/-
XH(1.5)	4/-
VU111	4/-
VU133	4/-
VU120A	4/-

CV54	5/-
S130	7/6
7475 (V570)	7/6
CV66	6/-
VR150/30	8/6
CK510AX	5/-
DI	2/-
AC6PEN	6/6
AC5 PENDD	12/6
PEN25	6/6
PEN45	7/6
QP25	6/6
QP230	8/-
SP61	4/-
SP41	4/-
HL23 DD	6/6
TP25	8/-
VP23	6/6
VP41	7/6
U22	8/6
ATP4	4/-
TP22	8/6
TH233	10/-
41MP	7/6
42SPT	6/-
215SG	4/-
MS/PENB	7/6

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MU-METAL SCREEN for VCR97. 10/-.
VCR139A (ACR10). 35/-. Brand new.

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RECEIVER R1355. As specified for "Inexpensive Television." Complete with 8 valves VR65 and 1 each 5U4G, VU120, VR92. Only 29/-, carriage 5/-. Or Brand new in original packing case 55/-, plus 5/- carr.
RF24, 25/-; RF25, 25/-; RF26, 59/6; RF27, 59/3.

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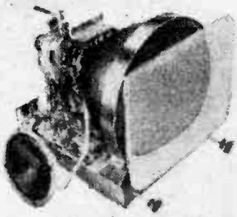
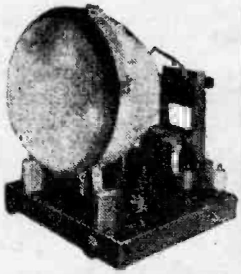
ELPREQ READY MADE TELEVISORS—SUPERIOR 15" NEWS



These are Five Channel Televisors employing completely tuneable superhet sound and vision receivers. They have noise suppression on both sound and vision and incorporate a special I.F. filter in the aerial circuit. The circuit is absolutely up-to-date and in fact uses the latest Mullard valves. The 12in. model uses MV 31/74 tube with the tinted special daylight viewing face. The 15in model uses the Cossor 85K tube. Price, either model, is **£42.10.0.** complete ready to receive sound and vision. Carriage and insurance £2.0.0. (Partly returnable). H.P. terms **£14.3.6** deposit. Cabinets: 12in. (table model). **£3.17.6.** carriage, etc., 7/6d. 12in. Console Model. £7.17.6. carriage, etc., 10/-. 15in. Console Model **£11.10.0.** carriage, etc., 15/-. Any cabinet may be purchased by H.P. Simply send one-third as deposit.

Our "Superior 15." has proved quite easy to construct and we are glad to say that most purchasers now have theirs working, some in fact, have already started on a second model for a friend.

Unfortunately, due to the increased prices of certain items, the cost of all components, valves and Cossor 15in. tube is now **£37.10.0.** (H.P. deposit now **£12.10.0**). Plus £1.0.0 carriage and insurance. Nevertheless it is still an exceptional bargain for it employs all the latest features—line fly-back E.H.T.—noise suppression—diode damped interlace, etc., etc.



A constructors' envelope, giving full details with blueprints, is available price 7/6d. (returnable within 14 days if you decide not to make the set). Working models can be seen at Fleet Street, Ruislip and Finsbury Park. A beautifully finished walnut cabinet has been made for the "Superior 15." Price is **£11.10.0** (or **£3.17.0** deposit). Carriage £1.0.0. This now means you can have a really super T.V. for less than £50.

AUTO-RADIOGRAM 29 gns.

Full-size walnut Console CABINET **£11.10.0.** plus 15/- carriage. 5-valve all-mains superhet RADIO. 3 waveband coloured illuminated scale, fully guaranteed. **£8.19.6.** plus 7/6 carriage and insurance. Record changer. Collaro 3-speed with dual pickup.

SPECIAL OFFER. Three units for **29 gns.** or **£10.14.0** deposit and 12 monthly payments of **£2.3.0.** plus carriage and insurance. **Booklet of photos, circuit diagrams, etc., 2/6 (returnable).**

TABLE RADIO CABINET

Due to a special purchase, we are able to offer this very fine cabinet, size approx. 18 x 16 x 7—walnut veneered and satin finished. Complete with 3 colour 3 waveband glass scale at only **37/6d.** carriage and packing 3/6d.

We also have a limited quantity of the complete chassis to fit these cabinets, specification 5 loctal valves, standard long, medium and short wavebands. A.V.C. 8in. speaker, A.C. mains operation. Price **£9.19.6.** plus 10/- carriage and insurance. H.P. terms **£3.7.0** deposit, or with cabinet **£4.0.0** deposit.

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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).

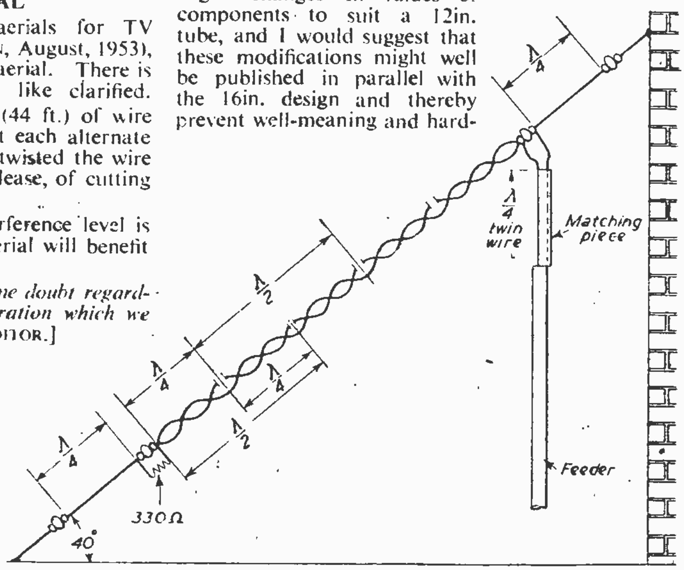
TILTED WIRE AERIAL

SIR,—*Re* capacity tilted wire aerials for TV reception (PRACTICAL TELEVISION, August, 1953), I am very interested in this type of aerial. There is one constructional detail I would like clarified.

The writer stretched two lengths (44 ft.) of wire between two insulators and then cut each alternate wire R/4 along its length and then twisted the wire lightly together (what is the object, please, of cutting the wire, then joining it ?).

I live in a locality where the interference level is very high and I think this type of aerial will benefit me.—H. HAWKINS (Slough).

[*As several other readers are in some doubt regarding this aerial, we show a new illustration which we hope will clear up any doubts.* — EDITOR.]



Tilted wire aerial.—H. Hawkins (Slough).

SLOT AERIAL

SIR,—I made up the slot aerial shown in PRACTICAL TELEVISION February, 1953, by Mr. Rosbottom and it has proved 100 per cent. satisfactory without any adjustment whatever. I hung it under my roof and did not have to move it once. I am using a 15in. Murphy table model.

I am situated fairly high up, so am not troubled with ghost.

Your journal is very helpful and well worth the subscription.—E. NORMAN (Ilfracombe).

MIXED CIRCUITS

SIR,—In a recent Editorial you stressed the danger of experimenters attempting to adapt published designs of television circuits to suit their own ideas and existing equipments. This is, of course, very sound advice, and in general it should be adhered to by all except, perhaps, the trained engineer with sufficient design experience and testing facilities to avoid the pitfalls.

There is, however, another aspect worth consideration and is probably the main reason why enthusiasts dabble to the extent they do, hoping to improve their results by trying new ideas out and improvising with what they have. This is purely the one of financial economy. A design stressing a particular feature not previously published is always a temptation to the least experienced, but when the cost of fully constructing the new design is assessed, the urge to adapt existing equipment becomes almost too great to resist.

Such a position might well arise with your currently published initial design features of the 16in. SuperVisor receiver. The advantages of flywheel synchronising and picture level control are an attraction to the fringe area enthusist but, since your details of the Lynx 12in. receiver have just been concluded, it is very probable that many such enthusiasts will have invested their hard-earned cash for a 12in. tube, and cannot afford to dispose of this to expend a much larger sum for a 16in. one, together with the necessary associated components. It might well be that many attempts may be made to improvise the Lynx into a SuperVisor, retaining the 12in. tube, and one can well imagine the results that may eventuate.

A study of the SuperVisor circuitry shows that only the scanning, EHT and modulator circuits need slight changes in values of components to suit a 12in. tube, and I would suggest that these modifications might well be published in parallel with the 16in. design and thereby prevent well-meaning and hard-up enthusiasts from disaster and disappointment. —W. M. McMAHON (Liss).

NON-TECHNICAL CRITICS

SIR,—The acknowledged and increasing "news-value" of television has led to the appearance of many "semi-technical" articles in the lay press. Many of these articles are, to put it very mildly, misleading, often in quite a serious manner, and the long-term effect is to give the public a completely erroneus idea of the truth about the technical facts concerned.

A typical example is a weekly columnist living in an area where fading causes appreciable annoyance who repeatedly stresses that this fading could be removed by increasing the transmitter power, and calls on the BBC to take action. Apart from the fact that increased power would do nothing of the sort, he ignores the limitations imposed on the BBC by international agreements, etc., and gives the impression that they are failing to do their duty by the public. This is only one instance of the misstatements perpetrated by that particular columnist, and others appear almost weekly. It is, undoubtedly, a particularly typical case, and some lay writers serve television well, but the public cannot be expected to know the difference.

It would help the public greatly if those in a position to do so would write to the newspapers concerned, pointing out the errors. It is a thankless task, but it can often save trouble later on, when members of the public begin to act on the false information they have been given.—ENGINEER (Exeter).

TV A MENACE ?

SIR,—Although I am an enthusiastic television home constructor, I cannot help but consider the medium as a great menace to our lives.

I do not think, unlike many people, that to watch a small picture on the end of a tube in a darkened room is bad for anyone. But I do believe that it will in the future bring so much into the home that there will be little need for anyone to leave the house for any outside social functions.

Many regular cinema-goers who frequented the local picture house in the old days have now bought TV sets and become addicted to them. No one will ever convince me that the average evening's viewing entertainment on television is even half as entertaining as a programme of good feature films at the cinema. The only difference is that it is so much easier and cheaper to remain at home with TV. Thus, film artists, although turning out better material, are being scorned and eventually put out of work.

Take also the case of the music hall artist. When the entire nation can look in at a dozen acts on television, why go to all the small variety houses to see others. The result ? Twelve artists are employed to entertain the whole country while thousands are put out of work because everyone can see the same show.—V. B. RICHARDS (Nottingham).

Temporary Supplies for Series-connected Heaters

By M. C. Matthews, B.Sc.

IT is frequently desirable when constructing a complex piece of equipment such as a television set to be able to test sections of it separately from the whole. The supply of H.T. for this purpose is seldom difficult, but in these days of A.C.-D.C. sets with series connected heaters it is often found that an odd and inconvenient heater voltage is required. Thus, a line timebase may require about 44 volts at 0.3 amps, while the vision receiver may only need 36 volts and other parts widely differing voltages.

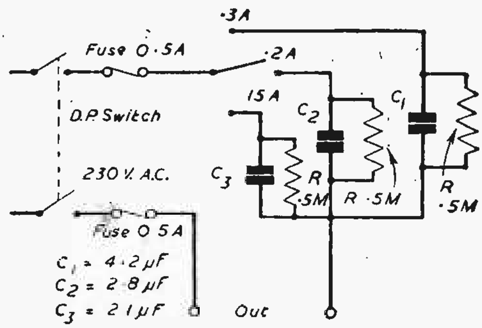
The provision of an adjustable resistance capable of dissipating the unwanted power is inconvenient and expensive owing to the power involved and the wide range of output required, but there is a simple solution to the problem in the capacitor voltage dropper.

This has been described on various occasions, and there is no need to go into the theoretical explanation again here, but the method has one advantage which is not always appreciated, and that is that the regulation is far better than that of a resistance provided that the output voltage is low compared with the input voltage. This means, of course, that fluctuations of the mains voltage have little effect on the output, but it also means that alterations in the load also have little effect on the output current. In a typical case it was found that a particular capacitor of nominal capacity 4μF passed a current of 0.310 amps when connected across a 200 volt A.C. supply. The insertion of a 200 ohm resistance in series, equivalent to a 60 volt heater chain, reduced the current to 0.297 amps. Thus, a change of output from 0 to 60 volts produced a change of current of 0.013 amps, or from +3 per cent. to −0.1 per cent. of the nominal current of 0.30 amps, which is not material.

Outputs Required

The three usual currents required are 0.15 amps, 0.2 amps and 0.3 amps, and it is a simple matter to arrange to provide up to 60 or 70 volts at any one of these currents. The circuit is shown in the figure and needs little explanation. The principal point is that the capacitors must be paper, of high quality and with a minimum working voltage of 500 D.C. A wooden case is to be preferred, but if a metal case or chassis is used it must be insulated from the circuit and should be separately earthed. The resistances R are provided to discharge the condensers on switching off, as otherwise they may be left charged to a high voltage.

Care must be taken when using this circuit with an A.C.-D.C. H.T. supply, and it is advisable to disconnect the heater chain from the chassis and reconnect it through a capacitor of about 1,000 pF.



Details of the circuit.

The values given in the diagram are for a mains voltage of 230 A.C.; but if the device is required for use on a widely differing voltage the required capacity can be calculated from the formula :

$$C = \frac{I_h \times 10^6}{2\pi f\sqrt{V_m^2 - V_h^2}}$$

where C is the required capacity in microfarads
I_h is the heater current in amps
f is the supply frequency
V_h is the heater voltage
V_m is the mains voltage.

The regulation becomes poorer as V_h approaches V_m, and it is desirable to keep the ratio as high as possible.

LOUD HAILER.—Powerful P.A. system. New. Works off 12 or 24v. Colossal range. Consists of microphone and amplifier/speaker. Weather-proof. Complete for **£8-17-6**. Carriage 5 6.

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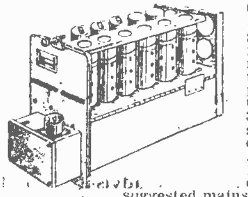
TELESCOPIC MASTS.—Ex W.D. dinghy masts, but unused. Extend to 7ft. 6in. Weatherproof. Ideal radio and TV aerials. SPECIAL PRICE **7 9**. Post 1/6.

RADIO-TELEPHONES.—Brand new walkie-talkie type transreceivers, made by Jefferson Travis Co. (U.S.A.). Individually boxed. Maker's handbook with each pair. 53/75 mc/s. Visual range. Works off complete set of internal batteries, or with a vibrator pack from a 12-volt supply. Offered less batteries and vibrator at **£9-17-6**, or **£18-17-6** per pair. Vibrators, **27 6** each. Carr. 6 6.



6-VALVE V.H.F. SUPERHET RECEIVER CHASSIS

Six channel switching, tuning 30.5 to 40 mc/s. Receives many British and Continental amateurs, etc. Components include 30 ceramic trimmers, 30 small condensers, 30 resistances (½ to 1 watt), six valve holders, cans and covers. All complete for **7 6**. Also offered with valves at **17 6**. Carriage 2 6. Drawings of circuit lay-out, and suggested mains conversions available at 1/-.

VALVES.—Clearance of surplus and salvage stocks, from **1/9**. Also bargain offers of shop soiled stocks of normal retailer's lines. Send for list.

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CONDENSERS.—Store soiled, unused. Two gang, .0005 mfd. tuning condensers. Standard size. Price **2 9**. Post 6d. Special offer of 3 for **7 -**.

O.P. TRANSFORMERS.—Store soiled, unused. Match all normal O.P. valves to 2-5 ohms speech coil. CLEARANCE OFFER, **1 9**. Post 6d.

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STAMP FOR 1953 LIST

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STANDARD VIEWMASTER. Constructor's Envelope, **7 6**; complete kit with wire, sleeving, nuts and bolts, less valves, tube and cabinet. **GENUINE** parts only, **£31**. **OR** in 7 easy stages: 1, **62/3**; 2, **42/9**; (Wenvoe, **39/-**); 3, **£5 1 3**; 4, **9 10**; 5, **£10 4 -**; 6, **£7/5 9**; 7, **67/8**; Individual Parts (any item separately), WB100 (sound and vision chassis), **18 6**; WB101, **6 -**; WB102, **18/6**; WB103, **42/-**; WB103A, **52 6**; WB104, **15 6**; WB105, **43 6**; WB106, **25 6**; WB107, **32 6**; WB108, **33 3**; WB109 1, 2 or 3 (state tube type), **22 6**; WB110 **10/-**; WB112, **21 6**; WB Console conversion kit, **35 -**; WB300 pre-amp chassis, **17/6**; Westinghouse Rectifiers, 14A86, **20/4**; 14D36, **11/7**; WX3 and WX6 **3 9** each; 36EHT100, **29 5**; 36EHT50, **26 1**; 36EHT45, **23 8**; K3 100, **14 8**; K3 50, **8 9**; K3 45, **8/2**. T.C.C. Condensers, **£7 10 -** (any condenser supplied separately). Morganite pots, **5/-** each; Morganite resistors, **35 3**. Colvern pots, **22/6**; or CLR901, **3/3** each and CLR4089 22, **6 4**. Belling Lee L707, **8/9**. Fuses, **6d.** each. Wearite Coilsets (with L9), L'don, **22 -**; Wenvoe, **28/-**; B'ham., H'Moss and K.-O.-S., **30/-**. Pre-amp coils, **4/-** pair any channel. Special components will be available for the WIDE ANGLE Viewmaster shortly.

TELEKING. Constructor's Envelope, **6/-**; Coilsets, **44 6**; Chassis kit, **50 -**; T.C.C. kit, **£7 4 3**; RM4 rectifier, **21 -**; Allen Components, LO308, **40 -**; FO305, **21 -**; DC300, **39 6**; FC302, **31/-**; GL16 and GL18, **7 6** each; BT314, **15 -**; SC312, **21 -**; AT310, **30/-**; OP117, **9 -**; Dubilier Resistor pot. kit, **81 6**.

MAGNAVIEW. Denco coilsets, **41 3**; Erie resistor kit, **39 2**; Denco W A components, WA DCA1, **43 -**; WA FCA1, **31/-**; WA LC1 and WC 1, **7 6** each; WA FMA1, **21 -**; WA LOT1, **42/-**; WA FBT, **16/-**; Valveholders, pots, and T.C.C. condensers as per our TV list.

P.T. SUPERVISOR. T.C.C. Condenser kit, **£8/6 4**; Erie resistor kit, **54/6**; 4 Colvern pots., **26 -**; 7 Erie carbon pots, **35/-**; Allen coilsets, **44 6**; Denco chassis sets, complete, **51 6**; ALLEN and DENCO items as listed under TK and Magnaview above.

SOUNDMASTER. Everything in stock in reasonable quantities. Complete priced parts lists are available for the above designs, and are issued with our GENERAL CATALOGUE (**6d.** in stamps please). Please add postage to orders under **£2**.

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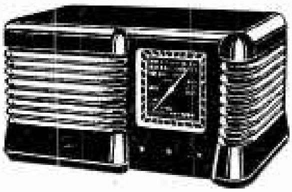
77, LOWER BRISTOL ROAD, BATH. Tel: 3811



CABINET as illustrated, 11½ × 6½ × 5½ in. in walnut or cream, complete with T.R.F. chassis, 2 waveband scale, station names, new waveband, back-plate, drum, pointer, spring drive spindle, 3 knobs and back, **22 6**. P. & P. 3 6.

AS ABOVE but complete with 5in. speaker and O.P. trans. (these speakers have been used but tested O.K.), **30 -**. P. & P. 3 6.

Metal rectifier **7 6**. Gang with trimmers, **7 6**. Medium and long T.R.F. coils **5 6**. 3 obsolete ex-Govt. valves, 3 v holders and circuit of an A.C. mains 3-valve plus rec. T.R.F. which can be built for approx. £4, **8 6**. Heater trans. **6 -**. Volume control with switch **3/6**. Wave-change switch **2/-**. 32 + 32 mfd. **4 -**. Bias condenser **1 -**. Resistor kit **2 -**. Condenser kit **4 -**.

Cabinet as illustrated above complete but with 5 valve Superhet chassis, **23 6**. P. & P. 3 6.

As above but complete with new speaker and O.P. trans. to fit, **36/-**. P. & P. 3 6. Medium and long-wave superhet coils with circuit, **6/6**. Iron cored 465 Kc. IF's, **7 6** pair. Miniature gang, **5 6**. Volume control with switch, **4/-**. Wave-change switch, **2 6**. Heater trans. Pri. 230 250 4 v. 3 amp., **7 6**. 5 valveholders, **2 -**. 5 Obsolete Ex-Gov. valves with circuit, **14 6**. 25 mfd. 25 wkg. condenser, **11d.** 8 + 16 mfd. smoothing condenser, **3/6**. Condenser kit (17), **7 6**. Resistor kit (14), **3 6**.

Standard Wave-change Switches. 6-pole 2-way, **2 -**; 4-pole 3-way, **1 9**; 5-pole 3-way, **1 9**. Miniature 3-pole 4-way, 4-pole 3-way, **2 6**.

Used C.R.T. Tubes. Heater cathode short 9in., **45 -**. 12in., **75 -**. Ion burn 9in., **35/-**. 12in., **55 -**. P. & P. on each 7 6.

Valveholders. Paxolin octal, **4d.** Moulded octal, **7d.** EF50 ceramic, **7d.** Moulded B7G slightly soiled, **6d.** Loctal amphenol, **7d.** Loctal pax., **4d.** Mazda Amph., **7d.** Mazda pax., **4d.** B8A, B9A amphenol, **7d.** B7G with screening can, **1 6**.

Trimmers, 5-40 pf., **5d.**; 10-110, 10-250, 10 450 pf., **10d.**

Twin-gang .0005 Tuning Condensers, **5/-**. With trimmers, **7 6**.

Midget .00037 dust cover and trimmers, **8 6**.

P.M. SPEAKERS	with trans.	less trans.
2½in.		15 6
3½in.		13 6
5in.	16/6	12 6
6½in.	16 6	12/6
8in.	18 6	15 -
10in.		19/6

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

Crystal pick-up with Sapphire Trailer Needle, **21 -** each; with volume control, **23 -**; post and packing on each, 1 -.

Constructor's Parcel, comprising chassis 8in. × 4in. × 1½in., with speaker and valveholder cut-outs, 5in. P.M. speaker with transformer, twin gang with trimmers, pair T.R.F. coils long and medium, iron cored, four valveholders, 20 K. volume control and wave-change switch, **23/-**, post and packing, 1 6.

Output Transformers. Standard type, 5,000 ohms imp., 2-ohms speech coil, **4 9**; Miniature type 42-1, **3 3**. Multiratio 3,500, 7,000 and 14,000 2 ohms speech coil, price **5 6**. 10-watt push-pull 6v6 matching 2 ohms speech coil, **7 -**.

Mains Transformers, primary 200-250 v. 280-0-280, 250 mA., 6 v. 6 amp., 5 v. 3 amp., drop-through, **29 6**. P. & P., 3 -.

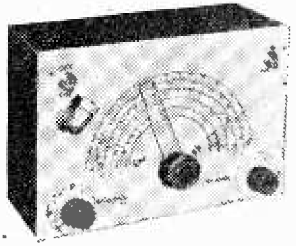
Mains Trans. Pri., 200-250 v. Sec., 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 and 30 volt at 2 amps., **13 -**. P. & P., 1 6.

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

Germanium crystal diode, **2 3** post paid.

Heater Transformer, Pri. 230-250 v. 6 v. 1½ amp., **6 -**; 2 v. 2½ amp., **5 -**. P. & P. each **1/-**. 2, 4, or 6 volt 2 amp., **7 6**.

Completely built Signal Generator. Coverage 100 Kc/s.-320 Kc/s., 300 Kc/s.-900 Kc/s., 900 Kc/s.-2.75 Mc/s., 2.75 Mc/s.-8.5 Mc/s., 8.5 Mc/s.-25 Mc/s., 17 Mc/s.-50 Mc/s., 25.5 Mc/s.-75 Mc/s. Metal case 10 × 6½ × 4½in. Size of scale 6½ × 3½in., 2 valves and rectifier. A.C. mains 230 250 v. Internal modulation 400 c.p.s. to a depth of 30 per cent., modulated or unmodulated. R.F. output continuously variable 100 milli volts. P. & P. 4 -. **£4 5/-**.



Terms of business:—Cash with order. Dispatch of goods within three days from receipt of order. Where post and packing charge is not stated, please add 6d. up to 10/-, 1/- up to £1 and 1/6 up to £2. All enquiries and Lists, stamped, addressed envelope.

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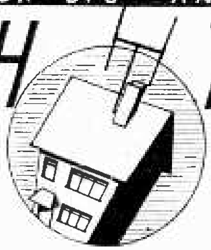
TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

MULTUM in parvo! The Albert Hall on a 10in. x 8in. screen! After a week or so of looking at large-screen TV, projection-type home sets, sets with 17in. tubes and the like, together with a demonstration peep at the wide-screen Cinemascope, I settled down to see and hear on my home TV the final concert of the Promenade season. By comparison, it seemed to me like looking at an indoor jamboree through the wrong end of a telescope! Only a year or so ago, the size of the screen of my set seemed quite adequate—but now, dwarfed by getting used to so many of the big-picture sets, it takes on the aspect of a postage stamp. But the long shots of that final concert from the Albert Hall, looking for all the world like a huge nest full of enthusiastic ant-like specks, did the trick. I shan't be satisfied until I possess a set with a much larger screen.

"THE PROMS"

AS a matter of fact, the last night of the Proms is traditionally a bit of a jamboree. Years ago, at the Queen's Hall, the audience, packed with enthusiasts, used to restrain much of its hysteria until the last item, Sir Henry Wood's "Fantasia on British Sea Songs." Starting with discreet foot tappings in time with the music, the audience gradually warmed up to active participation in the final few bars of the piece. How Sir Henry would have enjoyed the excitement and enthusiasm of the Albert Hall Proms of 1953. "Rule, Britannia!" in which Sir Malcolm Sargent conducted vocalist, orchestra, organ and audience even aroused viewers to active participation. The climax was terrific. It ended with the waving of flags, throwing of streamers, cheers and thunderous applause.

MENTAL SOMERSAULTS

NEVERTHELESS, successful though the transmission was, it contained a number of irritating little faults. The sound mixing was not entirely satisfactory, the first few words of commentaries between the musical items being clipped off, faded in too late. The quality of the sound, though excellent, judged by sound radio standards, did not always match close-ups on the picture. Close-up sound should synchronise with close-up picture, especially when any special solo parts are being played. TV cameras should be sited to shoot in the same general direction. It is very disconcerting to look at the orchestra in long shot, as from the left-hand side, and then to be "cut" over to a close-up of the conductor, picked up from a camera on the right-hand side. One has to perform mental acrobatics in remembering the geography of the hall and the positions of the instrumentalists. Viewers can be certain, however, that they heard the orchestra far better than anyone in the hall. For them, the balance, clarity and presence of each instrument was as clear as if played in the acoustically perfect Royal Festival Hall.

THE REJECTED DOCUMENTARY

IT took me quite a long time to find any viewers who sat through all of *World Without End*, a documentary feature produced by UNESCO. This is the film, made partly out of taxpayers' money, which was reported to be not good enough for commercial showing at cinemas—and so was handed to BBC TV. Another plausible report was that, as it was shown on TV, it would be banned from the screen by the Cinema Exhibitors Association. Both reports sound equally authentic, because this well-intentioned, long, drawn-out message failed in its mission by not holding its audience, and it would certainly have no appeal for cinemagoers. As for the TV audience, it is this kind of thing which reconverts them into cinemagoers again. It is time for UNESCO to get up-to-date in knowing how to "hold" an audience. In the meantime, the Cinematograph Exhibitors Association should pass a vote of thanks to the BBC every time a long documentary film is presented on TV! It's an ill wind. . . !

COPYRIGHT

ANOTHER department at the BBC which performs daily or weekly miracles is that one which acquires the copyrights of the constant stream of plays, ancient and modern. The purchase of television performing rights is not quite as straightforward as it sounds. The performing rights of novels are even more difficult to negotiate than plays, those of works published twenty or thirty years ago being particularly complicated. An eminent author of a best-seller novel, such as H. G. Wells or Temple Thurston, might years ago have disposed of the play performing rights (for Britain) to one party and the silent film performing rights to another. Some years later a film producer might have arranged with both of these parties for the right to make a talking picture of the work, using also some of the original dialogue from the book. In the meantime, the author may have died and his interests have been divided between various beneficiaries. The TV copyright purchasing people have to follow up these threads and negotiate a deal with all interested parties before they can hand the novel or play over to the producer, "free of all encumbrances," to produce a play on TV. It was the excellent production of Barrie's *Twelve Pound Look* which brought these thoughts to my mind. This was a short play which was successful in many forms and at last it reached us, as effective as ever, as a short TV play. Further complications for the copyright people arise with musical performing rights, of which usually have to be negotiated separately. These are just one or two of the many links in the long chain of events which has to be connected up before you and I, the viewers, can sit back and enjoy (or dislike) a dramatic work on TV.

YOUR Problems SOLVED

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 287 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

FRAME TROUBLE

I have a Pye LV30, sound is quite good also picture quality, except for one thing, and that is when the set is first switched on I get a fluctuation of frame amplitude quite rapid with thin black lines wavering across the bottom of picture. The fluctuation seems to affect the bottom more than the top, although this also has about two thin lines running across. Adjustment of frame amplitude has no effect thus eliminating faulty potentiometer. Also, please, is it a common fault with these receivers that the PZ30s flash-over? I have had three in about two years. Do you think it is a fault with the valves or the set and, if it is the set, is there any modification that can be carried out?—W. Germin. (No address.)

The frame amplitude changes are most likely due to either a worn frame oscillator or output stage, and if you can try replacements for these two valves, the trouble will most probably disappear. You do not mention how long the effect lasts after switching on; a fairly short period can be due to a long heating time of the above valves, these being seriesed wired in this receiver. Check on the heater voltage supply to the valves; the available voltage may be low.

PZ30 troubles in this receiver seem fairly common; you might try wiring a 47 ohms 6 watt resistance in series with the anode of this valve. This will tend to prevent flash-over trouble and extend the life of the valve.

WEAK SYNCHRONISING PULSE

My View Master has been going well for the past year, but lately the frame flyback lines started showing, then the frame started slipping downwards with a dark band between. The line lock is also very critical, and often there is a dark margin about ¼in. at the right-hand side. I have checked all voltages, condensers, also line and frame valves. Am I right in thinking that the frame is going at half speed, as the return lines are pairing? Also, the height control is at its minimum and I still cannot fill the top of the screen. Trusting you can help me.—Lawrence John Fox (Newcastle-upon-Tyne).

The effects you describe are due to weak synchronising and we suggest that you replace R21 and C18 and if the effect still persists then realign your receiver.

To increase frame height, we suggest you try reducing the value of R56.

TUBE FAULT

I have an H.M.V. Model 1804 receiver which is in good working order except for one recently developed tube fault. Immediately after switching on, after warm up, the C.R.T. face lights up full brilliance and returns to normal after about two minutes, and the picture remains perfect the whole time the receiver is on. I have checked voltages at C.R.T. grid and cathode and these are in accordance with maker's service chart, and there does not appear to be any heater cathode leakage, the meter reading from tube cathode to earth being of the order of 50 kΩ, which is in accordance with circuit diagram. Is the fault due to the tube or could it be associated with the video stage? I would add that the tube has become somewhat soft and that I have had to increase the video bias to enable the brilliance control to blank out the tube face.—F. W. Hattemore (Eastbourne).

It is very unlikely that a fault in the video output stage is responsible for this symptom, and we feel that failing inter-electrode insulation within the picture-tube is the provoking factor. It may be advisable, however, to check the insulation of C22 (100 picofarad) located in the can of the final vision I.F. transformer. This capacitor has been known to leak and allow the application of a highly positive potential to the control grid of the video output valve, with a consequent lowering of picture-tube cathode potential. C29 and C30 should also be checked for insulation. An initial collapse of the potential at the picture-tube cathode is almost certainly responsible for the effect, and in this connection the picture-tube is the most probable cause.

FRAME OSCILLATOR FAULT

I have an Ekco TC138 which has developed a fault recently, which is becoming more pronounced and which I hope you can diagnose for me. The fault takes the form of a rapid oscillation of the picture of about ⅛in. in an upward direction only; this gives an impression of a double image. At the beginning of a programme I can eliminate this by adjusting the frame hold control, but after a time the fault again develops and the frame hold control has to be adjusted again. This goes on throughout the programme and each time the adjustment becomes more critical due to the fact that the critical position creeps nearer the point where complete picture slip occurs. I have tried changing valves of the same type round on video, frame and line sections, but without success, but two valves, the frequency changer and Thyratron I cannot check this way. The picture signal is quite strong, needing only quarter turn on contrast control. I have looked in all the back numbers of my PRACTICAL TELEVISION, which I have taken from its first publication, but cannot find anything mentioning a fault like this. Hoping you can help me to rectify this fault.—H. E. Smith (Sheffield, 5).

This symptom is generally caused by a defective 6K25 frame generator valve, and we feel certain that valve replacement will solve your problem.

DERANGED VERTICALS

I have built the View Master using a 12in. tube and I have made all the recommended modifications, from PRACTICAL TELEVISION, of June, 1951, to obtain increased E.H.T. and line and frame amplitude.

The fault I would like help on is as follows: With the contrast control set to give correct variation on shades I am getting, on the test card, the verticles stepped or pulled sideways, similarly on the circles the two vertical curves are pulled. The effect on a moving picture is that sections of the picture become what I might call liquid and ripple in a sideways direction.

(*Continued on page* 287)

"**VIEWMASTER**" Valves, exact to specification, guaranteed new and boxed, comprising 5 EF50, 1 6P25, 1 KT61, 1 EBC33, 1 EB91, 2 6K25, 1 6P28, set of 12 **£6/2/6**, with EF91 **7/-** extra (post and insurance 2/-). "Tele-king" 16in. Receiver, complete set of 17 valves exact to specification, **£9/9/-**; 6AM6, EF91, 6F12, Z77, 8D3, 6C4, L77, W77, EF92, 6AM5, EL91, 12AX7, **7/9**; EB91, 6AL5, HVR2A, **6/9**; 1.4v miniatures, 1S5, 1R5, 1T4, 3V4, 1L4, 3Q4, 3A4, **7/6**; 3S4, **8/6**; 6V6G, 6V6GT, 6F6G, KT63, Y63, 1C5GT, DL35, EF39, EBC33, EF50, 20D1, 7B7, 7C5, 7H7, 7S7, **7/6**; 5Z4G, 5U4G, 5Y3G, MU14, 7Y4, 7C6, U22, U78, DH77, 6AT6, 12AT7, ECC81, 6X4, 6BA6, 6BE6, 6BW6, 6J6, EC91, Pen46, PY82, 6LD20, 6X5GT, **8/6**; EL38, PL38, **22/6**; PZ30, GZ32, 6U4GT, **17/6**; 6P25, N78, **15/-**; UU8, U25, **13/6**; U16, EAC91, ECC91, 6A7, UBF80, PL83, 6F1, 6F14, **12/-**; PL81, PL82, PY81, ECH42, UCH42, UL41, X65, 10F9, 10LD11, 10C1, 10C2, **11/-**; ECL80, EF80, EY51, PY80, 6F15, 6C9, 10F1, 10P13, AX31, CY31, 43, KT33C, 6K8GT, 12K8GT, EAF42, R10, **10/6**; 25Z5, 25Z6GT, EBC41, UBC41, UF41, **10/-**; 6SN7GT, 6Q7GT, 12Q7GT, 12K7GT, 25Z4G, 25A6G, EF41, **9/6**; 6K8G, U50, 5Y3GT, 25L6GT, 35L6GT, 50L6GT, 35Z4GT, 80, UU9, U404, UY41, EZ40, **9/-**; 6K7G, EF8, **6/-**. All new and boxed. Postage 4d. per valve extra. READERS RADIO, 24, Colberg Place, Stamford Hill, London, N.16. (STA. 4587.)

TRANSFORMERS, 230v input, 345-0-345v 200ma, 6.3v 5a, 5v 2a output, **30/-**; 110/245 in, 350-0-350v 120ma, 6.3 v 4a, 5v 2a out, **16/6**; 500-0-500v 120ma, and 4v CT 3 times, **30/-**; potted 230v in, 220v 30ma, 6.3v 1a out, **8/6**; VR91 pre-amp with built-in 230v power pack (5Z4G rec.), **50/-** (carr. 5/-); RF Units, type 24 **18/-**, 25 **25/-**, 27 **42/-**; Valves at **3/6**, KT44, MH4, CV54, VU120, VU111, VR65, VR66, 6H6, VR56, VR21, 9D2, 8D2, 4D1, 9004, 9006, 954, 9567193, VR135, U17, 9001, RK34, EA50. Terms: Cash with order, immediate delivery. S.A.E. for list/enquiries. W. A. BENSON, 308, Rathbone Rd., Liverpool, 13. See our display at Superadio (Wcpl) Ltd., 116, Whitechapel, Liverpool, 1.

PREMIER Magnetic T.V. A.P. Model, complete **12in.** tube, walnut table cabinet, spare vision kit., including **10** spare new valves. Pye H aerial. Box No. 157, c/o PRACTICAL TELEVISION.

TELEVISION. "Lynx" Coilset, wound, complete, **63/-**; Formers, Sep., **2/3 ea.** Frequency modulation, a new **FM** Receiver for fantastic clear reproduction from Wrotham on 91.3 mcs. BEL SOUND PRODUCTS, Marlborough Yard, Archway, N.19. (ARC. 5078.)

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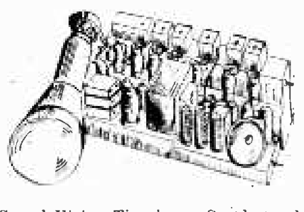

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If I increase the contrast control until I get an objectionable soot-and-whitewash picture this fault is no longer apparent, and on the test card it pulls the circle nearly round except for a slight flattening on the left and a slight lobing on the right-hand sides.—L. A. Bence (N.W.9).

The effect you describe may occur if R21 or C18 are faulty and require replacing, though a similar effect can also occur if the alignment of the receiver is at fault, giving insufficient response at the L.F. end; we suggest, therefore, that you realign your receiver.

FAULTY ELECTROLYTIC

Will you please help me to trace a fault which has appeared in my Premier Magnetic TV? An H.T. to chassis short has developed in the line timebase. It first showed on the tag strip marked H on the timebase chassis. I removed the H.T. connection from the strip and connected it up clear, the short has now shown itself from R.35 to chassis on the C.R.T. chassis. I built the set myself and with the aid of PRACTICAL TELEVISION have serviced it and kept it going fine for over three years, but I am afraid of this doing more damage.—C. Pierce (Caergwrle).

This H.T. short circuit is probably due to a breakdown in an associated electrolytic capacitor, but to find the one responsible it may be necessary to disconnect the various feed circuits in turn, and with the aid of a continuity tester endeavour to isolate the defective section, when further continuity tests should soon reveal the faulty component.

E.H.T. INCREASE

I have had the View Master in operation for a year now and have been receiving a good picture using a Mazda CRM121A tube. I would like to increase the E.H.T. to 9,000 v. for better daylight viewing, but am anxious to know if, by doing so, I would seriously lower the life of the tube.

In the event of the tube's life not being much affected, could you please advise me with regard to the best positions for the condensers and metal rectifiers, if this is the better way of increasing the E.H.T.?—Wm. White (Glasgow).

It is probable that the maximum E.H.T. for the CRM121A is only 8 Kv. and therefore the E.H.T. boost circuit should be used with a condenser of approx. 680 pF across the scanning coils. The additional components should be located around C45 with C45A mounted on an insulated clamp immediately above the line transformer, C45B, adjacent to C45, and the metal rectifiers mounted on the condensers themselves.

FAULTY SNYC SEPARATOR

I have a little trouble with my H.M.V. 1204 televisor, which has given me good service for six years till a few days ago, when I noticed that the circle on test card C and also the clock on the tuning signal was no longer a circle but just a gearwheel. When the programme starts the picture tears up in about two or three strips which run up and down the picture. Can you please advise me what to do?—R. Horne (Fulham).

This symptom is almost certainly the result of a defect in the sync separator stage. In your receiver a KTZ63 valve is employed for this function, and is located adjacent to the loudspeaker, on the left-hand side of the magnet, viewing into the chassis from the rear. The valve itself should first be tested for emission and characteristics. Should it appear to be up to standard, however, the associated components must be checked for value and efficiency, paying particular attention to the insulation of the capacitor connected from the grid (top cap) of the sync separator valve to the anode of the video output valve. Check also the 3.3 megohm grid resistor, for this sometimes goes high in value to provoke the symptom.

ARGUS AND MAGNETIC TUBE

Would you please let me know if it possible to convert the Argus TV to take a 9in. or 12in. C.R.T.? If so, let me have the necessary modifications.—James McDonald (Glasgow).

Without severe modification it is not possible to convert the "Argus" to cater for a magnetic type picture-tube (see the recent series of articles in PRACTICAL TELEVISION entitled "Conversion to Magnetic Tubes."

FRAME LINEARITY

I have built the Premier Electrostatic Kit and my picture is cramped at the bottom.—Alex McCampbell (Glasgow, S.4).

You should be able to enhance the vertical linearity of a picture by slightly enlarging the grid bias on the frame output valve. Should this not have the desired effect, however, a leaky charging or coupling capacitor in the timebase circuit may be responsible. Also ensure that the H.T. potential applied to the timebase circuit is well up to specification.

FAULTY RECLAIM DIODE

I have a a problem which concerns my 12in. Ultra television.

When I switch on, instead of the tube lighting up from the centre and gradually filling the screen, a thin white line running diagonally from top right to bottom left is all that is visible, neither contrast nor brightness has any effect on this line and it just remains there, sound being O.K. It has never failed to go wrong, when once the tube has lit-up. It seems that most of these failures occur when the set has been used for, say, 1 hour, then switched off, then put on again say in half-an-hour or more's time.—A. Pike (Leicester).

In this model receiver it sometimes happens that a diffused diagonal strip of screen illumination appears when the reclaim diode (half PZ30, located on the extreme right-hand side of chassis—viewing from rear of receiver) develops a defect—valve substitution should prove whether this is the cause in your case. An intermittent internal leakage between line and frame scanning coils may provoke a similar effect, although it is not very obvious how such a fault could prevent the frame timebase from operating giving the effect of an inclined horizontal line, which remains unaffected by brightness control setting. The fault in the reclaim circuit is the most likely.

QUERIES COUPON

This Coupon is available until November 15th, and must accompany all Queries.

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