MODIFYING THE RF 24 UNIT

PRACTICAL TELEVISION

AND TELEVISION TIMES

1/-

EDITOR
F. J. CAMM

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FEATURED IN THIS ISSUE

Wide Angle Tubes
No Raster!
Industrial Television
A Grid-dip Meter
Flywheel Sync Systems
Using "Faulty" Tubes

PRACTICAL TELEVISION
& "TELEVISION TIMES"

Editor : F. J. CAMM

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Televiews

THE WHITE PAPER ON BROADCASTING

THE White Paper on broadcasting, which was published on May 15th, states that the Government have come to the conclusion that in the expanding field of television, provision should be made to permit some element of competition when the calls on capital resources at present needed for purposes of greater national importance makes this feasible. As the policy governing the BBC Charter and Licence is always considered by Parliament on the occasion of the renewal, the Government thinks that Parliament should have a similar opportunity of considering, before the licensing of the first station, the terms and conditions under which competitive television would operate. It would be necessary to introduce safeguards against possible abuses and a controlling body would be required for this purpose, for regulating the conduct of the new stations, for exercising a general oversight of the programmes and for advising on appropriate matters. The new stations would not be permitted to engage in political or religious broadcasting, and licences for new stations would be granted and, if necessary, withdrawn by the Postmaster-General on the advice of this body, subject to reservation by the Government of all rights in time of emergency.

The licensing of other bodies or persons to broadcast television programmes would involve the use of higher frequencies and on technical aspects the Government would continue to seek advice from the Advisory Committee concerned with the development of television generally. The new licence will be modified to ensure that within the sphere of programmes and general administration the Corporation will be in the same position of independence in regard to television for the home as it is in respect of sound broadcasting.

It must be noted that the establishment of new television services will require new stations and their ancillary services such as studios, and the radio industry must be given, as soon as possible, the technical information necessary to enable it to design and produce adaptors for existing television sets and receivers, capable of picking up either the BBC programmes, or those on other frequencies.

For many years the BBC have been prevented by limitations on capital investments from developing television in certain areas, and from introducing very-high-frequency sound broadcasting, and the Government considers that the BBC have a continuing obligation to provide adequate national broadcasting services throughout the United Kingdom, and the fulfilment of this policy must clearly have first place when labour and materials become available.

The BBC Staff Association at its annual Council meeting discussed the White Paper and passed the following resolutions: "This Council welcomes the Government's White Paper on broadcasting as recognising the efforts of the staff to provide an efficient public service. It disapproves of the proposal to permit sponsored television, and believes that broadcasting is best carried on as a public service with no motive other than that of the responsibility which it bears towards the public. It deplores the Government's intention to tax this public service by 15 per cent. of subscribed licence revenue and believes this proposal will gravely handicap the BBC in maintaining its present programme standards and in its attempt to meet rising costs, including labour costs.

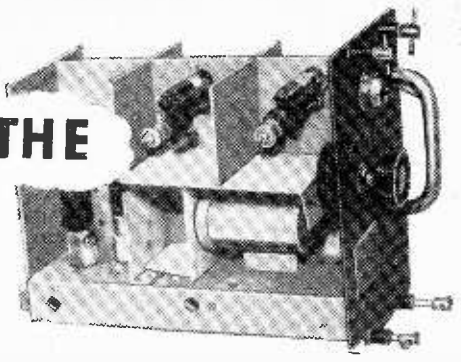
"It regrets that in the brief reference to external services no indication is given that the Government is prepared to provide grants in aid commensurate with their national importance and on a longer-term basis than before, and believes that these vital services are being handicapped thereby and skilled staff rendered unnecessarily insecure.

"While welcoming evolution to regions within the framework of the BBC, this Council believes that conditions of service should continue to be nationally agreed between the Corporation and the Association and that the maintenance of the highest standard both in broadcasting and in quality of its staff depends upon retention of a central staff administration. In particular, it views with anxiety proposals which appear to permit appointments of certain staff by national councils outside the ambit of agreed appointment and promotion regulations."

2,000,000 VIEWERS THIS YEAR?

AS we go to press we learn that the number of viewing licences issued exceeds 1,400,000. With the year almost half-way through, it is possible that by December 31st there will be 2,000,000 viewing licences, representing a viewing public of, perhaps, three times that number.—F. J. C.

Modifying THE RF24 UNIT



By B. L. Morley

USING THE UNIT TO BUILD TWO A.C./D.C. PRE-AMPLIFIERS, AND TWO SUPERHET CONVERTERS—THIS MONTH WE DESCRIBE ONE OF THE PRE-AMPLIFIERS

THIS adaptable unit is one of the few ex-Government items which is still in plentiful supply. It is a three-valve unit using VR65 valves, and was designed as a converter for frequencies extending from 20 to 30 Mc/s. It delivers the signal at an I.F. of 7 Mc/s, and was intended for use with the well-known I.F. strip, the R1355.

The unit can be bought for as little as 12s. 6d. and is well worth the money. The prototype was bought from the U.E.I. Corporation.

In the following paragraphs four methods of modifying the unit are described. The first is as an A.C./D.C. pre-amplifier with conversion data for all channels: the second is as a long-range pre-amplifier, also for A.C./D.C. use; the third is as a superhet converter for the experimenter, or for use with the R1355 unit; the fourth is as a long-range superhet converter.

1.—An A.C. D.C. Pre-amp with Self-contained Power Pack

Fig. 1 shows the circuit. The modifications are as follows:

1. Remove the channel selecting switch.
2. Remove all components in compartment 3a (Fig. 2).
3. Remove all components from compartment 2a, with the exception of the coil and one variable condenser (T2) to the left of the coil. Remove the green and white wire going to the paxolin panel in compartment 1b, and run a length of coaxial in its place from the panel to the

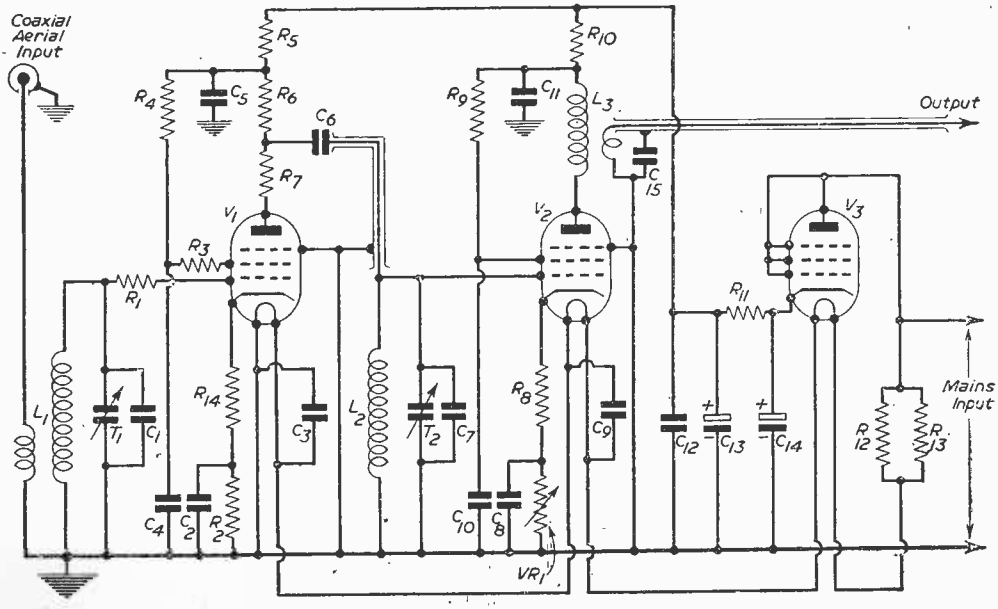


Fig. 1.—Circuit of the first A.C./D.C. Pre-amplifier.

grid end of the coil in 2a. The outer sheath of the cable should be earthed.

4. Remove all the components from compartment 1a, except the coil and one variable condenser (T1) on the left-hand side of the coil.

5. Remove the metal screen "A" (Fig. 3a). Cut away the shaded portion as shown in Fig. 3b, and replace the screen.

6. Make another screen from aluminium 5½in. by 2½in. with ¼in. flanges and erect in the position shown in Fig. 3c. This becomes screen "B." Note: VR1 is best mounted as shown in the figure, rather than as in the photo, for ease of replacement.

7. Make screen "C" and provide it with a hole for mounting the condenser C13/14, and fit in position. The distance "d" will depend upon the height of the condenser but should not exceed 4in.

8. Underneath the chassis recover all the components in compartment 3b.

9. Compartment 2b (Fig. 4). The components crossed out are to be removed; then

(a) Shift wire on pin 1 (V2) to pin 8 (V2).

(b) Modify wiring to the screening grid (pin 4) by replacing the 10-ohm resistor by one of 2.2 KΩ, and shift the 300 pF condenser on the tag strip end of the 10-ohm resistor to pin 4.

(c) Leave the wiring on pins 5 and 6 as it is.

(d) Recover 50 pF condenser in the cathode lead; leave the 47-ohm resistor which becomes R8.

(e) Remove the 300 pF condenser and 1 KΩ resistor from pin 8 and disconnect the "earth." Shift the lead from the 300 pF condenser on pin 8 to earth.

(f) Recover the coil F with its 10 KΩ resistor and the 10 pF condenser.

(g) Strip the coil and rewind in accordance with the coil data. This coil becomes L3 (see Table II).

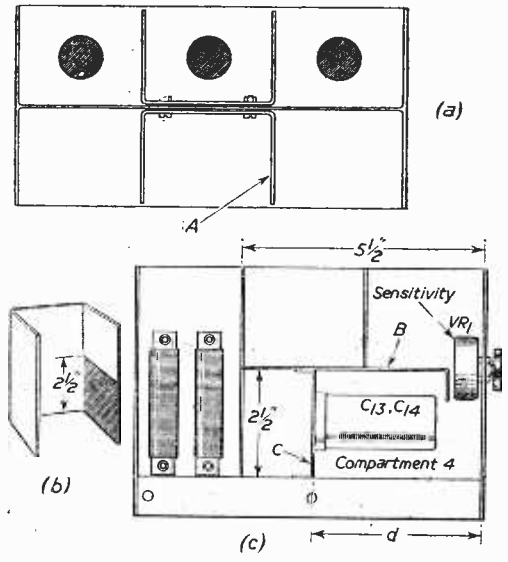
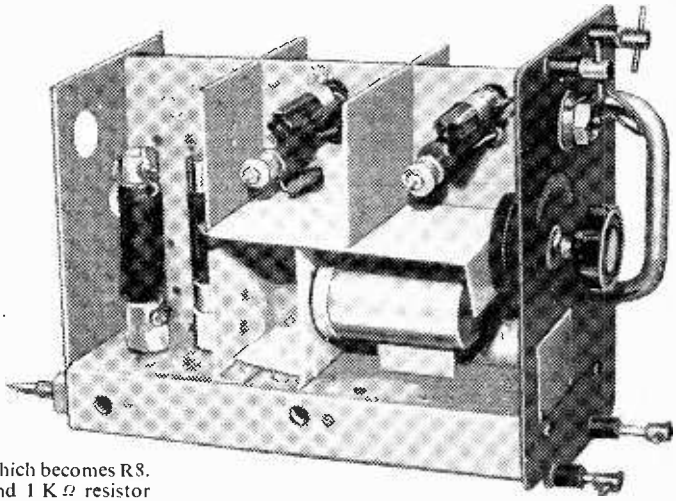


Fig. 3.—Details of the chassis modification and layout.

(h) Refit the coil; connect the bottom end of the secondary to the junction of the 2.2 KΩ resistor and the 100 KΩ resistor on the resistor panel. Connect the other side of the coil to pin 3 of the valveholder. (Anode of V2). Connect the bottom end of the primary to earth via the coil-retaining bolt. Connect the top end to the existing coaxial cable. Insert a 300 pF condenser between the coaxial sheath and earth to isolate it, and disconnect any earth connection from the Jones plug to the chassis.

(i) Fit VR1 in the position indicated in Fig. 3c and connect a length of coaxial cable from it back to the



The Unit which is the basis of the conversions described in this series of articles.

compartment 2b, drilling holes where required. Connect the central conductor to the 47-ohm resistor in the cathode lead of V2, and also connect a 300 pF condenser between this point and earth. The outer sheath of the cable should be earthed. At the VR1 end the centre conductor of the cable goes to the slider of the potentiometer, and the sheath is connected to the "outside" tag.

(j) Remove the 100 KΩ resistor on the resistor panel and short-circuit the tags.

(k) Wire a 300 pF condenser from the top of the 2.2 KΩ resistor to earth.

Fig. 5 shows the completed circuit.

10. Compartment 1b. Replace the 3.3 KΩ resistor in the anode of V1 with a 4.7 KΩ.

11. Compartment 1a. Wind the coil in accordance with the data given in Table I.

12. Compartment 2a. Wind the coil in accordance with the data given in Table I.

13. Compartment 3a. Fit the heater voltage-dropping resistors. Two 600-ohm 0.3-amp. resistors should be used (the usual voltage-dropping type rated at 50 watts), and the voltage tap on each should be adjusted to the voltage of the mains supply. The two resistors should be wired *in parallel*.

14. Compartment 4 (Fig. 3c). Mount the smoothing condenser (350 volts, or over, working voltage; electrolytic) and wire R11 across it.

15. Compartment 3b. Wire the valveholder as shown in Fig. 6 and wire associated components.

16. Check the wiring carefully.

17. Connect coaxial cable from the output of the pre-amp on the Jones plug to televisor aerial input sockets. As a precaution the outer sheath of the coaxial should not be directly earthed to the chassis of the pre-amplifier, but connected to the chassis via a 300 pF condenser. The actual method of connection will depend upon the conditions of use and the type of input socket. If the televisor is wired for balanced feeder input, then a length of balanced twin feeder should be used to connect

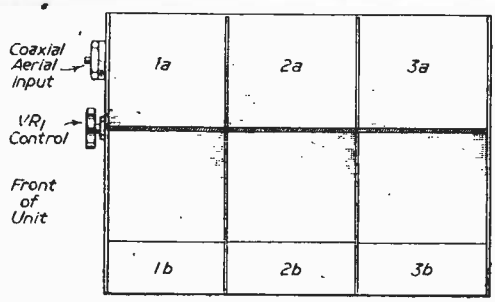


Fig. 2.—Controls and compartments.

the pre-amp to the televisor. The balanced feeder cable should be continued through to the smaller winding of the output coil L3, and no connection should be made to chassis, either directly or via a condenser, at either end. Alternatively, a balance/unbalance transformer can be used as described in the February issue of PRACTICAL TELEVISION, page 392 ("Aerial Matching," by W. J. Delaney).

18. Connect the mains plug and switch on. (The mains feeder can be taken via the televisor on/off switch if desired, so that the pre-amp and televisor switch on together. Alternatively an on/off switch can be incorporated in the pre-amp.)

19. Adjust T1, T2 and L3 for maximum noise, with the sensitivity control at maximum.

TABLE I

Coil modifications and Condenser Values

Station	Coil Turns	Condenser
L1.		
Wenvoe	2½	15 pF.
Sutton C.	2½	30 pF.
Kirk o' Shotts	3	20 pF.
Holme Moss	3½	10+5 pF. (in parallel)
Alexandra P.	4	25+5 pF „ „
L2		
Wenvoe	2½	5 pF.
Sutton C.	2½	15 pF.
Kirk o' Shotts	2½	25 pF.
Holme Moss	2	15 pF.
Alexandra P.	3	30 pF.

TABLE II

Coil Winding Data for L3.

Station	Primary	Secondary	
Wenvoe	4½	1½	⅜ in. coil former, 22 s.w.g. wire.
Sutton C.	5	1½	
Kirk o' Shotts	5½	1¾	
Holme Moss	6	2	
Alexandra P.	7	2	

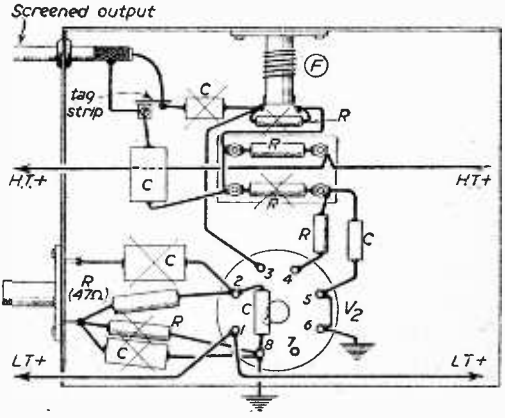
20. Connect the aerial and tune in the desired signal by readjusting the trimmers and the core of L3. If difficulty is experienced in tuning both sound and vision channels, then either increase the value of C1 and C2 if maximum positions of T1 and T2 are used; decrease the value of C1 and C2 if minimum positions of T1 and T2 are used. As this is an A.C./D.C. model no signal will be received on D.C. if the mains plug is in the wrong way round.

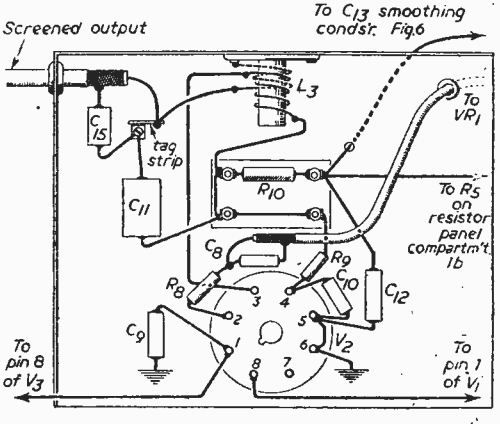
Final tuning will depend upon whether the greatest gain is required on the sound channel or the vision channel. If it is required on both equally, then the mid-point position between them should be adopted.

If desired, an increase in quality (but with decrease in gain) can be obtained by fitting a 4.7 K Ω resistor across each coil.

VR1 should be adjusted according to the gain required and left in that position.

Remember that this is an A.C./D.C. model and, therefore, it is possible for the chassis to become "live" under certain conditions. The coaxial feeder from the aerial must therefore have its outer conductor well insulated from earth. Alternatively, the coaxial input socket can be isolated from earth by mounting it on a strip of paxolin. In this case the primary coil should not be connected in any way to the secondary, but its two ends should be wired across the aerial input socket.





Figs. 4 and 5.—Above and below chassis wiring details.

If desired, the pre-amp can be operated purely as an A.C. model. In this case the dropping resistors, R12 and 13, should be replaced by a small transformer, and the valve heaters should be wired in parallel. V1 can then be replaced by a selenium rectifier if desired.

Figure 7 shows the alteration to the circuit.

(*To be continued.*)

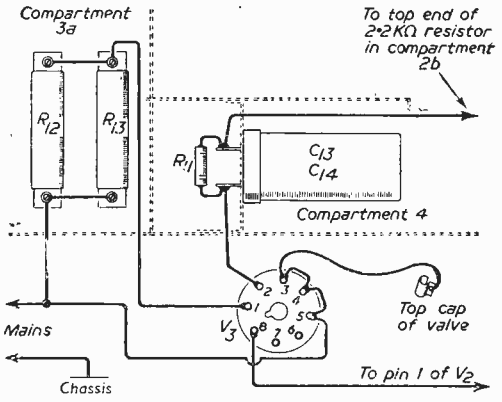


Fig. 6.—Wiring of the mains side.

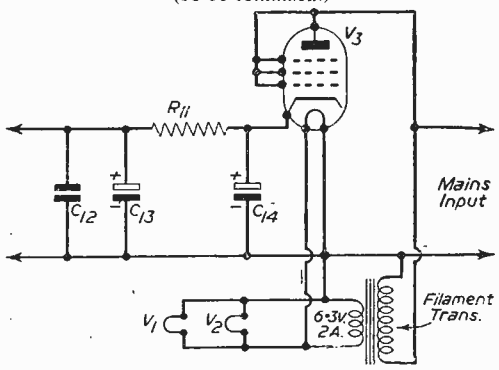


Fig. 7.—Modification when using the unit for A.C. operation only.

Experimental Colour Equipment

EXPERIMENTAL equipment has been constructed in order to study the problems of colour reproduction as affected by the properties of the pick-up tube and the cathode-ray reproducing tube.

To this end a simple field sequential system has been chosen using 150 frames with double interlacing to give a colour picture frequency of 25 per second. The number of scanning lines is 405, the line frequency is 30,375 c.p.s. and the system bandwidth is 9 Mc/s.

This system is not suggested for broadcasting purposes. The standards used have been chosen for convenience in experimental working and to provide a ready comparison with the existing monochrome standard.

It can, however, be employed in any closed circuit application where questions of bandwidth economy and compatibility with existing systems do not arise, or are unimportant.

The pick-up tube used is the C.P.S. Emitron which was selected because of three outstanding advantages for the reproduction of colour. In the first place, the tube has an absolute black level, which is constant for all three colours and which can be pre-set with considerable accuracy, thus avoiding any possible ambiguity of operation or colour change due to variable black level. The use of a line-by-line clamp circuit for re-inserting the black level permits the use of A.C. lighting.

Secondly, the signal output is linear with light input in all tubes and for all colours, so that it is possible to apply a contrast gradient control (Y-correction) with certainty, in order to produce an overall Y of unity through the whole system over the working range. This Y control is even more necessary with colour than with monochrome, since a departure from an overall Y of unity in the system means that any colour composed of a mixture of primaries (and this means nearly all colours) will change its hue with change of brightness. This can be most disconcerting.

Finally, the tube is free of spurious signals which means that any colour will be reproduced without being affected by the brightness and colour distribution of neighbouring objects.

In addition to the obvious benefit of improved picture quality, the factors referred to above result in considerable simplification of colour television equipment. Black level and Y controls are common to all channels and can be pre-set for indefinite periods. Three amplitude controls are provided—one for each colour channel—which are subordinate to the main gain control common to all channels and only need adjustment when the quality of the illumination changes; for example, when changing from artificial illumination to daylight or from one type of artificial illumination to another. The incident illumination required for a good picture is about 500 ft. candles at f/5.6, when employing a standard C.P.S. Emitron.

It had been anticipated that using the frame sequential system some trouble might be experienced from colour contamination caused by incomplete discharge of the mosaic in a full storage tube of the C.P.S. Emitron type. In fact, this has not proved to be a serious difficulty, and it has been possible to convert the colour contamination into a slight colour dilution to which the eye is much less sensitive—i.e., the colours are reproduced with the same hue but are slightly less saturated than the original.

NO RASTER!

A COMMON FAULT AND METHODS OF TRACING THE CAUSE

By "Engineer"

BY far the most alarming symptom for both set owner and constructor is when a television receiver, which has been functioning normally, suddenly cuts off with a loss of vision only. The situation appears worse if, by advancing the brilliance control, a raster cannot be resolved on the blank screen; for this can easily mean the life of the picture tube has come to an end. Fortunately, however, conditions are not usually as bad as they may first appear. Other factors inherent to the supply networks of the picture tube may be responsible. The writer has discovered from experience that an approximate 10 to 1 chance may be held in favour of the picture tube when such a fault exists.

Voltage Supplies

Under the above-mentioned condition, the set owner will wish to ascertain as quickly as possible whether fault correction will necessitate picture tube replacement, which is quite understandable in these days of double tax. However, we must consider first the application of the various voltages employed in connection with the picture tube.

The most obvious of these is the heater supply, and unless the characteristic glow is visible the tube heater and associated circuitry should be checked for an open circuit.

Next is the final anode potential or E.H.T. Measurement of this is quite easy for the constructor who possesses an electrostatic or electronic voltmeter, but the more unfortunate enthusiast must revert to some other, perhaps less scientific, method. Before proceeding further, here is a word of caution. Final anode voltages can be extremely dangerous, in fact lethal. When performing tests on this circuit, make them slowly and think carefully before acting—there may not be time afterwards!

The most lethal type of circuit is that deriving E.H.T. from the mains supply via a step-up transformer. This circuit uses a rather large value reservoir capacitor which may hold its charge for a while after switching off. Systems employing the flyback or R.F. method of deriving the E.H.T. potential are less dangerous, owing mainly to the lower value reservoir capacitor needed for a similar degree of smoothing. Nevertheless, when making E.H.T. tests of any description it is well worth while to acquire the habit of putting one hand in the trouser pocket.

As we are only interested in establishing whether E.H.T. is present or not, we are able to use a simple dodge. This is to hold a screwdriver, by an adequately insulated handle, close to the final anode connector of the picture tube. The presence of E.H.T. will be revealed in the form of bright blue sparks between the two. If such sparks do not occur, then it is reasonably safe to assume that the fault lies in the E.H.T. circuit and that the tube is free from defect.

Normal circuit testing should soon indicate the faulty component, although analysis may be expedited by ensuring that the high alternating voltage is reaching the anode of the E.H.T. rectifier, where the foregoing dodge can be used with equal suitability. Similar testing at the anode of the line output valve will ascertain by the presence of high-voltage back E.M.F., whether the line-scanning generator is functioning. It is surprising how quickly this simple trick will assist in locating the faulty section of the E.H.T. circuit.

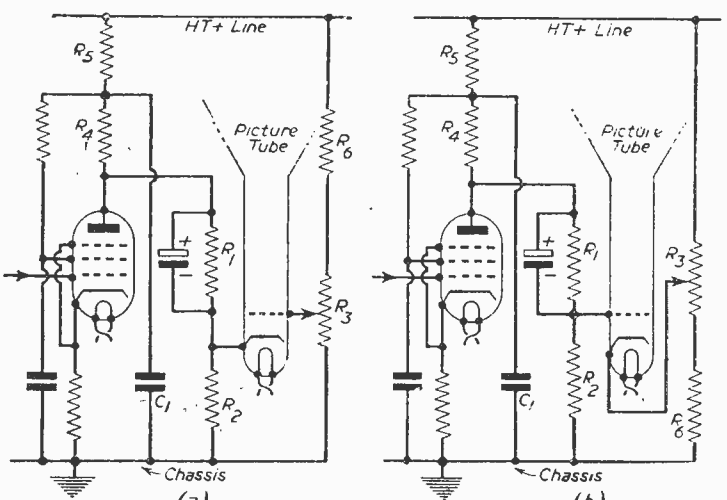


Fig. 1.—Methods of modulating the picture tube: (a) cathode modulation and (b) grid modulation.

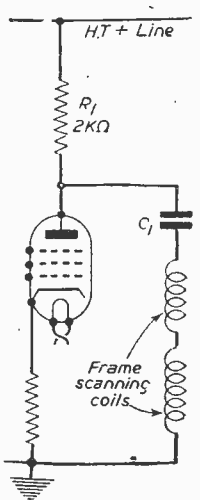


Fig. 2.—A R.C. coupled frame output stage. Note the importance of high insulation across C1.

Tube Bias

It is well known that a C.R.T. functions very much like a thermionic valve ; the electron flow being controllable at the grid by the application of a variable negative voltage. If this bias voltage is increased so as to exceed the anode cut-off of the tube, a blank screen will result, precisely the effect created by retarding the brilliance control. At present, however, we are assuming the screen to be blank even though the brilliance control is advanced to its most clockwise position.

If the E.H.T. circuit checks normal, our blank screen may well be due to a fault in the tube biasing circuit. At this stage it will be instructive to consider a pair of typical biasing circuits used for cathode and grid modulation, shown at Fig. 1(a) and (b) respectively, the former being more common in modern receivers. Referring to the circuit at (a), from which it will be observed that the cathode of the picture tube is positive with respect to chassis, by an amount depending on the values comprising the potential-divider R1, R2. The grid is also positive to chassis, but is adjustable by the potentiometer R3. Now suppose the cathode voltage to be, for example, 100 volts positive. Then, for a raster of peak white brightness to appear on the screen, provided everything else is normal, the brilliance control (R3), when advanced fully clockwise, should bring the control grid voltage within at least 10 volts negative of the cathode voltage or about 90 volts positive. This simply means that the grid is 10 volts negative with respect to cathode under conditions of full brilliance. Retarding the brilliance control will, of course, make the control grid less positive, or more negative with respect to cathode, and thus reduce the electron flow with a consequential reduction in brilliance (see " More About the Cathode Ray Tube," P.T., July, 1951.)

A word of warning is advisable about voltage readings obtained when making checks in this circuit. It is a well-known fact that voltage readings may be affected seriously by the load imposed by the test meter, and unless this is taken into consideration, the figures obtained may be extremely fictitious. This is especially so in this case where two separate high-impedance voltages are measured and then compared to compute the bias voltage. The need is thereby illustrated of employing a voltmeter of high sensitivity, preferably one coming under the classification of a " valve-voltmeter."

Where such an instrument is not available, the quantity of error can be minimised by measuring the bias voltage direct from grid to cathode. An alteration of negative grid voltage should ensue by actuating the brilliance control, and if it is possible to take this down to about the 10- to 20-volt region, then the fault lies elsewhere than in the biasing circuit.

Another dodge frequently employed by the writer to ascertain as rapidly as possible whether a blank screen is caused by excessive bias, is to short-circuit the grid and cathode pins momentarily. This has the effect of completely cutting-off the tube bias, when—if the bias circuit is at fault—the tube will glow with a peak white raster. *The short-circuit should be as rapid as possible, since there is the possibility of the tube being damaged through lack of bias.* If we find this dodge creates a raster, then the biasing circuits are at fault.

The too negative grid voltage may be caused by the cathode going too positive with respect to grid, or the grid going too negative with respect to cathode, the former condition usually being responsible. This is quite frequently occasioned by the video amplifier valve losing emission, or failing to conduct due to an open-circuit screen feed or cathode bias resistor.

Should this happen the tube cathode would be carried excessively positive, since less volts drop would occur across R4, R5, and therefore the anode of the video valve would rise to nearly the full potential of the H.T. line voltage. The potential would rise across R1, R2, and—in most cases—would not be counterbalanced by the brilliance control. A similar result would occur should R2 become open-circuited.

On the other hand, very little in the grid circuit proper can cause the fault, with the possible exception of R6 going open circuit, when the grid will go negative. There is the possibility that the slider of the brilliance control may short-circuit to chassis, especially the variety having an earthed metal shield. The writer can recall at least one instance where this did occur, so such a potentiality should not be dismissed.

In the case of the grid modulated system, Fig.1 (b), conditions are reversed. A non-conducting video stage would tend to carry the grid more positive, resulting in uncontrollable brilliance instead of a blank screen. R2 going open circuit would produce the same result.

An excessive negative grid voltage, however, may be caused by an open circuit between the picture-tube grid and the anode of the video valve, or even between the anode and the H.T. positive line, when, in either case, the tube grid will fall to chassis potential, while the picture-tube cathode potential would go excessively positive, and equal the H.T. line voltage, should R6 become open circuit.

Should the video decoupling capacitor, C1, develop a short-circuit the grid would go negative, but usually this would be accompanied by R5 overheating, and the fault would become immediately apparent. In any of the other cases, a voltage check should soon reveal the faulty section.

Biasing Circuit Normal

If our short-circuit test failed to produce a raster, we still need not despair. The first anode voltage, if the tube is a tetrode, should be checked. This should be in the region of 200 to 300 volts according to the type of tube, but again, allowance should be made for the load created by the test meter, for this anode is sometimes fed from a very high resistance circuit.

With first anode voltage present, our fault may lie in the scanning circuits. It is a frequent practice to couple the frame-scanning coils to the output valve by means of a resistance capacity network (see Fig. 2). Should C1 develop a short-circuit a very heavy current would be permitted to flow through the scanning coils, and since the coils used in this type of circuit are of high impedance, the resulting magnetic field would be of sufficient magnitude to deflect the electron beam right off the fluorescent screen. To determine whether such a fault is responsible for our blank screen, we can momentarily short-circuit the frame-scanning coils when a single horizontal line should appear across the screen.

Very rarely are the line-scanning coils coupled in this way. Invariably, a transformer is employed, the insulation of which has not been known, by the writer at least, to break down in such a way as to cause a heavy current to flow through the line-scanning coils.

Having arrived at this latter check with still no sign of screen illumination, we can assume with reasonable safety that the tube is at fault. The most likely cause will be lack of emission, although bad connections at the tube base may be responsible and should receive due attention before a new tube is purchased.

A heater-to-cathode short-circuit can be ruled out

since in either circuit the grid will go extremely positive with respect to cathode, resulting not in a blank screen but in uncontrollable brilliance.

Ion-traps

The paradoxical situation may arise where, after fitting a new tube, a raster cannot be obtained, although everything else appears normal. This is probably due to the replacement tube containing an ion-trap, or the ion-trap magnet being incorrectly positioned. In quite a few cases now, ion-trap tubes are being supplied as replacements for earlier types, and unless the special ion-trap magnet is used in conjunction with them a raster will not be obtainable.

The magnet is mounted on the neck of the tube so that the locating arrow points towards the screen, and immediately over the line marked on the neck of the tube. With the magnet so set, a raster should be seen, but further adjustment may be necessary. This is best carried out on a just-visible raster. Without altering the brilliance control, move the magnet along the neck of the tube without rotating, until the raster acquires maximum brilliance.

Finally, reduce the brilliance again and rotate the magnet very slightly for the position of maximum brilliance. The magnet should then be secured in position by the thumbscrew clamp, taking great care not to alter its position, for not only will an incorrectly adjusted magnet give rise to a poor picture, but also serious damage to the picture tube may occur.

An Aerial Pre-amplifier

A CRITICISM AND SOME IMPROVEMENTS

By Spencer West

The description of an aerial pre-amplifier by B. L. Morley (May issue) will undoubtedly be of great interest to many receiver owners who can appreciate the advantages obtainable employing such arrangements. I wonder, however, if I may be permitted to make a few comments on the reasons supplied to justify the use of the arrangement, by your contributor.

Mr. Morley states that a weak signal is seriously attenuated if the transmission line is of reasonable length. This may well be true, of course, but consideration will show that it will make no difference whatever whether a pre-amplifier is employed at the aerial or receiver end, or indeed at any intermediate position in the feeder so far as improving this particular failing is concerned.

Mr. Morley then goes on to say that the increased gain secured when a high aerial is employed is partially offset by the loss occurring in the longer feeder, and he states this is another difficulty that an aerial pre-amplifier will overcome. However, consideration will once more show that the use of an amplifier at any position in the feeder will have exactly the same effect. A simple example will perhaps make the point quite clear. Let us assume that the aerial provides a signal of one volt and that the feeder attenuates 2 : 1 (wishful thinking in both cases, of course), also that the amplifier has a gain of 10 times, then the voltage available for the receiver will be $1 \times \frac{1}{2} \times 10$ and it will make no difference whatever to the result whether we write $1 \times 10 \times \frac{1}{2}$ or $1 \times \frac{1}{2} \times 10$. I have taken rather a lot of space to deal with this matter because it is a common misconception. Oddly, Mr. Morley does not detail the real justification for employment of an aerial amplifier. It is this: unless a balanced feeder correctly connected to both the receiver and aerial is employed there will be pick-up of electrical disturbances on this feeder which will be applied to the receiver and cause "interference." However, when an aerial amplifier is employed it will amplify only the aerial signal and thereby increase the signal/noise ratio. Other benefits can be secured with specialised arrangements, for example in a unit designed by us we take advantage of the fact that the amplifier and aerial can be regarded as one unit, thereby permitting the use of a compact $\frac{1}{4}$-wave aerial array, but in general the benefit mentioned above is the only applicable one. May I also draw attention to a more economical method for feeding power to and the signal from the aerial pre-amplifier. It is not necessary to employ two separate lengths of feeder and all of the inter-connection requirements can be met with one single core feeder.

The outer braid of the feeder is employed for earth, H.T.—, and one heater terminal. The centre core is used for H.T.+, the other heater terminal, and for the signal feed wire. There is no difficulty in isolating the various voltages on the centre core from one another when it is remembered that the H.T. supply is D.C., the heater supply is 50 cycles A.C. and the signal voltage is A.C. of a very high frequency, thus isolating components of a very simple nature only are required. For example, the valve heater may be fed at the correct voltage through a capacitor suitably chosen to pass the correct current. This capacitor also ensures that the H.T. is not earthed via the valve's heater. The H.T. voltage can be isolated from the signal voltage with a resistance or R.F. choke, and the heater's A.C. supply is either isolated by the aerial coupling coil of the receiver, or by employment of a low value capacitor whose reactance will be very low for the signal voltage, but high for the 50 cycles supply. Actually, in our own aerial amplifier, we employ a twin core feeder, but this is done to ensure that any electrical disturbances are not carried up to the vicinity of the aerial in an unbalanced manner and the refinement is probably unnecessary.

A Grid-dip Meter and Bar Generator

A TELEVISION TEST SET FOR THE AMATEUR AND SERVICEMAN

By E. N. Bradley

(*Concluded from page 26 June issue.*)

THE leads of the Brimistor should not be trimmed down, otherwise the end contacts, which are sweated to the body of the Brimistor, may melt. Ventilation inside the instrument case is provided by two holes at the bottom of the back of the case, with a further two holes near the top, a convection current of air then being set up. A further grommeted hole at the bottom of the case gives entry to the mains lead.

S1 and S2 in the original instrument are a pair of push-to-make-push-to-break switches in white plastic, rated to carry 3 amps at 250 volts and obtained from Woolworth's. Ordinary toggle switches would serve equally well, but the plastic switches require little mounting space and can be fitted in on either side of the meter.

A view through the instrument case was shown in Fig. 4, this diagram showing the positioning of the components in the prototype. Different types and sizes of components, such as the 2 μF heater capacitor C5, may make slight changes in layout necessary. All earth connections may be sweated directly to the case or lid.

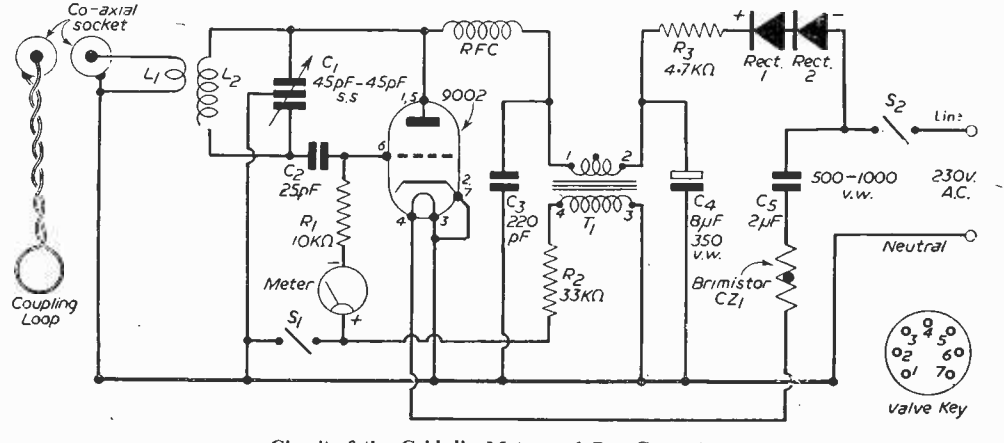
With the instrument completely wired it may be tested; no difficulties should arise. If for any reason oscillation should appear to be weak the value of C2 may be doubled to 50 pF but a high value should be avoided here to obviate any chance of squegging.

The case should then be cleaned and painted or enamelled; black crackle enamel is an excellent finishing medium.

Calibration

If the split-stator tuner and the coil have been duplicated exactly a tuning range of approximately 39 or 40 Mc/s to 68 Mc/s can be expected and the grid-dip meter can prove decidedly valuable without exact frequency calibration. By adding the calibrated points previously mentioned, however, the value of the instrument is still further enhanced, and it is possible, by presenting the coupling loop to any tuned circuit, to bring the circuit to resonance on any required channel. One method of calibration would be to make and suspend as much in the open as possible a dipole aerial cut for the London sound frequency of 41.5 Mc/s, connecting an 80 ohm feeder from the centre of the dipole to the grid-dip meter output socket and tuning the meter for maximum dip. This tuning point could then be calibrated as 41.5 Mc/s. The aerial could then be trimmed in length for 45 Mc/s, and the meter again resonated for the next calibration point and so on until all the sound and vision channels had been covered. The method would be clumsy, however, and very liable to introduction of errors. The most satisfactory manner of calibrating the instrument is to couple it loosely to a good signal generator (one with crystal-controlled check points if possible) with a further coupling from both instruments into a sensitive detector. The grid-dip meter can then be tuned to beat against the calibrated signal generator at any desired frequency, this being the method used for the calibration of the original instrument.

The calibrations are drawn in India ink on a card surface covering the top of the instrument case. A primary card layer was cut to fit the top of the case, and holes were cut in this card to accommodate the few bolt heads protruding through the lid. This then provided a flat bed on which a further layer of card



Circuit of the Grid-dip Meter and Bar Generator.

could be placed, both layers of card being held in position by the securing nut of the tuner and by the body of the co-axial output socket. The calibrations were marked in pencil on the top card which was then removed, an arc drawn and calibrating cardinals and figures inserted. The card was then replaced and its edges bound down with cellophane tape to the sides of the lid. The top of the case remains a push fit on the body so that should the need for servicing arise it is readily possible to reach the internal circuits.

Using the Grid-dip Meter

The chief uses of the grid-dip meter have already been covered in the text. Resonant lines and aerials are checked for frequency by coupling them directly into the output socket, fitting them with a suitable plug first, if necessary. For very quick checks it is sufficient to hold the bared ends of the feeder across the socket, the inner conductor of co-axial line being taken to the "live" socket and the screen to the body of the socket and thus to earth. Any aerial or resonant line should give a very strong dip when the meter is brought into tune. Failure to dip indicates either a non-resonant aerial or line or, if the aerial or line is known to be resonant, a break or failure at some point. As already indicated this is a check for normal television aerials together with their feeder systems. A failure of the meter to dip strongly at the correct tuning point (which should generally be between the sound and vision frequencies of the appropriate television channel) indicates a fault somewhere in the aerial-feeder system, probably in the feeder or at its junction with the aerial.

To check the resonant frequency of coils and tuned circuits, plug into the instrument output socket the single-turn loop and, carrying the instrument in the hand, place the loop as near as possible to the coil under investigation. It must be remembered that in a normal televisor the majority of coils are tuned by circuit and valve capacitances, so that the valves should be plugged in. Generally, however, the heaters should not be switched on for best indications, otherwise the cathode-grid conducting path damps the tuned circuit heavily. Tune the grid-dip meter until a sharp dip of the pointer indicates resonance; the reading of the instrument tuning scale will show the frequency to which the external circuit is tuned.

As close a coupling as possible is required for this test, and the single-turn loop mounted on the grid-dip meter should be made actually to encircle the coil under test, if this is practicable.

To use the instrument as a bar generator, switch on the modulator with the single-turn loop in position in the output socket. Feed the televisor under test from a dipole aerial which can be cut roughly from thin wire and suspended horizontally along the workshop roof. Set the oscillator to the required tuning point —if the receiver is tuned correctly a quite strong signal should be received and a set of bars should appear horizontally across the screen, the number depending finally on the tuning of the audio oscillator. These bars should lock in solidly. Slowly swing the grid-dip meter tuning knob across the tuning point—the bars should not tune in and out rapidly but should fade in and out. If at the strongest reception tuning point the bars dissolve into "hash" this may be due to overloading of the receiver input stage but is more likely to be due to feedback over the tuning circuits.

Tune the grid-dip meter from the vision to the sound channel. The audio note should be strongly received and heard from the loudspeaker, but there should be no bars visible on the screen—if bars appear under these conditions the receiver is probably suffering from sound-on-vision breakthrough, though a first check should be made by removing the grid-dip meter to some distance away from the aerial as a test for overloading.

Caution

The grid-dip meter is connected directly to the mains supply, since a half-wave rectification circuit is employed, so that every precaution must be taken to see that the case is connected to the neutral line, and thus safely earthed. Even then, under some circumstances, it is possible that there will be a slight potential difference between neutral and true earth, and tests for this state of affairs should be made, before using the instrument, by connecting a neon bulb between the case and a good physical earth, the instrument being switched on.

The instrument should be supplied from a three-pin plug (although only two leads are employed for the mains connections) so that the plug cannot be reversed in its socket.

If this, or any other grid-dip meter with an earthed case, is to be used in checking A.C./D.C. televisors or other A.C./D.C. gear it is a wise precaution to fit the grid-dip meter with a substantial and solid insulating handle.

Latest BBC News

Franco-British Joint Programmes

DISCUSSIONS between M. Jean D'Arcy, of Radio-diffusion et Television Françaises, and Mr. Peter Dimmock and Mr. Imlay Newbiggin-Watts, of the BBC Television Service, now in Paris, are proceeding satisfactorily for the first international relay exchange between France and Great Britain which will begin on July 8th and end with the traditional celebrations on the Quartorze Juillet. It can now be stated that an international football match between the French and British Olympic teams may be televised to viewers in both countries from the famous Parc des Princes Stadium, Paris, on Saturday, July 12th, at 5 o'clock. Both the Federation Française de Football and the British Football Association have given their agreement in principle.

The French Olympic Association football team will fly to Helsinki on the morning following the match.

Wenvoe Station

It is officially announced that it is hoped to open the new transmitting station at Wenvoe, near Cardiff, *on medium power*, on August 15th. The Postmaster-General, Earl De La Warr, P.C., has agreed to perform the opening ceremony.

Much work has still to be done to make the station ready by August 15th and details of the test transmissions and of the expected range of the station will be given later.

Wide-angle Picture Tubes

DIFFICULTIES AND PROBLEMS MET WITH IN CHANGING OVER TO THE NEW ALL-METAL TUBES

By W. J. Delaney (G2FMY)

THE increase in advertising of the all-metal wide-angle tubes has aroused considerable interest among home constructors, and many amateurs are interested in making a change-over to this new type of tube. We are often being asked whether they may be used as a replacement in the P.T. Receiver, the View-master and other popular home-constructor models, while some enthusiasts even ask for particulars of fitting one to their out-of-guarantee commercial receiver. Unfortunately, these tubes are not in the same category as the standard 12in. or even 15in. tubes which may, in many cases, be substituted for smaller tubes fitted to an existing receiver without very much difficulty. Usually, a change to one of the normal-angle larger tubes merely calls for a slight increase in E.H.T., or perhaps in the line scanning amplifying valve, although most time bases have sufficient power available. It should be borne in mind in this connection that, theoretically, no more power is required to scan a normal 12in. tube than one of 7in., as the angle is constant, and the larger tube merely has the face farther forward so that the same angle is covered by the scanning beam. In practice, however, there is loss of brilliance due to the fact that the beam has to travel farther before striking the screen, and to make up for this loss it is usual to step up the E.H.T. voltage. This in turn calls for an increase in the line scanning power (the frame is usually sufficiently covered), and the increased voltage for the line time base is conveniently covered by the use of a booster diode, which means only a small alteration in the time base circuits.

Wider Angle

In the case of the new wide-angle tubes, however, which may be either round- or rectangular-faced, a different set of conditions is met with. As the term describes, the beam traces a wider angle, so that a large picture area may be obtained without unduly increasing the length of the tube. As was mentioned in the case of the larger standard tubes, the picture face is farther away in a 12in. tube than in a 9in. tube, but most of the modern wide-angle tubes have very little increase in length over a normal 12in. tube, and yet have a face giving a picture with a diagonal of 16in. or more. This, then, introduces the first difficulty—existing scanning coils will be unsuitable and coils designed for the wider angle will have to be obtained. At the moment, so far as we can trace, there are available to the home-constructor only two types of wide-angle scanning coil—those manufactured by Haynes Radio and by Allen Components Ltd. These coils both call for new time base circuits, and the special tubes call for an additional E.H.T. voltage up to 15 kV. This means that a new output line transformer must be obtained and introduces problems of insulation. Coupled with this is the fact that the cone of the new tubes is actually the anode and this carries the full E.H.T. which introduces problems of mounting.

Leakage

The anode, being unprotected, must be covered or protected in some way for two reasons. First, as it carries the full E.H.T. voltage, it presents a potential danger to the user even after switching off the receiver, unless precautions are taken to short the tube to earth to discharge any smoothing condensers across the E.H.T. supply. Secondly, it must be so placed that it is well clear of any earthed surface, as otherwise flash-over may take place, or corona discharge may occur. The latter will cause spots all over the picture, although it may not actually prevent a bright picture from being obtained. Thirdly, any coating of dust which may gather on the normal set during its period of use will eventually give rise to a leakage, especially in damp weather, and thus it is very desirable that the cone should be covered with some insulating material. The constructor may easily carry out this protection either by enclosing the entire tube in a plastic housing, or cutting a sheet of thin plastic and making a cover to fit closely round the cone. As the rim of the tube face is also of metal, this also must be protected in mounting, and a ring of heavy rubber hosing may be cut for this purpose and it may at the same time hold in position the plastic cover.

Where the tube is mounted near to a metal chassis, it is worth while cutting away the chassis (if this may be carried out without unduly weakening it), and the makers recommend a spacing in air of at least 1in. between the metal cone and any earthed metallic surface. Finally, on the question of mounting, the face plate itself is not entirely non-conducting, although of glass, and therefore any screen placed in front of this, whether of glass or plastic, must be spaced suitably or be of a material having insulating properties adequate for 15,000 volts with a minimum creepage distance of 2in. Failure to observe these precautions may result in picture distortion, in addition to a potentially dangerous surface.

Circuits

Apart from the mounting difficulties mentioned, there is also the question of the time base circuits. The new type coils will call for quite different technique, not only on account of the wider angle, but also in view of the increased power required to overcome the effects of the high E.H.T. Fly-back E.H.T. is obviously a solution and this means a special line-output transformer suitable for the new coils; and although a standard line output valve such as the EL38 may be employed, a modified circuit arrangement will be found necessary to preserve linearity on the larger scan. Similarly, on the frame side the main requirement will be found to be the preservation of a linear scan when covering the wider picture area, and therefore existing time bases will have to be modified or replaced.

It is to be expected that the viewer will not take up his viewing position farther away from the screen, but will wish to remain at his usual distance, which means that better interlacing will be necessary in the interests of picture quality, and quite possibly spot-wobble or some similar device will be necessary to avoid the line structure impairing picture detail.

It is hoped shortly to present to readers a design for a complete conversion unit, incorporating a modern wide-angle tube and complete time bases with sync separator, etc.

Flywheel Sync Systems

IMPROVING LINE SYNCHRONISING HOLD AGAINST INTERFERENCE

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

PULSE interference manifests itself on the fluorescent screen of the picture tube in two forms. The most obvious is, of course, a host of bright spots that tend to give the picture a sandy background with a consequent loss of definition. The less obvious, and in the writer's opinion, the one whose contribution offers more in the way of inferior definition, is the resulting lateral displacement of the scanning lines which is noticeable in the "ragged" or "cut-up" vertical edges of the raster or picture.

Whereas an efficient picture interference limiter reduces to a tolerable limit the former presentation, the latter—due to noise superimposed upon the line sync pulses—is unaffected by this style of limiter. Therefore, picture entertainment value may thus be restricted, especially in metropolitan and the so-called fringe areas of low signal-to-noise ratio.

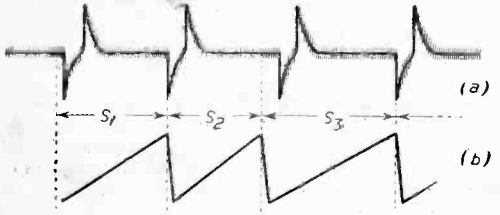


Fig. 1.—Diagram showing effect of interference on pulses.

The way in which this occurs is very interesting and is clearly illustrated by the waveforms of Fig. 1(a) and (b). Waveform (a) shows a series of differentiated line sync pulses which are heavily laden with noise of the impulsive type usually associated with car ignition systems and certain forms of electrical devices.

Now in order to obtain a satisfactory line-lock, the repetition frequency of the line generator—when unsynchronised—should be slightly less than the line sync pulse frequency. The arrival of a differentiated line sync pulse, therefore, initiates the flyback and of a consequence cuts short—within limits—the amplitude of line-scan. This is the normal function of synchronising and, provided a line pulse "fires" the generator at precisely the same point in each line-scan, the picture will be completely free from "ragged" edges.

The presence of noise on the sync pulses modifies this action, however, for then, just prior to flyback, a noise pulse may take control and "fire" the generator prematurely, resulting in a reduced amplitude line-scan for that particular line only. Towards the end of the next and subsequent lines the noise magnitude will be different and initiation of flyback may be earlier or later, producing a smaller or greater amplitude of scan. This, then, is how the "ragged" vertical edges are created and is shown diagrammatically by waveform (b), illustrating the difference in amplitude of successive line-scans at S1, S2, S3, etc.

A Method from America

Line synchronising poses a twofold problem in America, for—apart from the interference aspect—the character of line sync pulses radiated by different transmitters tend to diverge slightly from the standard, and since the general trend in that country is for multi-channel receivers, a change of channel—under this condition—would entail also the modification of pre-set adjustments. Further, owing to the use of negative modulation, an interference spot is displayed on the picture-tube as black and entertainment value is, therefore, limited not so much by interference on the picture proper as by the effect it has on the "firing" of the line generator.

Such conditions have stimulated the evolution of

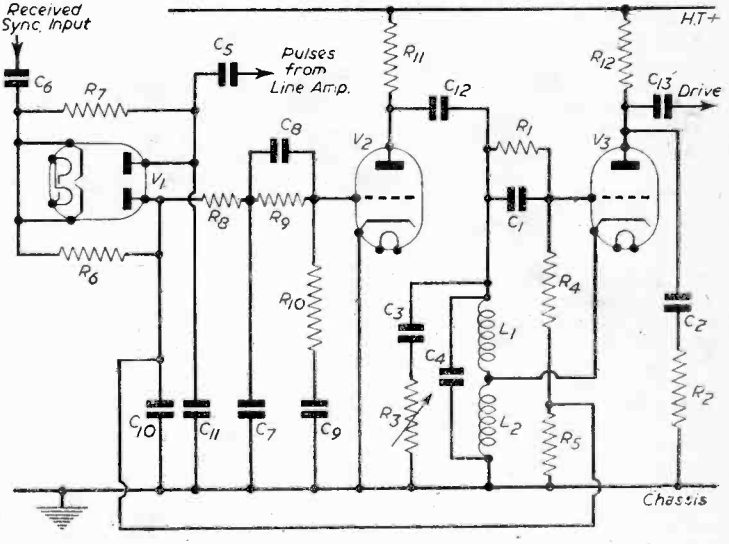


Fig. 2.—A G.E.C. circuit. Component values are :

R1 : 47 K Ω
R2 R3 : 50 K Ω (variable)
R4 : 220 K Ω
R5 R10 : 100 K Ω
R6 R7 : 470 K Ω
R8 R12 : 4.7 K Ω
R9 : 330 K Ω
R11 : 22 K Ω
C1 C8 C12 : 5,000 pF
C2 C13 : 500 pF
C3 : 2,000 pF
C4 C7 C9 : 1,000 pF
C5 C6 : 50 pF
C10 C11 : 10 pF
V1 : EB91
V2 V3 : half of ECC33 (or similar class)

receivers embodying special circuits to counteract these effects. In America, general television design includes this feature, while in this country at least one manufacturer has provided similar facilities in the form of a plug-in unit, which need be employed only when conditions demand, i.e., when the receiver is to be used in an area of low signal-to-noise ratio.

Several circuits have been adopted for this function, though essentially their principles are similar. One style employs a modified sine-wave oscillator—resembling in action the blocking oscillator, since its output consists of a sawtooth waveform suitable for driving the line output stage. The fundamental frequency of oscillation is arranged to be equal to the line sync pulse frequency, but instead of feeding the sync pulses to the oscillator to lock it—as is usual practice—the frequency is maintained constant by a stabilising capacitive effect across the tuned circuit.

This is furnished by a reactance valve, the same as that used in "automatic frequency control circuits." Therefore, by changing the control-grid potential on this valve, the effective shunt capacitance across the tuned circuit is altered, allowing by this method a control of sawtooth frequency.

Bias potential for this valve is derived from a discriminator circuit comprising a double-diode valve into which is fed both the line sync pulses and a sample of the generator voltage. Now, provided the frequency of the two waveforms are equal the bias potential for the reactance valve is zero, and under this condition the line-generator is running at its correct speed.

If, however, the two frequencies tend to get out of line, a bias potential is developed by the discriminator which biases the reactance valve in such a way as to bring the generator frequency back into step.

This method, as will be appreciated, isolates the interference-affected sync pulses from the line-generator and so, irrespective of interference magnitude, completely eliminates "ragged" vertical edges. Another advantage of these circuits is that, once running, they acquire a momentum effect, and one or two distorted—or even missed—sync pulses would have no appreciable effect on the line-generator synchronising. For this reason they are frequently referred to as "flywheel synchronising systems."

A Circuit by G.E.C.

A circuit after this style is depicted by Fig. 2. Here V3 constitutes the oscillator valve, which in conjunction with L1 and L2 forms a cathode-coupled Hartley oscillator. Time constant C1 R1 in the grid circuit is such that C1 acquires sufficient negative charge during a portion of each cycle to cut off the anode current, and the action then is very similar to a blocking oscillator. The waveform after leaving the oscillator is linearised by C2, R2 and brought to a form suitable for application to the line-output valve to provide a linear sawtooth current change through the scanning coils.

A noteworthy feature of this section is the manual tuning control formed by C3 R3. This, together with C4, enables the circuit to be adjusted initially to the correct frequency or, at least, within the operational limit of the reactance valve.

The Reactance Valve

Shunted across the tuned circuit also is the reactance valve V2, and from the oscillator point of view this shunt is reactive in the capacitive sense, i.e., the applied generator voltage lags 90 degrees on the current. How this happens may be clearly understood by referring to the circuit of Fig. 3.

If first this circuit is considered without the grid

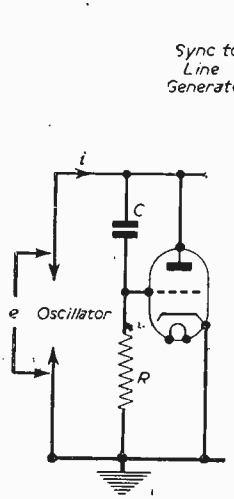


Fig. 3.—In this circuit capacitative or inductive effects are given by the relative positions of C and R.

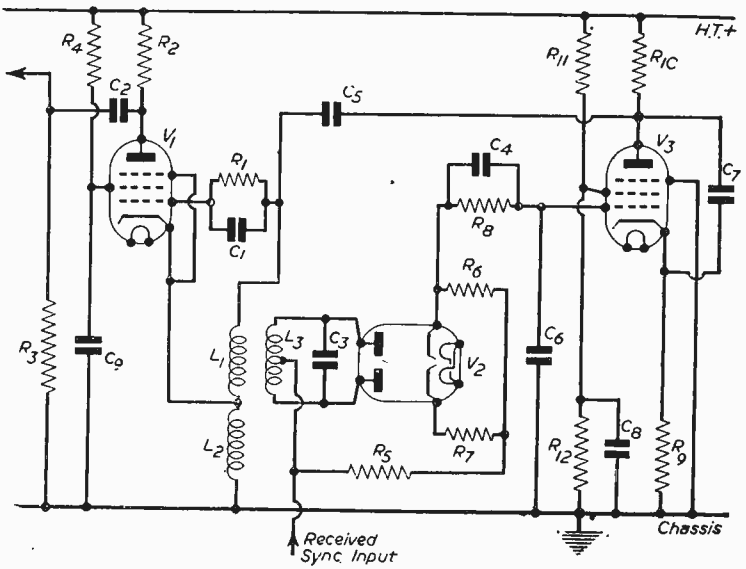


Fig. 4.—Another form of generator. Component values here are :

R1 : 62 KΩ
R2 : 5 KΩ
R3 : 50 KΩ
R4 R9 : 10 KΩ
R5 : 1 MΩ
R6 R7 R8 : 470 KΩ
R10 : 22 KΩ
R11 : 39 KΩ
R12 : 27 KΩ
C1 C4 C5: 5,000 pF
C2 : 50 pF
C3 : 2,000 pF
C6 C8 : 50,000 pF
C7 : 10,500 pF
V1 : 6K6
V2 : D77
V3 : Z77

components C and R, it will be obvious that—provided the grid potential is such that the valve passes current—the oscillator voltage *e* will be in phase with the current *i*, or in other words the circuit will be purely resistive.

The presence of the potentiometer C R alters this condition, however, by tapping off and applying to the grid a portion of *e* which, due to the effect of C and R, has a phase advance of very nearly 90 degrees. Owing to the valve amplification, the anode current created by the out-of-phase grid voltage is greater than *i* and, therefore, the valve passes an alternating current component 90 degrees ahead of the applied voltage *e*, which is equivalent to a capacitive shunt across the oscillator-tuned circuit.

The intrinsic value of this arrangement is, of course, the provision of voltage control over the frequency of the oscillator, for by altering the control grid-bias—and thus the effective gain of the valve—the magnitude of capacitive reactance presented by the valve and, consequently, the frequency of the oscillator, will alter in sympathy.

In practice, slight deviations from this system will be found to exist, for sometimes Miller effect circuits, or modified arrangements of the Quadrature circuit (as described), are employed. Whatever form the circuit takes, however, the valve always acts as a tuning reactance, but may be either capacitative or inductive depending upon the relative positions of C and R. For instance, the circuit of Fig. 3 may be made predominately inductive by simply transposing C and R.

The Discriminator

A suitable control potential is obtained from the double-diode discriminator circuit V1 (Fig. 2), where the relative phase of the oscillator output and the received sync pulses are compared. Again, this section is analogous to the discriminator frequently encountered in A.F.C. networks.

Briefly the action is as follows: a sample of oscillator voltage conveyed via C5 and the potentiometer R4 R5 cause both diodes to conduct equally. The currents in their load resistors are equal and the resulting drops in potential are added in opposition and, therefore, provide zero potential across the combination R6 R7.

The sync pulses are fed through C6 to both diode cathodes and again—in the absence of oscillator voltage—zero potential exists across the load resistors.

When both voltages are applied to the discriminator, however, the balance is disturbed unless, of course, the phase of both voltages is the same. Differences between their relative phases will result in one diode receiving the sync voltage plus some oscillator voltage — depending upon the phase error—while the other will receive the same magnitude of sync voltage minus the same oscillator voltage. Thus one diode will pass more current than the other and the potential drop across the respective load resistor will be greater.

The balance will be upset and a potential difference will appear across R6 R7 which is fed, via a filter R8 C7 and an integrating network R9 R10 C8 and C9, to the reactance valve. The polarity of this potential is such as to increase or decrease the oscillator frequency if it is lagging or leading the sync pulse frequency, and thus ensuring that the line generator is held in synchronism.

A Variation in Style

The foregoing circuit is of comparatively new design, but other methods have been—and still are—in general use. Essentially, their fundamental features are the same, though modifications do occur in the oscillator circuit, where instead of deriving a sawtooth voltage a near square-wave voltage is produced which, after differentiation, acquires a form similar to a series of differentiated sync pulses. These are used for synchronising purposes and are injected into a sawtooth generator of standard design in the usual way.

Such a circuit is depicted by Fig. 4. The generator valve V1 is—as previously—cathode coupled to L1 L2 to form a Hartley oscillator. This time, however, the grid circuit time constant C1 R1 is such that the valve is run into anode current cut-off during negative half-cycles only, resulting in the appearance of voltage pulses across R2. These are effectively clipped due to the presence of grid current—for it should be understood that the grid goes extremely positive during this period. The resulting negative going square-wave voltage is

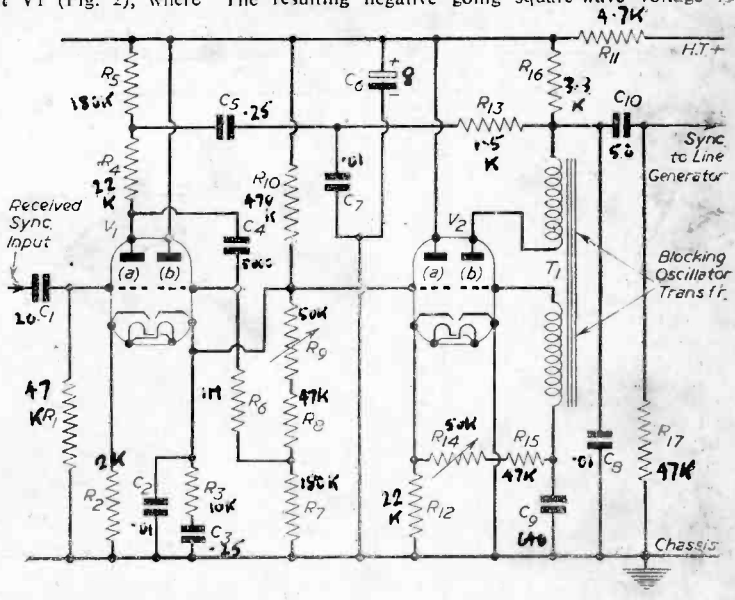


Fig. 5.—This English Electric circuit utilises two double triodes. Essential values are :

R1 R8 R15 R17 : 47 KΩ
R2 : 2 KΩ
R3 : 10 KΩ
R4 R12 : 22 KΩ
R5 R7 : 180 KΩ
R6 : 1 MΩ
R9 R14: 50 KΩ (variable)
R10 : 470 KΩ
R11 : 4.7 KΩ
R13 : 1.5 KΩ
R16 : 3.3 KΩ
C1 : 20 pF
C2 C7 C8 : 10,000 pF
C3 C5 : 0.25 μF
C4 : 5,000 pF
C6 : 8 μF electrolytic
C9 : 640 pF
C10 : 50 pF
V1 V2 : ECC33 (or similar class)

differentiated by reason of C2 R3 and may be applied directly to the line generator.

Inductive coupling between the oscillator coils and the discriminator valve V2 is achieved by L3. This winding is also centre-tapped to provide an anti-phase voltage at each diode anode and allows a convenient point for the injection of the sync pulses.

Although the load resistors R6 R7 are connected in the cathode circuit, phase comparison between the two signals is attained precisely the same as previously described, while the control potential is fed through R8 to the grid of the reactance valve V3.

Without a Reactance Valve

An extremely efficient form of flywheel synchronising has been evolved by The English Electric Company for optional inclusion in their current receivers. The system—illustrated by Fig. 5—consists basically of a conventional blocking oscillator V2(b) whose frequency is controlled directly by an error voltage without the need of a reactance valve. The output from the blocking oscillator is differentiated by C10 and R17, as in the previous circuit, and fed to the line generator in place of the received sync pulses.

The received line sync pulses are fed through C1 to the grid of V1(a), and therefore appear amplified and inverted in form across the load resistor R4 in the anode circuit. Pulses from the blocking oscillator are integrated by the action of R13 and C7 and fed through C5 to the junction of R4 R5. These pulses are developed across R5 so that the composite signal present at the anode of V1(a) may be fed via C4 to the grid of V1(b). This valve acts as a form of discriminator and produces a D.C. potential at its cathode dependent upon the relative phase of the two signals at its grid. The grid of the cathode follower V2(a) is in direct connection with this potential, and since the output voltage developed across its load R12 is in association with the frequency-determining elements of the blocking oscillator—C9 R14 and R15—it follows that an alteration in potential here will modify the repetition frequency of the oscillator.

The potential necessary for accurate synchronising is provided only when the two signals across R4 and R5 are in phase. A departure from this condition will therefore tend to be counteracted by an alteration in control potential. The oscillator frequency is correctly determined initially by adjustment to R4—constituting a form of line hold control.

In order to facilitate the biasing of V1(b) and V2(a) a potential divider chain comprising R7 R8 R9 and R10 is included across the H.T. circuit. The element R9 is made variable to provide a variable degree of bias potential, but once set should not require further adjustment.

Component Values

For readers wishing to experiment with the foregoing mode of synchronisation the component tables may be of assistance. It should be noted, however, that the values indicated may require slight modification to suit individual requirements, but, nevertheless, they will serve at least as a guide.

Viewers' Programme Poll

LEEDS Tele-Viewers Society recently conducted a poll on the various programmes. Members were asked to indicate their likes by giving the following references :

A—for like very much.
B—for like moderately.
C—for neutral, no opinion or never seen.
D—for don't like much.
E—for strongly dislike.

Programme poll in percentages

	A	B	C	D	E
Plays	93	5	2	—	—
Floor Shows	88	11	1	—	—
Comedy Shows	5	65	25	5	—
Music Hall	50	41	9	—	—
Magazines	58	22	15	5	—
Quizzes	100	—	—	—	—
O.B. of Sport	49	32	10	9	—
O.B. of Public Events	84	16	—	—	—
O.B. Places of Interest	77	—	7	16	—
O.B. Spectacle Shows	100	—	—	—	—
Discussions	62	22	16	—	—
Individual Speakers	5	24	6	65	—
Illustrated Talks	32	37	21	10	—
Short Stories	52	17	21	5	5
Afternoon Programmes for Women	20	—	80	—	—
Picture Page	18	42	15	19	6
Documentaries	32	57	11	—	—
Ballet	31	32	12	19	6
Opera	16	67	11	6	—
Soloists & Orchestral	38	27	15	15	5
Newsreels	100	—	—	—	—
For the Children	100	—	—	—	—

Note.—Afternoon programmes for women had not been seen by about 50 per cent. of members who are men.

Members Remarks About Various Programmes

More up-to-date films asked for such as *Rebecca, Roberta*, etc.

Programmes from 7 to 8 p.m. needed, also on Sunday afternoons (sponsored if needs be).

Can Fred Streeter have a programme in the evening?

Plays : Too much studio noise. Shadows are cast by lighting.

Floor Shows : Too many acts of the same type. "Pot Luck" no favourite.

Comedy Shows : Not enough comedy. Norman Wisdom asked for.

Music Hall : Not enough close-ups ; backcloths do not provide enough contrast.

Magazines : Wanted oftener.

Quizzes : Excellent ; other types needed ; change of chairman and artists asked for.

O.B. Sport : Less tennis wanted, and films of T.T. Races instead ; more professional boxing wanted.

O.B. Spectacle Shows : Not enough of them ; "Come Dancing" excellent.

Discussions : Too much political slanging ; chairman should control ; change of members more often would improve.

Illustrated Talks : Films of travel talks asked for.

Short Stories : John Slater much enjoyed.

Picture Page : Not enough variety.

Ballet : Performances too long.

Soloists and Orchestral : Cinema organ wanted, and more light music ; "Music for You" excellent.

Newsreels : Too brief.

For the Children : Excellent.

Using "Faulty" Tubes

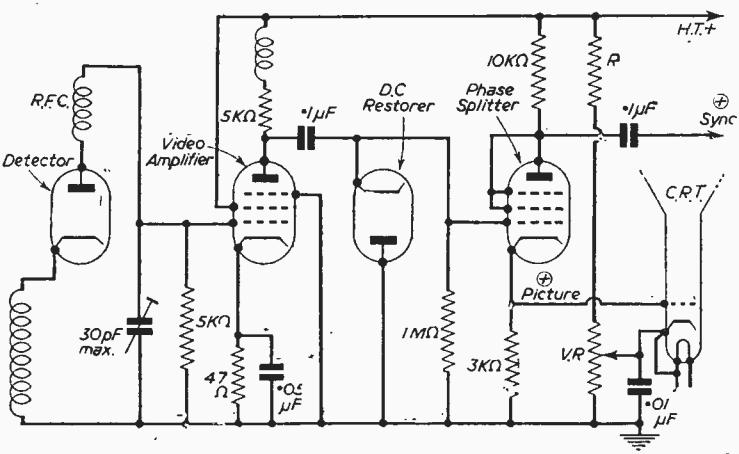
HINTS ON CHANGING FROM CATHODE TO GRID MODULATION

By P. Dodson

WHEN a picture tube develops low heater-to-cathode insulation, and the picture signal is applied to the cathode, it means changing the tube.

The present-day cost of tubes is very high, and so it is very much cheaper to change over to grid modulation. A tube with low heater-to-cathode insulation will, as a rule, give a perfect picture in a grid modulated circuit.

Undoubtedly the safest way of operating a tube is by the use of a phase splitter-cathode follower and D.C. restorer. This means two extra valves, but this is of no significance compared with the price of a new tube. Without the phase splitter-cathode follower one would have to connect the tube grid to the anode of the video amplifier, this method has the disadvantage that the breakdown of a condenser or valve would mean the full H.T. being applied to the tube grid, with disastrous results. The tube when fed by the method shown in the accompanying circuit diagram is completely protected.



Circuit of the re-arranged tube-feed.

For grid control it is necessary for the picture signal from the detector to the grid of the video amplifier to be negative going. For this reason the cathode and anode connections of the diode detector need to be reversed. With a negative picture input to the video amplifier the bias of the valve can be reduced. A cathode resistor of 47 to 68 ohms will be found satisfactory with a valve of the EF50 class.

D.C. Restorer

This can be a VR92 and its use is necessary to maintain picture quality. Without it, the picture would be flat and dull, and the firing of the time-bases would be erratic.

Phase Splitter

A triode such as VR137 or VR65 (with anode, screen and suppressor strapped together) are suitable valves. The picture signal is taken from the cathode of the phase splitter, which is in the same phase as the input to the grid, i.e., positive. Positive sync pulses appear at the anode. The output is, therefore, suitable for feeding to the sync separator. Another phase reversal in this valve will make the pulses negative in which form they are suitable for the time-bases. Very little amplification is obtained from this valve owing to the high degree of negative feedback. The anode and cathode resistors may be of equal value. Greater output is obtained, however, by increasing the size of the anode load. The cathode resistor can be reduced as well. A 10 KΩ anode load, with 3 KΩ cathode resistor work well and give good synchronisation.

C.R.T.

The video signal is applied to the grid of the tube, and the connection from the cathode of the phase splitter is best made in screened cable. Length is not too important. The cathode should be connected to one side of the heater. The sizes of the resistors across the H.T. supply from which the positive potential is obtained to black out the tube may need some slight adjustment, depending on the type of C.R.T. Average values are, R 50 KΩ to 100 KΩ, VR 50 KΩ. No difficulty should be experienced in selecting the correct value for R, thus ensuring good control over brightness.

The two additional valves which are interposed between the video amplifier and sync separator take up but little space, they may be mounted on a quite small chassis.

Control of Cranes by Television

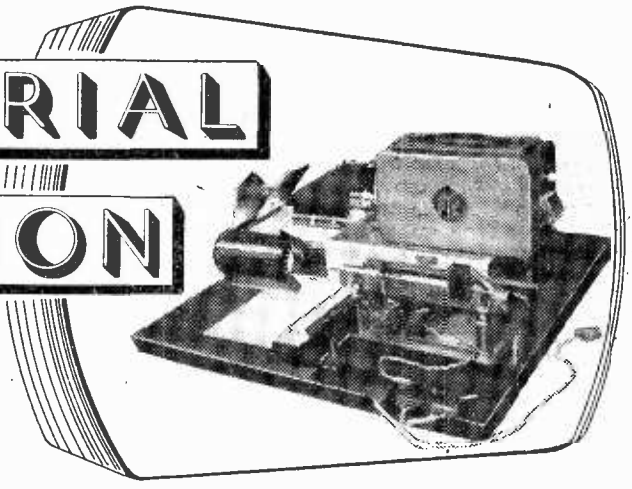
REMOTE control of cranes by television was demonstrated at the Third Mechanical Handling Exhibition at Olympia.

It was shown by the Vaughan Crane Co., of Manchester. This company has for some considerable time had on the market an overhead travelling crane, entirely controlled in its operations by remote radio; and this system has been largely used in specialised industrial processes where it is undesirable or impracticable to deal at close quarters with the material being handled.

This may be the case in the handling of radio-active materials, atomic weapons, poisonous substances and special steels in some process of their manufacture.

With this new development, however, the operator can see on a television screen exactly what his crane is doing, and he can adjust its movements by reference to the screen only, when operating his radio controls.

INDUSTRIAL TELEVISION



DETAILS OF SOME NEW COMMERCIAL EQUIPMENT AND ONE USE TO WHICH IT IS BEING PUT

THE rapid expansion in the production of television transmission apparatus during the last few years has led the Pye organisation, as pioneers in that direction, to devote considerable attention to the possibilities of introducing television as an aid to industry. Investigations into this devious aspect have shown that the industrial applications are numerous and far-reaching in scope. A careful study of the exact requirements has resulted in the development of special equipment for industrial purposes using a miniature television camera tube, the "Staticon."

The equipment is designed to provide remote observation of industrial processes which may be inaccessible to the human eye, or where close scrutiny would be injurious to a human observer. Such conditions may exist, for example, in a steel foundry, involving heat, glare, and fumes from a furnace. Two main units only are required—the camera, which is located close to the subject, and the control and monitor unit, on which the observer views the image at a suitable remote point.

The television eye may be used also as a valuable substitute in precision engineering observations where it might be advantageous to have the image of the subject enlarged on a screen for viewing by a greater number of persons. It may also be used for time study of diverse operations, remote and local, from a central office, or the combining of several different operations so that one operator controls many.

Other fields for the application of industrial television equipment include educational purposes in schools and hospitals, and motion picture production, where it could be used for viewing rehearsals in black and white, thus obviating film wastage due to the necessity for retaking scenes.

Where there is a need for the instantaneous conveyance of visual information to a remote point, the Pye industrial television system will find an application, and will result in improved efficiency and economy.

Description

The Pye industrial television equipment consists of a miniature camera, a combined control unit and monitor, together with a multi-way connecting cable, a set of three lenses and a small tripod. This binary television chain is compact, light in weight (under 100 lb. for both units), and thus easily transportable. The apparatus is very simple to set up and is economic in operation.

The "Staticon" camera can be operated at distances up to 300 yards from the control unit by means of the connecting cable, all the controls being operated from the viewing position. The miniature camera tube, designed and manufactured by Cathodeon, Ltd., the vacuum tube division of the Pye group of companies, operates on the principle of photo-conductivity which permits a simplicity of construction previously unattainable in pick-up tubes. The tube is only 1 inch in diameter and 7 inches in length, and is so designed that it functions with lenses of the conventional type normally used on 16 mm. ciné cameras. Its size enables it to be sited in close proximity to the subject required to be televised, while normal industrial lighting provides sufficient illumination.

Self-contained

The video pre-amplifier and the tube blanking amplifier are both housed within the camera, the whole unit being so constructed that all components and sub-assemblies are easily accessible for servicing or changing. The tube with its focusing and deflecting coils is mounted on a detachable sub-chassis. The correct distance between the lens and the photo-cathode of the pick-up tube is set before leaving the factory by adjusting the position of this chassis on its slides. A three lens rapid change turret is attached to the camera face.

A combined control unit and monitor employs a

The desk receiver in use

9-inch cathode ray tube for setting up and monitoring, and also includes the necessary circuits for the generation of all the waveforms conforming to the scanning standards required for the operation of the camera.

The scanning and pulse timing circuits may be adjusted to operate on any of three standards (see specification).

The eight controls for the operation of both the camera and monitor are grouped together on the front panel of the control unit.

Provision is made for locking the synchronising pulse signal generating circuits to the power line frequency, or to any suitable external reference frequency.

Two outputs are provided, one video and the other radio frequency. The latter may be preset to any required frequency in the television band and can be fed to the aerial input of a standard television receiver. This enables existing television receivers to be used as additional monitors.

A specially designed hand-operated panning head having a very smooth action is supplied for mounting the camera on a standard tripod of the type used for a 16 mm. ciné camera. The camera is self-locating on the panning head and is secured in position by three thumb-screws.

Bank Use

The well-known banking house of Glyn, Mills have installed one of these units, and recently a press demonstration of the installation was given, at which Mr. C. G. Randolph made the following statement.

"Glyn, Mills have in the past financed many pioneering projects, and in the last century we played a big part in the development of the railway systems of this country and of many countries abroad. So we are pleased to be associated with Pye, Ltd., in the first practical application of this system in Britain, apart from a limited use for medical teaching.

"The story of how this came about goes back to 1946, when it became clear that for a number of reasons certain Departments would have to remain at Osterley Park, where we were evacuated during the War. This created a considerable problem in communications as telephoned queries from Kirkland House regarding a customer's account at Osterley were not without difficulties and it was certainly impossible to verify signatures by 'phone. The two forms of communication which we first examined, teleprinting and telephotography, were in certain respects more suitable than the telephone, but did not give the immediate picture we required.

"We therefore consulted various manufacturers with a view to obtaining their co-operation in producing a television unit which would be not too costly, but compact, mobile and easy to maintain. Pye, Ltd., of Cambridge, showed particular interest, and agreed to assist us in an experiment to achieve this object.

"Experiments took place over a distance of ten miles between Osterley Park and various terminal points in the vicinity of Kirkland House, the terrain being reasonably flat, but with obstructions in the form of high buildings between these two points, a fact which has had tremendous delaying action in the achievement of our present results. Also, administrative and technical difficulties constantly arose which caused delays. However, these delays and difficulties have now been overcome.

"By using this private television link, a manager here in Kirkland House could immediately refer to a customer's records and, by using the remote control, he could scan the document across or down the columns as he wished. All that is necessary at Osterley is for a clerk to place the document under the camera. Also, lenses can be instantly changed to give a magnified image for the immediate verification of such records as a signature from a specimen signature card.

"Now that we have reached the demonstration stage, the question of applying it to our own use must depend on installation and running costs. Besides this particular application there may be many other uses for the employment of a private television system. For instance, if the records of an office in the centre of a city could be transferred to the suburbs, a large saving would result, owing to the difference in cost of office space, which may be as great as two to one.

"The final cost of installation must depend on the amount of equipment required for each individual use, but if the results justify the cost of installation, television may in the future be a tool to increase commercial and industrial efficiency, and to cut down administration costs and other overheads. Television now may well have justified itself as a necessity on entirely other grounds than the provision of a public broadcast service."

Specification

System. 405 lines interlaced, 50 fields per second, 25 frames per second; or
525 lines interlaced, 60 fields per second, 30 frames per second; or
625 lines interlaced, 50 fields per second, 25 frames per second.

Scene Brightness. 50 ft. candles minimum (with f1.9 lens).

Outputs.

Video (complete). 1 V. p-p. (polarity reversible).

Radio Frequency. Peak amplitude 0.1 V. (modulation reversible).

Maximum distance between Camera and Control Unit. 300 yards.

Lenses. As for standard 16 mm. ciné camera.

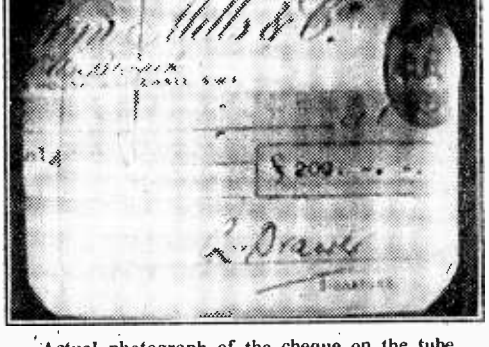
Focal Length	*Aperture*	*Horizontal Viewing Angle*
1in.	f 1.9	23 deg.
2in.	f 1.9	11.5 deg.
3in.	f 2.5	8 deg.

Power Supply. 100-115 V., or 190-240 V., A.C., 50-70 c.p.s.

Power Consumption. Approximately 300 watts.

Over-all Dimensions.	*Length*	*Height*	*Width*
Camera ..	11in.	6½in.	4¾in.
Control unit ..	26¼in.	16¾in.	10¼in.

Weights. Camera: 12¾ lbs. with lenses.
Control unit: 86 lbs.



Actual photograph of the cheque on the tube face—showing the detail it gives

The A.C.-D.C. Television Receiver

FIRST DETAILS OF A NEW RECEIVER FOR A.C.-D.C. MAINS, 210 TO 250 VOLTS

By S. A. Knight

IN spite of arguments to the contrary, the Universal television receiver has much to recommend it against the claims of the A.C. only receiver. There is no expensive high-current mains transformer involved, the design can, in general, be more compact and much easier to build and handle, and the whole receiver can be accommodated on a single chassis. No additional valves are required over and above those that would be used in an A.C. design, consequently the cost is less, and, finally, from the point of view of the man on D.C. mains, it represents his only chance of enjoying television on a par with his A.C. "neighbour."

Inevitably, of course, there are snags in the design of such a receiver that would not be so apparent on an A.C. design, the chief of these being the provision of adequate safety for the user, the chassis being connected directly to one pole of the supply, and the difficulty of obtaining a full line scan when the mains voltage is below 220 volts if ordinary techniques are employed. In the present receiver design, there is no danger of shock to the constructor or user if the instructions are followed properly, and full line scan is obtainable for mains voltages down to 210 volts. Although the receiver has not been tested under actual conditions, slight modifications in the design should enable it to function quite satisfactorily on 200-volt supplies also, but it must be emphasised that the design has only been checked down to 210 volts. The general text of this article will, therefore, refer and apply to mains supplies of from 210 to 250 volts, A.C. or D.C., and the suggested modifications for 200-volt supplies will be given at the end.

The receiver utilises eighteen valves, including the flyback E.H.T. rectifier, and as described is suitable for reception within a radius of some 35 to 40 miles of Alexandra Palace. The circuit is, of course, adaptable to the other channels, and coil winding and rejector details will be given later for each of these ; the range of the receiver in each case will be roughly the same as that stated above.

The vision and sound receivers, and part of the time-base units, use all-glass pentodes of the EF91 variety, and the circuits are straight, the tuning being staggered on the vision side. The coils are fully screened in small aluminium cans, and there is consequently no under-chassis screening across the valveholders.

The complete theoretical circuit diagram is shown in Fig. 1, while Figs 2 and 3 show the general upper chassis appearance of the receiver before the fitting of the tube. The chassis measures 16in. square by 2½in. deep ; actually two 16in. by 8in. chassis are joined together side by side, thus making a clean division between the R.F. sections and the power and time-base sections as well as strengthening the whole assembly across the mid-line. The chassis are of the open-ended type and the rear and front controls of the receiver are mounted on paxolin strips which form the remaining chassis sides and also provide insulated supports for the spindles which project through the cabinet front when the model is completed. There is, therefore, an additional safety measure, and when combined with sunken grub-screws makes the receiver perfectly safe to tune and operate by an inexperienced person.

Circuit Details

The vision receiver consists of four R.F. stages V1 to V4, followed by a diode detector V5, and a video amplifier V6. The design is perfectly straightforward and calls for little comment ; as will be seen, tuned grid coupling is employed throughout, and the usual anode resistors are replaced in each stage by untuned chokes to maintain the highest anode voltage on each stage. The chokes and tuned coils are both wound on the same former and the 100 pF coupling condensers are included in the screening can along with these windings.

The diode detector delivers a positive-going signal to the video amplifier, which in turn is coupled to the cathode of the C.R. tube via a conventional compensating circuit consisting of R18, R19, R21, R22, C19 and C20. No anode inductance is used.

The sound receiver proper consists of V8 and V9 as R.F. amplifiers, crystal diodes V10 and V11 as detector and noise limiter respectively, and V12 as output stage. V9 is reflexed to act as the first low-frequency amplifier stage in addition to its normal R.F. duties. Coupling to the sound receiver is made from the grid of the second vision valve to a tapped coil wound on a polystyrene former and iron slug tuned ; this tuned circuit in conjunction with the 3 pF coupling condenser forms the main sound rejector for the London transmission, the remainder of the vision receiver being tuned to the upper sideband. For the other channels, further traps are required as the vision receiver must of necessity utilise the lower sideband.

The R.F. sound amplifiers are conventional transformer coupled stages, and the crystal diodes are used for detection and noise suppression solely to avoid thermionic valves and so maintain the heater-voltage sum within 210 volts. To provide gain without an additional L.F. stage, the output of the detector is fed back to the grid of the second sound R.F. amplifier and the resulting amplified audio signal is developed across R33 in the anode circuit, whence it passes to the noise limiter and the output stage. The R.F. choke L16 blocks off the R.F. component of the detected signal.

The output stage uses a car radio type of valve, EL42, and an output of about two watts can be obtained with an anode voltage of 220 volts. For a standard three-ohm speech coil a transformer of ratio 55 to 1 is suitable.

Time-base Details

The sync separator stage V7 is a conventional pentode limiter operating over a short grid base and biased close to cut-off by the grid rectification of the vision signal over C21 and R24. Anode current consequently flows only during the positive sync pulse excursions of the grid, and negative-going sync pulses are developed across R25 and R26 in the anode circuit. Line pulses are taken directly from the anode through a differentiator

consisting of C55 and R61, and frame pulses are fed through the integrator R43 C43 from the tapping point on the anode load. The interlace obtainable from this simple arrangement is sufficiently good to render the inclusion of a more elaborate system unnecessary, although a slight improvement can be obtained if R43 is replaced by a W6 metal rectifier, positive to the anode side.

The time-bases employ transitron oscillators for both line and frame, followed in turn by conventional amplifier stages. The choice of transitron oscillators instead of the more usual blocking oscillators needs a little comment; in the experimental stages of this receiver design, a frame blocking transformer was obtained cheaply on the surplus manufacturers' market and included in the circuit. This worked quite successfully, and a line blocking oscillator was set up similarly. However, it was realised that such surplus transformers have a habit of vanishing abruptly from the market, and so the circuits were changed over to transitrons which called for no special components. The *frame* blocking transformer can still be obtained, and so the alternative circuit is shown in Fig. 4; those constructors who can obtain this component may use this circuit, but when the transformer cannot be obtained, the transitron will have to be used.

The frame amplifier is conventional and uses a voltage feedback circuit to linearise the scan, the coupling to the scanning coils taking place through transformer T2. Resistance R55 damps out any tendency to ringing in the frame coils set up by the line scan impulses.

On the line side of the unit, the transitron is rather a nuisance in that the output is negative-going, and the line output stage requires a positive input. An inverter stage V14 is consequently included; this stage is in no way critical and any valve of the 6J7 type, strapped as a triode, is suitable. The 6SJ7 as specified is particularly useful, as it is single-ended and can be obtained readily on the surplus market. If an alternative is used, care must be taken to ensure that the heater current rating is 0.3 amps. The output amplifier V15, a PL38 pentode, feeds the line scanning coils through the transformer T3 and also provides the E.H.T. for the C.R. tube by pulsing the rectifier V16 during the flyback periods. An average E.H.T. of 5 kilovolts is obtainable.

V17 is an efficiency diode which rectifies the oscillations set up in the output transformer secondary winding during the flyback, and provides the initial scanning current through the scanning coils while V15 is cut off. The additional voltage developed in this way across C63 is effectively added to the anode supply of the output valve; it must be noted that the positive pole of C63 is earthy. C66 simply acts as a D.C. blocking condenser for the scanning coils, and its positive pole is likewise connected towards earth.

Picture width is controlled by the variable inductance L20 in series with the line coils; operation of this control does not affect the E.H.T. or focus, as would be the case if some form of control were included before the output stage proper.

The control in the anode of the line transitron is the Line Form control and is set up in conjunction with the Hold control R65 to correct cramping on the left of the screen. The screen of the output valve is separately fed through R72 to maintain the screen dissipation within its rated limits.

Power and Heater Circuits

The mains supply is fed to the receiver through a double pole switch (fitted to the Brilliance control) and a filter system consisting of L17, L18 and C51. It is then passed to the rectifier V20, and so on to the conventional smoothing system made up of choke L19 and condensers C53 and C54. These latter are of large capacity compared with normal A.C. practice, but such

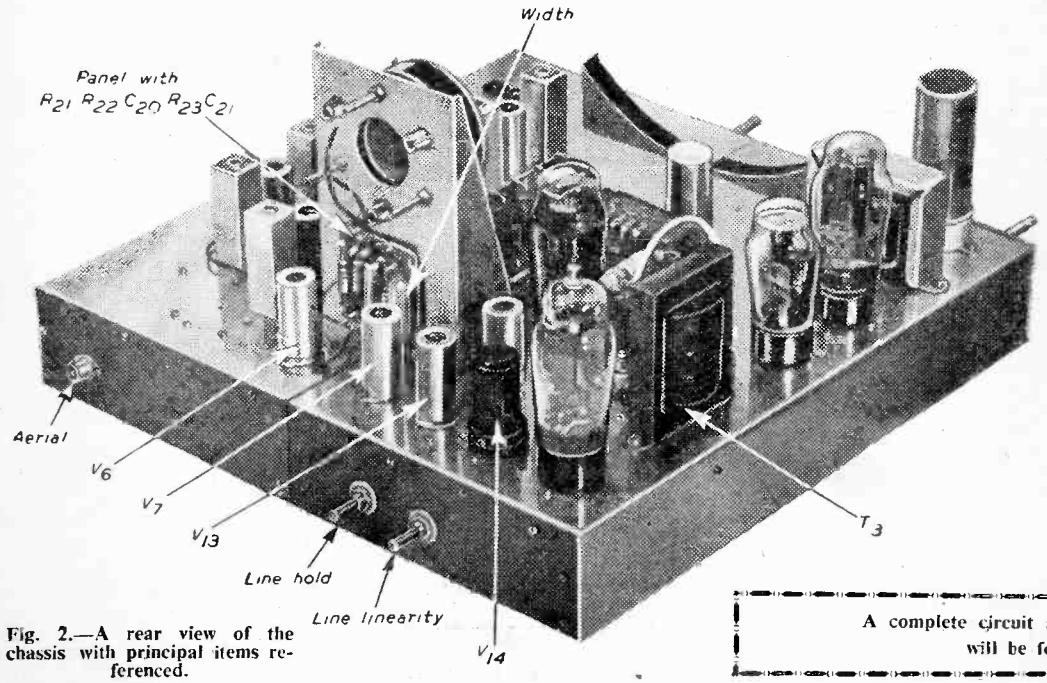


Fig. 2.—A rear view of the chassis with principal items referenced.

A complete circuit and full list will be found on pag

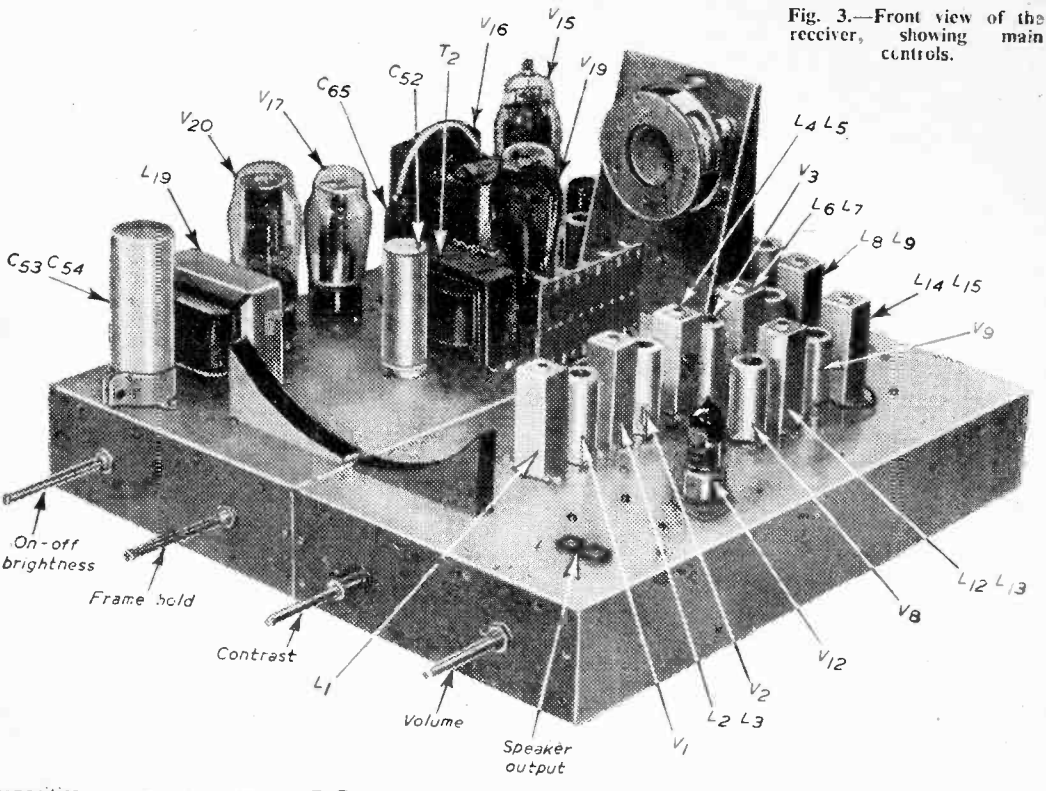


Fig. 3.—Front view of the receiver, showing main controls.

capacities are necessary even on D.C. supplies where ripple can sometimes be almost as severe as badly smoothed alternating current supplies. Choke L19 is rated at 5 henries, 250 mA. and its D.C. resistance is 50 ohms. A smaller resistance is permissible, but 50 ohms should not be exceeded, especially by those constructors whose mains supplies are below 220 volts. The sound receiver is separately fed through R56 and additionally decoupled by C52.

The heaters of the valves are, of course, wired in series and the heater current drain is 0.3 amps. All the valves are of this rating except the diode V5 and the output pentode V12. V5 is rated at 0.15 amps. and must be shunted by a 42 ohms resistance to bypass the excess current. Similarly, V12 is rated at 0.2 amps. and a shunting-resistance of 63 ohms is necessary. For V5 two 82-ohm half-watt resistors are used in parallel, and for V12 two 120-ohm half-watt resistors are used similarly.

The order in which the valves are wired is important, and is shown on the theoretical diagram. The rectifier, efficiency diode and line output valve are "closest to the mains," while the frame time-base valves are at the earthy end of the chain. This is to ensure that the frame time-base does not lock to the mains when the set is used on A.C. The C.R. tube heater is about 25 volts above chassis, but the cathode is also above chassis, and so the total heater-cathode potential is quite small and well within the rating for the tube used. A Thermistor element is wired in series with the heater chain at the mains end to eliminate any surge on switching on: the resistance of this element is about 3,000 ohms when cold, but this falls to about 40 ohms as the valves draw current and its temperature rises to the normal operating condition. R82 is the main dropper and is set to suit the supply voltage, but more about this later on.

As the receiver stands, a total of 206 volts is required for the heater chain, and so 210 volts is the lowest permissible mains supply when 4 volts have to be "lost" in the Thermistor. Details will be given later on a valve change which will make the circuit suitable for use on 200-volt mains.

(To be continued.)

**of components required
s 74 and 75**

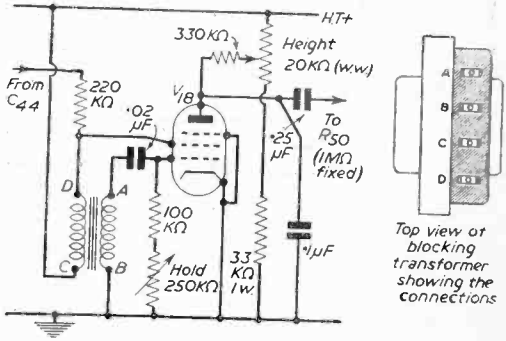


Fig. 4.—Alternative frame oscillator stage. When this circuit is used, the bias resistor of V19 is 160Ω.

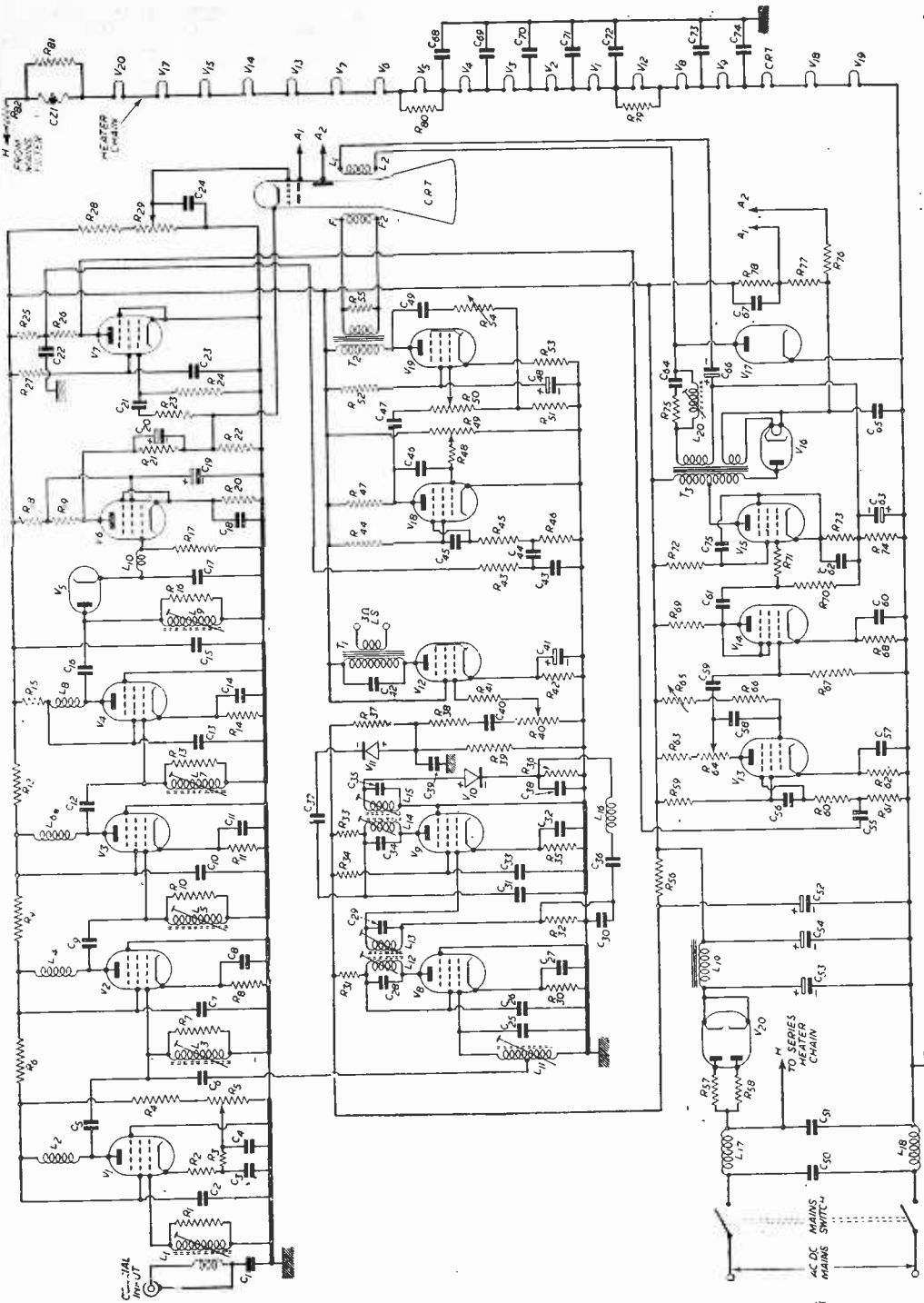


Fig. 1.—Theoretical circuit of the A.C.-D.C. Receiver—The heavy 'earth' line denotes common earthing points. R39 should be joined to—side of the eleven not + as shown.

LIST OF COMPONENTS

Chassis, two off open-ended type, 16in. × 8in. × 2½in. (Precision Equipment Co.).

Scanning coils, Line and E.H.T. transformer, Frame transformer, L20 width choke } W.B., Plessey, etc. These are as used in the Viewmaster receiver.

Tuning coils and cans :
7 off complete formers, cans, side wires and cores (Haynes Radio or Bel Sound Products).

Smoothing choke :
5H 250 mA 50 Ω (Sterns Radio, Ltd. or Radio Supply Co., Leeds).

Valveholders :
10 off B7G with screening cans.
5 off int. octal.
1 off B8A.
1 off 3-pin EA50 type holder.
1 off 12-pin Duodecal (for C.R. tube).

Frame oscillator transformer (if used) : D. Cohen or Lasky's Radio.

Valves : All Mullard (or equivalent) except V14 :
10 off EF91—V1, V2, V3, V4, V6, V7, V8, V9, V18, V13.
1 off PZ30—V20.
1 off PL38—V18.
1 off PL33—V19.
1 off PY31—V17.
1 off EL42—V12.
1 off EA50—V5.
1 off EY51—V16.
1 off 6SJ7—V14.
1 off MW22-17 picture tube.
2 off CG1C crystal diodes (Germanium)—V10, V11, B.T.H.
1 off CZ1 Brimistor.

Focusing magnet (Elac type R17), with long adjusters.

Variable Resistances :
R5 —2 K Ω, wirewound. Contrast.
R29—0.5 M Ω, carbon with d.p. switch. Brightness.
R40—0.5 M Ω, carbon. Volume.
R49—0.25 M Ω, carbon. Frame hold.
The above have long spindles for panel control.
R50—1 M Ω, carbon. Height.
R54—1 M Ω, carbon. Frame linearity.
R64—25 K Ω, wirewound. Line linearity.
R65—2 M Ω, carbon. Line hold.
The above may have pre-set slotted spindles.

Fixed Resistances (all Erie or Morganite)

Value	Resistance Number	
	¼ watt	½ watt
33 Ω	2	
120 Ω		53
150 Ω	3, 8, 11, 14	
220 Ω	30, 35, 71	12, 55
390 Ω		20, 42
680 Ω	62, 68	
1 K Ω		9, 15
2.2 K Ω		6, 31, 34
3.3 K Ω	1	
3.9 K Ω	10	74
4.7 K Ω	7, 17, 41	
6.8 K Ω	13, 16	
10 K Ω	23, 46, 61	
22 K Ω		26, 44
33 K Ω	38	25
39 K Ω	45	47
47 K Ω	36, 60	59
68 K Ω		21, 22
220 K Ω	43	
390 K Ω	70	
470 K Ω	51	
1 M Ω	24, 27, 32, 39	
1.2 M Ω	48	
1.8 M Ω	66	
2.2 M Ω	37, 67	78

Other Resistances (Erie or Welwyn Vitreous, 10%)

Value	Number	Wattage	Notes
42 Ω*	80	1	2 of 82 Ω, ½ watt in parallel
47 Ω	57, 58	5	Vitreous
63 Ω*	79	1	2 of 120 Ω, ½ watt in parallel
68 Ω	73	1	Carbon
350 Ω	81	5	Vitreous
500 Ω	56	3	Wirewound or vitreous
1 K Ω	75	1	Carbon
2.2 K Ω	18	2	Carbon
3.3 K Ω	72	2	Carbon
4.7 K Ω	52	1	Carbon
6.8 K Ω	19	2	Carbon
10 K Ω	63	1	Carbon
22 K Ω	33	1	Carbon
82 K Ω	69	1	Carbon
100 K Ω	4, 76	1	Carbon
220 K Ω	28	1	Carbon
140 M Ω	77		7 of 20 M Ω, ½ watt in series

R82—See Text. * Theoretical values.

Output transformer : standard pentode type, 55 : 1.
4 pieces paxolin, 8in. x 3in. x 1/16in.
10 6-way tag strips. 1 12-tag panel.
Length of coaxial cable ; 4, 6 and 8 B.A. screws and nuts ; condenser clips, few feet screened lead.
1 ⅜in. diam. polystyrene former with iron core, Aladdin.
1 ½in. diam. bakelite former less iron core, Aladdin.

Fixed Condensers

Value	Condenser Number	Notes
3 pF	6	Erie Ceramicon
10 pF	17, 55	" "
25 pF	25, 28, 29, 30, 34, 35	" "
47 pF	38	" "
100 pF	5, 9, 12, 16, 58	" "
200 pF	56	Moulded mica. Hunts, T.C.C.
500 pF	31, 39	" "
.001 μF	1, 2, 3, 7, 8, 10, 11, 18, 22, 26, 27, 32, 33, 43, 67, 68, 69, 70, 71, 72, 73, 74	" "
.002 μF	59	" " T.C.C., 350 v. Metalmite
.003 μF	45	" "
.01 μF	15, 36, 37, 42, 44, 46, 64	" "
.02 μF	4, 40, 49	" "
.1 μF	21, 23, 24, 57, 62, 75	" " 350 v. paper
.25 μF	47	" "
.5 μF	60	150 v. midget type
1.0 μF	20	350 v. T.C.C. electrolytic
4.0 μF	19, 48	" "
25.0 μF	41	12 v. electrolytic
25.0 μF	63, 66	50 v. electrolytic
32.0 μF	52	350 v. T.C.C. electrolytic
60+250 μF	53, 54	350 v. electrolytic, together or separate
.01 μF	50, 51	1,000 v. T.C.C. paper
.001 μF	65	6kV. T.C.C. Cathodray

NEW RECEIVERS

First Ace Receiver

NEW TELEVISION RECEIVER INTRODUCED TO THE HOME MARKET

ACE RADIO, LTD., recently announced their first television receiver.

Known as the Ace "Astra" (Model V18/14), it is a five-channel type incorporating the new 14in. aluminised wide-angle rectangular tube and 18 valves. It is especially designed to give good reception under fringe area conditions, being of extremely high sensitivity.

Among the original circuit features is the employment of two R.F. stages, which effectively minimise second channel and F.M. interference—an important development in view of the rapid growth of F.M. broadcasting. Interference suppression is extremely efficient, being effective on both sound and vision. A high-sound rejection characteristic prevents the sound channel from breaking through into the picture.

The Ace laboratory staff and Design Department have taken three years to complete the design and development work on the V18/14 chassis.

Specification

Eighteen-valve plus 14in. high-efficiency aluminised rectangular picture tube receiver suitable for five-channel reception. Two R.F. stages, giving adequate freedom from second channel and F.M. interference. Single-valve frequency changer feeding into I.F. stages common to sound and vision. Vision detector and interference suppressor. Power-type video amplifier. Two-valve sync. separator. One sound I.F. stage, sound detector and interference suppressor. Audio amplifier and power output valve. Eliptical speaker. Three-stage line time-base, three-stage frame time-base. Economy circuit. Fly-back E.H.T. giving 13 Kv. Front controls: Brightness, Focus, Contrast, Volume/On-Off. Pre-set controls: Frame Hold, Line Hold, Frame Amplitude, Line Amplitude, Video Noise Suppressor, Frame Linearity, Line Linearity.

The chassis is compact and of sound mechanical construction. Tube, loudspeaker and all other components are neatly arranged in one assembly, self-contained and independent of the cabinet. When necessary the chassis can be simply slid out of its housing. Despite its compactness, all the parts are carefully laid out to be easily accessible.

Cabinet Details

The "Astra" is housed in a cabinet of distinctive design. It is "proscenium" fronted, simple, elegant and free from visual distractions. Behind this "frame," the rest of the receiver is totally enclosed by a laminated wooden case, which presents a pleasantly veneered and polished surface when viewed from any angle. Besides being a pleasing break from the normal, somewhat untidy cardboard "back," it has the practical advantage of making the chassis completely inaccessible to the user while the set is in operation—an important safety device.

The aerial input socket and pre-set controls the viewer may need to adjust are neatly laid out at the rear and insulated.

For the serviceman the "Astra's" moulded back has an additional advantage in that it is removed by simply loosening four bolts, when the entire chassis is laid bare for inspection and replacements. The underside of the chassis is made similarly accessible by detaching the base panel from its frame.

The "proscenium" is finished in ebonised beech and the moulded back in Sapele and Australian silky oak.

The "Astra's" cabinet was designed by Victor Taylor, M.S.I.A.

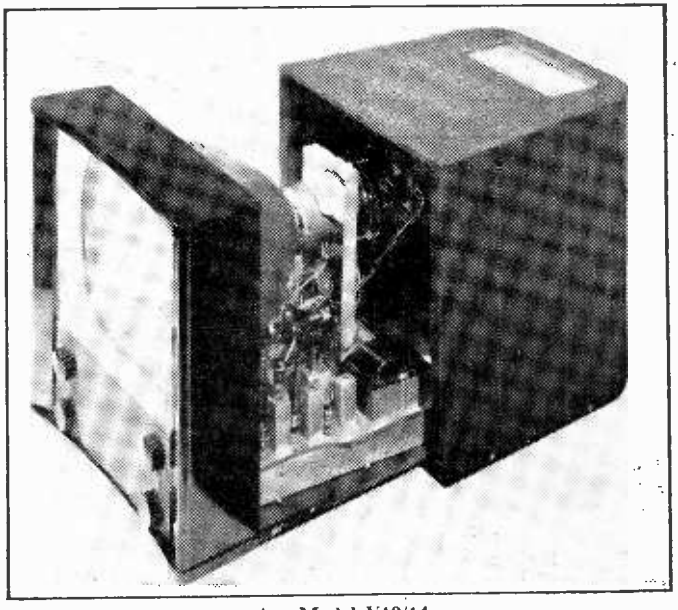
Retail price, £57 12s. 1d. Purchase Tax, £25 17s. 5d. Net price, 79½ gns.

One of the first pilot models of Ace "Astra," suitably adapted for Italian reception, was exhibited at the recent Milan fair.

Console Model

As we go to press we are informed that a console version of this receiver has been prepared and will also be on sale shortly. Known as Model V18/17, this will include a 17in. aluminised wide-angle tube and the price will be £83 6s. 8d., plus £37 8s. 4d. tax.

Full details of these new receivers may be obtained in a special television broadsheet available from the makers, Ace Radio, Ltd., Tower Works, Tower Road, London, N.W.10.



Ace Model V18/14

Dealers' Protest

TELEVISION dealers in Swansea are protesting against the ruling of the town's housing department, which wants aerials for council houses placed on poles erected at least 8ft. away.

The council is anxious that damage shall not be done to the houses, but the dealers say that the erection of a pole will add considerably to the cost of installation.

Provision is made, however, for the distance between the house and the aerial to be less than 8ft.—if it can be agreed upon at the time of inspection.

Servicing Projection Receivers

APPROXIMATELY one hundred and fifty members of the Institute of Practical Radio Engineers attended a lecture on "The Servicing of Projection Television Receivers," given by Mr. D. A. Ward, Grad. I.E.E., recently.

The lecture was illustrated by film-strips showing component parts of the optical unit and circuit diagrams of projection circuits and the E.H.T. unit.

The lecturer gave practical demonstrations of fault tracing and diagnosis from screen effects.

Presentation to Veteran

THE jubilee was celebrated in London recently of Mr. Raymond Dorrington Bangay, who is the first man to serve 50 years in the wireless industry, and is still foreign manager for Marconi's Wireless Telegraph Co., Ltd.

To mark the occasion, he was presented with a television receiver by Sir George Nelson, chairman of the English Electric Group of Companies.

Sir Noel Ashbridge, who has announced his retirement from the BBC, was also present.

Fire Danger

DAMAGE caused by fire in Britain for the first quarter of this year reached an all-time record of £8,020,000, almost £3 million more than for the corresponding period last year.

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Television." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed to: The Editor, "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

The increase is mainly due to television sets bursting into flames when left unattended. Although fire brigades are not always called in, the outbreaks are recorded by insurance companies.

The Fire Protection Association warns viewers that sets should never be left unattended after having been switched on and that electric plugs should always be disconnected last thing at night.

Zoo Programme Rests

PROGRAMMES from the London Zoo, in which viewers are introduced to animal and reptile inmates, have been discontinued until the autumn.

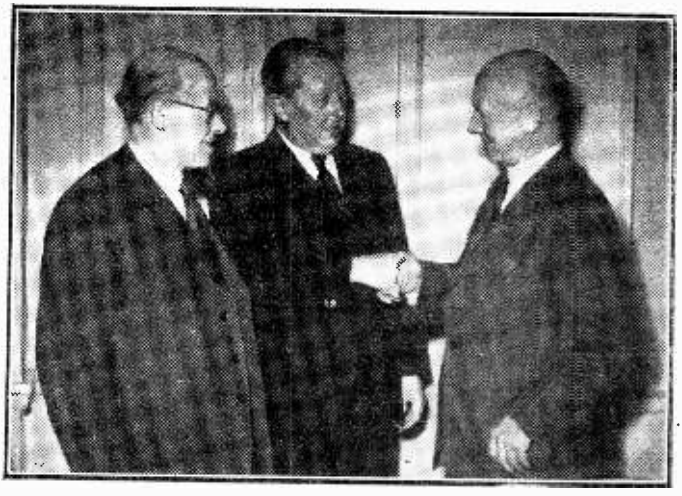
The rest is at the request of Mr. George Cansdale, Superintendent of the zoo, who also "interviews" the animals before the cameras.

Suite for Announcers

THE BBC hopes that by next year a special suite will be ready for use as a setting in which announcers can introduce an evening's programme.

It would be in the form of a small room furnished with chairs and a table and would be suitable also for discussion groups.

At the moment, announcers are televised either sitting or standing in a corner of the studio with a little scenery or cloth as a background.



Sir Noel Ashbridge (left) and Sir George Nelson (centre) photographed congratulating Mr. Raymond Dorrington Bangay at the luncheon party in his honour.

Crime Programmes

WHEN members of a San Francisco school education committee took a record of an average four-hour television programme, it was found to contain the following:

Thirteen murders, six cases of kidnapping, 14 beatings-up, three explosions, three blackmail attempts, two armed robberies and cases of theft, lynching, arson and torture.

In one edition of a children's bed-time serial, 104 gun shots were counted.

Bastille Day Celebrations

A JOINT statement from the BBC and Radiodiffusion et Télévision Françaises says that it is hoped to televise Bastille Day celebrations from France on July 14th.

Viewers in England and France would see the transmission and possibly the international soccer match as well between the French and English Olympic teams from the Parc Des Princes Stadium, Paris, on July 12th.

Manchester Show

OVER 100,000 people visited the Manchester radio show which was open to the public for 10 days.

Thirty-nine of the 48 exhibitors were manufacturers and of these 28 demonstrated television receivers. In all, there were 160 of the latter on show.

Because of the Government's decision to reduce home market production, the Radio Industries Council has decided that there will be no show in Glasgow later this year after all, but next year's components exhibition will be held from April 14th to 16th at Grosvenor House, London.

Order for Marconi

THE BBC have ordered delivery of two more medium-power television installations from Marconi's Wireless Telegraph Co., Ltd., one installation to be used as a standby at Sutton Coldfield and the other for future use elsewhere.

The order includes two 5-kilowatt vision transmitters, and two 2-kilowatt sound transmitters, with associated equipment.

Broadcast Receiving Licences

APPROXIMATELY 12,646,000 broadcast receiving licences, including 1,487,000 for television, were current in Great Britain and Northern Ireland at the end of April, 1952.

The number of television licences increased by about 30,000 during the month.

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

Increase in Wales

THERE were 430 more TV licence-holders in Wales and Monmouthshire at the end of April than in March. Total numbers then were 10,979, and radio licences, 614,916.

Film Scanner for BBC

EMITRON TELEVISION, LTD., have recently supplied a new 16 mm. film scanner to the BBC, supplementing the 35 mm. Emitron film channels already in regular use at Alexandra Palace.

Chief feature of the scanner is the continuous motion drive, the many difficulties associated with the adaptation of this method to 16 mm. work having been overcome with complete success by E.M.I. engineers. Either married or unmarried picture and sound prints, and either negative or positive films may be used, the necessary phase reversal being effected in the electrical circuits.

More West End Offers

THE success of the televising of the first act of *Reluctant Heroes* from the Whitehall Theatre has resulted in the offer of two big musical shows now running in the West-end of London for televising on a Sunday evening.

Following the Whitehall transmission, a marked leap in the takings of that theatre's box office has convinced other managements that TV can be regarded more as an ally than an enemy.

Exeter Mystery

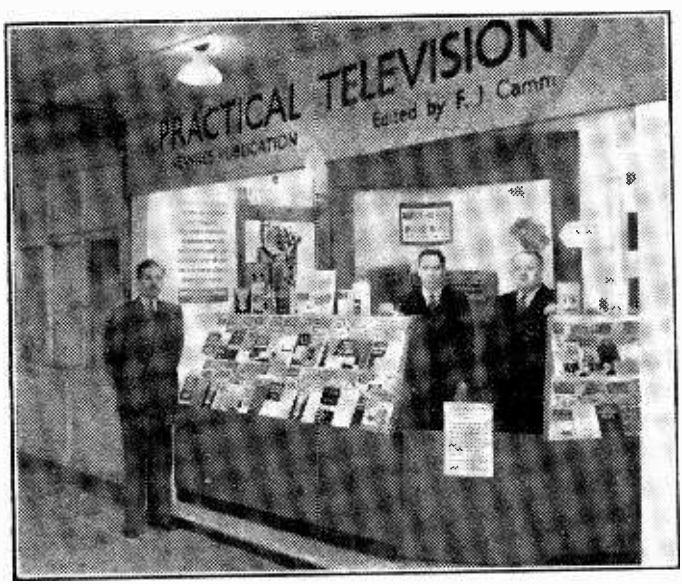
SIGNALS are being received in the Exeter area on the wavelength allotted to the transmitter at Wenvoe, Wales, yet the BBC has stated that no signals have so far been transmitted on that frequency.

It was thought at first that they might have been picked up from the Midland's transmitter at Sutton Coldfield, but this theory has been quashed by the fact that the signals have also been received outside normal BBC transmitting hours.

Detector Van's Success

AN increase is notable in the number of licences purchased since the announcement that a detector van would be patrolling streets throughout the country in an effort to halt "pirate" viewing.

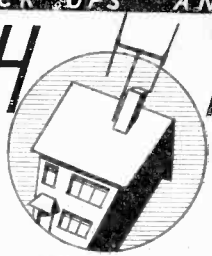
In Aldershot alone, during the first week, licence applications increased from an average of 10 a week to 50



A view of the combined "Practical Wireless"-"Practical Television" Stand at the Northern Radio Show.

TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

FIRE RISKS

THE rapid expansion of the use of film on television has made great demands upon the editing and cutting facilities at Alexandra Palace and Shepherds Bush. Until quite recently, elaborate fire precautions had to be taken because of the enormous fire risk of the celluloid base, and all cutting rooms and film vaults had to be fitted with sprinklers. About a year ago, manufacturers turned over from celluloid to non-inflammable "safety base," a change which involved radical alterations in material and the apparatus for rolling it, and the old nitrate base celluloid stock is no longer supplied. This has considerably lightened the requirements of the factory inspectors, who now permit the manipulation of safety base film under ordinary workroom conditions. Consequently, the BBC has been able to deal with the growing volume of film material without the very considerable outlay for sprinkler system, fire escapes and so forth. This will become very important when telefilm recording becomes a standard routine. I had an opportunity recently of seeing the results of telefilm re-recording made on 16 mm. film with a new type of camera designed by W. D. Kemp when he was with the BBC. This camera mechanically pulls down two frames at a time and the picture is optically split and photographed twice, thus recording both sides of the interlacing. Great precision is required to ensure registration, which has been achieved with this super 16 mm. camera which weighs about two cwts.! The results are first class, but in the meantime progress has been equally rapid with 35 mm. television recording. It is probable that 35 mm. will be adopted as standard, but that 16 mm. will also be available for special purposes. In either case we can expect that, ultimately, the quality of telefilmed repeats of plays and TV features will equal in definition and quality the original performance.

CUTTING THE CACKLE

FANTASY and satire do not come easily to the TV screen, and even the usually expert direction of Eric Fawcett failed to make a complete success of Arthur Swinson's comedy, *George and the Dragon*, about George, a simple Englishman, who encounters a dragon while on his way back from the fourteenth century Crusades, thereby saving a king's daughter. The story had many diversions and contrived situations, and went on for a very long time—one hour and twenty minutes. Arthur Wontner as the king, Brenda Hogan as his daughter, and Kenneth Mackintosh as George, all gave pleasing performances, but were unable to sustain the play, which sagged in several places. Here is a case where a few judicious cuts, amounting to about 10 minutes' playing time, might have saved the show.

Mourning Becomes Electra made a big impression two or three years ago, and its repeat performance demonstrated the progress in technique and presentation that has been achieved. This production was strong meat, and not everybody's meat, but it was certainly in the top class.

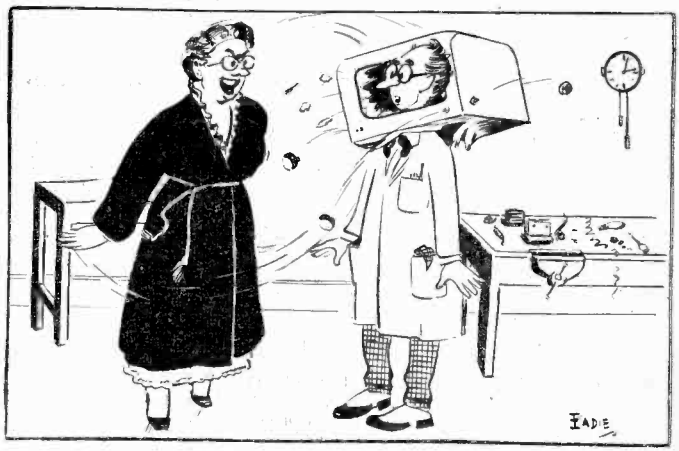
MUSICAL PRESENTATION

IT is a curious fact that, with one or two notable exceptions, presentations of orchestral musical features have not achieved very great popularity on television. Soloists—especially pianists—can be presented attractively with close-ups of the piano keyboard, reflections of the player on the polished wood of the instrument, and so forth. For years dance bands have topped variety bills, and the ingenuity of their stage presentation has won them great support throughout the country. The documentary approach, with its inevitable tracking of the television camera along rows of wood-wind players or double-basses, or the quick snap shots of jack-in-the-box players of swing or jazz, seems to be the only alternative to associating the music with pictorial vistas, scenic effects or still views of flowers. Naturally, the medium being television, one must look at something. The puzzle is—what to look at! Instrumentalists *en masse* are singularly unattractive, playing away with expressions of extreme concentration. It's not their fault, nor is it the fault of the BBC—but there must be some new way of putting them over.

SPONSORED TV

IT is a pity that the very idea of sponsored television in England induces so much wrath. The mild provision the Government has made for a possible competitive service in three years' time aroused several members of both sides of the House of

PROFESSOR BOFFIN



"Now that you are really wrapped up in your work you can stay down here ALL night!"

Lords to unusual invective. Lord Reith, one time Director-General of the BBC, condemned the scheme without reservation, and Lord Halifax, a former Governor, seemed unhappy about it. The television public, judging from my own little cross-section "galloping poll" of thirty viewers, seems strangely apathetic. The prospect of blatant advertising announcements filled some people with dismay, but they are content at the thought that if they don't like the sponsored programmes they will be able to switch over to the normal BBC programme. The whole crux of the matter depends upon the manner in which the advertising is put over; after all, many "credits" to current plays, films and managements are slipped into the announcements of present programmes and in the BBC journals Nobody seems to object to this practice.

MORE PAY FOR ACTORS?

I HEAR that the BBC have offered considerable resistance to any allocation of their studio space to a rival sponsored programme organisation. This would have enabled us to have a foretaste of British sponsored television programmes, and would have given the public a chance of forming their own opinions. Admittedly there is still a great scarcity of studios, but there is no reason at all why the initial sponsored programmes could not be made on film and "piped" to the BBC on a telephone line, thus utilising only the actual BBC transmitter. BBC policy is completely against the breaking of their television monopoly. On the other hand, the actors, engineers and technicians welcome the prospects of a competitive system, with consequent increase in remuneration. There is no doubt at all that competition will mean more pay.

THE TV CONVENTION

THE Institute of Electrical Engineers held their Television Convention in the Great Hall of the Institute of Civil Engineers. Speakers read their papers and carried out demonstrations in the adjoining library in front of a battery of television cameras, and the resultant picture was projected on a large silver screen in the Great Hall. The standard of definition was 405 lines, with spot wobble, and extremely good, though not very flattering, pictures were obtained. Most of the speakers seemed to be wearing at least a day's growth of beard, while the lines of their faces added 10 years to their ages! Lack of make-up and improvised lighting may have been the cause of this curious effect, but I have the feeling that some kind of colour distortion was taking place, since persons with red faces took on a definite dusky hue. More serious, however, was the poorness of the sound, which was well-nigh unintelligible in some parts of the hall. The acoustics of the Great Hall were highly reverberant, and the loud speakers seemed to be pointed up at the august rafters rather than down at the audience of professional electrical engineers from all parts of the world. Grim expressions on the huge portrait faces of eminent engineers of a hundred years ago, looking down upon the assembly, seemed to indicate—"Good—but not quite good enough." Let us hope that television demonstrations of such international importance will be given in auditoria specially designed for the job—such as the South Bank Telecinema.

HIGH DEFINITION FILMS

ONE of the highlights of the I.E.E. Television Convention was the first presentation of films made with Norman Collins' High Definition Process. This comprised a 10-minute film of a mannequin display, made with 625 line CPS cameras and recorded on film with slight spot wobble. In their paper on this process the authors claim that ultimately they will achieve definition at least as good as is possible with present-day optical cameras, but with much greater flexibility and sensitivity. The film shown did not achieve this standard of definition but, nevertheless, was an extremely good effort. I had an opportunity later of seeing this same film projected with a long focus lens, giving a very small picture comparative with an ordinary home television screen. The results in this case were quite astonishing, showing that even at this early stage the High Definition film process is far ahead of existing methods of recording television as used by the BBC.

TELEVISION MUSIC

CHRISTIAN SIMPSON is one of the few producers who seem to make the most of music on television. His "Music in View" was a short but worthy successor to the *Swan Lake* ballet, beautifully presented in full length. It is unfortunate that the studios used for ballet are acoustically so dead. The orchestra sometimes sounds as though it is playing in the open air. Here is a case where a little artificial echo could be introduced to give the true Covent Garden Opera House atmosphere. Special theatrical transmissions of excerpts from the comedy *Reluctant Heroes* and the revue *Penny Plain* were very well done and have had the gratifying result of increasing the box office receipts of these stage productions. It was a bold idea to televise the stage version of *Reluctant Heroes*, especially after the tremendous success of both stage and screen versions. *Reluctant Heroes* was specially rehearsed for television, and the action was modified to suit the special requirements of the television medium. The actors spoke their lines at a lower level, and whenever possible grouped themselves closer together than they do in the normal play performance. The actual television performance was given before a specially invited audience, who were forewarned about the lights, cameras and the usual television impedimenta. It could not, therefore, be classified as a straight relay of a stage play, and the amended technique was most effective. This seems to support the Actors' Equity claim that it is not possible to give an optimum performance for the two media at the same time. *Penny Plain* was an intimate revue of a type that used to be seen quite a lot on television. Max Adrian, Elizabeth Welch, Joyce Grenfell and Desmond Walter Ellis kept the fun going well.

SPECIAL EFFECTS

THE sound effects man is a dignatory of great importance in sound radio. He is important, too, in television. Additionally, there is the Special Effects man who provides pictorial effects, such as steam, smoke, rain, snow, cobwebs and "break down" furniture, which can be used for throwing at actors without injuring them. The clever use of cork, balsa wood and similar light materials replaces heavier, more fearsome missiles. The BBC are slowly increasing their range of effects, which are, on the whole, very good. But in *Swan Lake*, the materialisation of an evil spirit as an owl was not at all convincing. Special effects and trick work is a chancy business, many effects refusing to work at the critical moment. In some instances the BBC film the effects in advance, but this can only be done in situations which permit a cut from the scene to the required effect.

TV Interference with Broadcast Receivers

CAUSES AND SUGGESTED CURES

By H. H. Jay

MANY complaints are made by television users about interference with their reception and much time and money has been expended by firms and individuals in moderating this interference. Much less has been heard of the interference caused to broadcast receivers by the television equipment, possibly because the disturbance is only serious at close range. The actual number of listeners affected is small at the moment, but as the number of television transmitters increases so will the interference.

The trouble has two main manifestations. In the first, the broadcast receiver shows an apparent fall in sensitivity, increased background noise and distortion of the received signal when this is of moderate to low strength. In the second form, the set, even on strong, local signals, shows distortion and loss of quality, often accompanied by a strong whistle, resembling a heterodyne, and a high and variable hum level.

Direct Pick-up

The cause of the first form of disturbance seems to be direct signal pick-up from the transmitter. Not all receivers are affected but the constants of some input circuits seem to be such that they form an effective grid impedance at TV frequencies and so pass on a considerable voltage to the grid of the first valve. The characteristics of this stage are seldom linear so cross modulation results between the TV signal and the normal broadcast. Sum and difference frequencies are then produced of which a few pass through the I.F. stages to reach the A.V.C. and second detectors. The bias so produced reduces the apparent signal strength of the wanted programme and increases the detector distortion.

In cases where the television signal does not penetrate beyond the first grid, partial rectification can take place and this results in a symmetrical amplification of the wanted carrier.

The cure is a simple wave-trap made as a single parallel tuned circuit and wired in the aerial lead, preferably inside the set and as close to the aerial coil as reasonably possible. A simple plate screen between the trap and the main coil is usually adequate but the new coil can be potted if desired.

The dimensions and winding of the trap coil are a matter of experiment because the loading of the aerial is a variable factor. A good trial winding is six turns of 14 or 16 s.w.g. wire on a $\frac{3}{8}$in. diameter former spaced to a length of $\frac{3}{4}$in. This can be tuned by a ceramic semi-variable trimmer of 15 pF capacity. The connections to the circuit should be by the two middle turns, Fig. 1. The coil can be tuned by wiring a crystal detector in series with a micro ammeter or a pair of phones across the condenser. When set up, provide an iron core from a tuning coil and a short piece of brass rod about $\frac{3}{8}$in. diameter.

Start by varying the condenser, using a non-metallic tool. If no readings are obtained, insert the iron core a short distance into the coil and try again. A reading then indicates that the inductance of the coil is too low and the turns should be brought closer together. If no signal can be tuned with the iron core, substitute the brass slug. Success then indicates too high an inductance and the coil should be opened out or a turn removed to correct the matter.

Inductive Pick-up

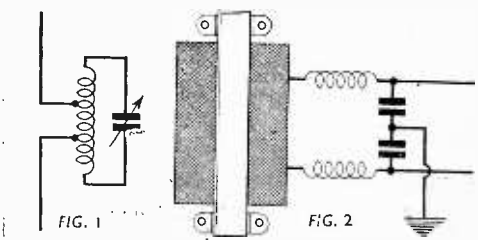
The second source of interference is the line time-base of the television set itself. The trouble tends to be most pronounced on the long waveband because some of the radiated harmonics are close to the frequency of the Light programme. The real cure for this trouble is screening of the television set, its removal to a greater distance and possibly a change in the run of the aerial feed. None of these remedies can be applied without the co-operation of the owner and when this is lacking, other palliatives must be sought.

The first and simplest device is a pair of good condensers of about .5 pF capacitance and rated for at least 750 volts working. Wire one from each side of the transformer primary to earth. The condensers may sometimes need supplementing with a pair of H.F. chokes, particularly when the receiver is of the A.C./D.C. type. Fig. 2 shows the arrangement. The chokes can be of 650 turns each of 32 to 34 s.w.g. wire wound on a $\frac{3}{8}$in. diameter mandrel. The axial thickness should be about $\frac{1}{2}$in.

Where the interference reaches the set through the aerial, the run of the lead in can be changed so as to increase its separation from the television set. Screened downlead with the screen earthed to the receiver earth can be used with advantage. The best material for this purpose is the co-axial feeder stocked by some dealers in surplus material. The screening should extend as far as possible towards the top of the aerial. After such an alteration it is wise to re-trim the first tuning coil.

Another remedy that is sometimes effective is to coat the whole of the inside of the receiver case with graphite in colloidal form. The coating should be bonded to the earth of the set and it will then provide a surprising amount of screening.

If none of the above remedies prove sufficiently effective, the receiver will have to be moved either to another part of the room or to another room altogether. The type of interference now being discussed usually occurs when receiver and television set are near to one another on opposite sides of a party wall.



Figs. 1 and 2.—Trap coil and mains suppressor circuits.

TRADE TOPICS

Television Light

A NEAT lamp for use during viewing periods has been produced by Northern Industries, and is sold under the trade name of "TeVeLite." It resembles a short column, complete with plinth and capital, and the lamp is concealed inside and thus directs its light upwards. It is designed to stand on top of the television receiver and thus enables viewing to take place without completely darkening the room—a practice which certain opticians claim leads to eye strain. The price of the lamp is 36s., tax paid, finished in gold.—**Northern Industries, Snow Hill, Bradshaw Street, Manchester, 4.**

Insulation Tester

IN response to requests from the radio and electrical trade at home and abroad Taylor Electrical Instruments have reintroduced their Model 130A insulation tester. This mains-operated ohmmeter covers insulation and medium values of resistance and is suitable for workshop tests or for routine checking of components, such as resistors, etc.

A robust moving-coil meter is used, fitted with a 4in. scale and knife-edge pointer. Two ranges are provided. the higher covering 200 KΩ to 1,000 MegΩ at a test pressure of 500 volts, and the lower covering 20Ω to 100,000Ω at a test pressure of 50 millivolts.

One of the most interesting features of the Model 130A is the press switch which is fitted for rapidly charging capacitors. The nett trade price of Model 130A is £12 15s.—**Taylor Electrical Instruments, Ltd., 419/424, Montrose Avenue, Slough.**

Stella's First Projection Television

STELLA are introducing their first projection television receiver, the ST1481A, with a special model. the ST 1481AF, available for fringe areas. Distribution will be, in accordance with Stella sales policy, through their wholesale distributors.

The Stella ST 1481A is a console model for operation on A.C. mains between 200 and 250 volts at 50 c.p.s. Consumption is approximately 200 watts. The picture size is 16in. by 12in., and the receiver is suitable for use on all channels by means of plug-in coils.

The receiver operates on a superheterodyne circuit taking in the lower vision sideband. There are interference limiters for both sound and vision channels. The sound limiter is fixed, and the vision limiter variable to deal with all types of interference. The frame and line scanning generators are of the blocking oscillator type, with a "booster" diode for the line scanning generator. Damage to the projection tube through either or both of the time-bases failing is prevented through the incorporation of electrical safety devices. A separate oscillator supplies the extra high-voltage necessary for operating the projection tube ; a voltage tripler circuit raises the voltage to the approximate 25 KV required. This extra high-voltage unit is regulated by a feed-back system. The high-voltage required is generated in a hermetically-sealed can ; through this, and the careful design of the connection of this high-voltage to the projection tube, the dangers usually associated with extra high-voltage supplies are eliminated. Electro-magnetic focusing and deflection of the cathode ray tube are used. There are four controls :—

1. Brightness.
2. Focus.
3. Sound Volume and On/Off Switch.
4. Contrast.

The Schmidt principle is the basis of the reflective optical system through which the very bright image is enlarged and projected on the flat viewing screen. Improvements in the screen give brighter pictures which can be seen from wide viewing angles. Good contrast in the television picture is maintained even under conditions of high ambient illumination.

The chassis is constructed to allow accessibility and speed of service ; it is easily and quickly removable from the cabinet.

The cabinet is walnut, with doors to protect the screen when not in use. Dimensions : high. 41⅜in. ; wide, 23½in. ; deep, 22in. Price : 158 gns. (including P.T.).—**Stella Radio & Television Co., Ltd., Oxford House, 9-15, Oxford Street, London, W.1.**

New Brimar Germanium Diode

THE Brimar GD4 is a high-quality diode which, together with the GD3, were the first to be designed specifically for the commercial side of the radio industry.

Produced particularly for noise limiter use in television receivers, where the peak inverse voltage rating is as high as 50 volts, this diode can replace the GD3, should the latter's lower voltage handling capabilities and lower back resistance be inadequate.

The special treatment of the Germanium surface and the design of the catswhisker in this new diode make it suitable to stand up to severe mechanical shock ; it is extremely well sealed in a ceramic tube, and will not deteriorate under changing climatic conditions.

Small in size (about that of a half-watt resistor), the diode can be suspended in the wiring, thus aiding the reduction of stray capacitances. Damage during the soldering of lead wires is practically eliminated by the employment of special wire which, while possessing low electrical resistance, has the added advantage of low thermal conductivity.

Comparative characteristics of the GD4 and GD3 are given below :

CHARACTERISTICS AT 20°C.			
Type	Max. forward resistance at +1 volt	Min. reverse resistance at −10 volts	Max. peak inverse voltage
GD4	350 ohms	250,000 ohms	50 volts
GD3	350 ohms	50,000 ohms	25 volts

English Electric Co., Ltd.

THE London Section of the Publicity Department of the above company is now located at Marconi House, 336/7, Strand, London, W.C.2. Telephone No. : Temple Bar 1577.

B.T.H. Headphones

THE list price of Ediswan BTH type headphones has been increased from 39s. 6d. to 45s.—**The Edison Swan Electric Company, Ltd., 155, Charing Cross Road, W.C.2.**

K.-B. Price Increases. T.V. Unchanged

DUE to increases in the cost of labour and piece parts, following the recent engineering industry wage awards, several models have been increased in price, but all prices for television models will remain unchanged.

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).

RADIO SHOW DISAPPOINTS

SIR,—I visited the Northern Radio Show and should like to say that from the point of view of the amateur designer and constructor it was very disappointing indeed and practically useless. There were very few component manufacturers exhibiting, in fact the four that I specifically went to see did not appear to be represented.

I was rather amused, on walking through what is termed "TV. Avenue" just before the transmission started when all the sets were switched on, to find that with practically no exception every set had from one to six bright lines shown on the screen. To me this indicates a self-oscillation defect associated with linearity or similar troubles which the amateur constructor runs into, particularly in the course of endeavouring to get high E.H.T. and ample scanning, but, of course, usually overcomes.

I can only say how surprised I was to see that sets exhibited by most of the reputable manufacturers exhibited these defects so plainly.—G. T. LAYTON (Urmston).

GRID CABLE INTERFERENCE

SIR,—With reference to reader R. H. B., of Dalton, regarding infrequent crackling noise in the sound, accompanied by shooting black lines across the picture (May issue correspondence), I also have similar trouble with my commercial receiver. The cause was traced by the G.P.O. Technical Officer to faulty insulation of grid system cables. These cables are linked to pylons on some of the highest ground near Dalton. It appears that during periods of rain, low cloud conditions, etc., electricity short circuits to earth via the pylons.

I suggest that R. H. B. contacts the G.P.O., a form for this purpose can be obtained from any post office.—F. BURGESS (Dalton-in-Furness).

"QUALITY" RECEIVER?

SIR,—Since returning to this country in the middle of 1951 I have been a regular reader of "P.T." During this time we have seen several designs and modifications all aiming at television for the minimum outlay. Could we, for a change, have a design that aims at the maximum efficiency regardless of the cost? Constructional details would not be necessary for I feel that persons interested in such a design would be experienced engineers. Such a receiver could be the ultimate in design, incorporating not only high R.F. and I.F. gain but refinements for the future such as switchable line frequency. Surely here is a chance for your design department to really "go to town."

With such a receiver in mind could you include a technical article on Continental television giving such details as transmission frequencies, time base frequencies and any differences in sync technique? There must be many persons in southern England who would like to try the continental programmes as an alternative to our own.

One further point. I have seen no reference to the use of amplified A.V.C. as a method of combating fading due to reflection from aeroplanes. Are there any drawbacks when using this at television frequencies providing a high gain receiver is used?

Hoping these points may provide the ideas for some future articles and thanking you for an excellent journal.—G. K. ALLISSTONE (Northampton).

[*What do other readers think of this suggestion? Would such a receiver be popular among keen experimenters? An article on "flywheel sync" appears in this issue.*—ED.]

COLOUR TELEVISION

SIR,—Regarding the continual and mild "High Definition versus Colour Television" controversy, my own feelings are that the first stage in the development of television is to ensure the modest coverage of the present 405 line system with all the requisite local low power transmitters. Then, and only then, an experimental system should be gradually introduced which will initially provide a monochromatic picture of 800 to 1,000 line definition. Then at a later date colour could be introduced but in such a manner as *not to interfere* with the reception of black and white pictures by receivers intended *only for that purpose*. At a later date still, stereoscopy (and stereophony) might be added.

The main feature of my proposals for the post-405 line era is that at any stage in the development *no modification* is made to existing gear to introduce colour or stereophony, *only additions* for those who want the extra facility. I think this is a good general principle.—S. COSGRAVE (Camberley).

READERS' EXPERIENCES

SIR,—You invite us, your readers, to write our experiences with television.

As you may guess, one could write a lot after nearly four years' viewing. But I will cut it as short as possible.

I purchased my receiver in August, 1948, and have had little trouble, except teething trouble at the beginning. My agent was not helpful, so I contacted the makers by letter and 'phone and on their stand at the exhibition, and they were very helpful. The trouble then was shrinking of picture top and bottom which, in my amateur way, I felt was wrong as it needed adjusting many times during an evening. The picture was slow (about ½ hr.) to open full height when switched on. After having set away (7/6 a time) on two occasions it was reported O.K., which proved untrue. After coming back a second time and before the car-man had left the road the picture disappeared and left a bright screen and no sound. Then, on third time away, they told me two valves EL33 had gone and new ones were fitted. Unfortunately the guarantee had run out while I was complaining.

That put right the picture and started flutter from dark to too bright in rapid succession, so I called in another engineer, who was baffled and I suggested a breakdown of resistor. This he replaced in the brilliance circuit with new brilliance control (the resistance, I believe, is 1,000 Ω and when replaced he added 0.5 MΩ to it).

Lines O.K., but then the picture started to break up; this happened within a day or so. When he called he discovered the EL38 was faulty. I myself bought a new one, replaced same and set-up the picture. Since then I have had no trouble until the bad weather, with snow which pushed my aerial down out of straight, which I managed to push up again, from my window.

Then I experienced a different flutter, bright to dark, which baffled me. It seemed to correspond to the gusty wind that was blowing, so in daylight I examined aerial and found that the down-lead was adrift from the wall

and floating very near to the dipole bottom half. Securing the lead again, the trouble has not recurred.—W. W. PARSONS (Walthamstow).

SIR,—I am astonished to read of the heavy replacements apparently necessary on commercial sets and I wonder whether I am lucky—or enjoying the benefits of home construction.

I constructed mine nearly three years ago and used nearly all ex-Service equipment bought as cheaply as possible, except the 12in. tube (which is not aluminised or fitted with ion trap), scan coils and two T41s. The EF50s looked badly mangled so I bought two extra.

The set is on almost all the hours of transmission, yet no valve has failed and the tube (fitted with neutral filter) is as bright as ever and quite unblemished. The performance compares still with any 12in. set that I have seen and far surpasses many.

Only one thing mars its performance at intervals—the EF50 valveholders develop an oxide on the contacts that reduces the sensitivity and bandwidth so they have to be scraped at intervals of 6-8 weeks.—G. H. BALL (South Harrow).

COMMERCIAL SERVICE SHEETS

SIR,—With reference to your aricle on page 531 of May, 1952 issue, entitled "TV Maintenance Costs." This is where you could help your readers for it is a fact that it is not the initial outlay so much as the cost of maintenance that deters so many from buying a television set. There must be thousands of viewers like myself with sufficient knowledge to be able to follow a Service Manual of the set we possess and locate a normal fault, at the same time being aware of the danger of a shock and how to avoid same.

I have applied twice to the manufacturers of the set I own for a service manual of that set *on payment*, but they refuse to supply one. Why? The answer is apparently that they do not want the public to know too much about their own sets; they want them to be at the mercy of the trade, as in the case of your reader who had to pay for 16 valves and one C.R.T. in two years—ridiculous.—L. R. (S.E.23).

STEREOSCOPIC TELEVISION?

SIR,—I enjoy reading the letters in your interesting periodical, and I am sure the following remarks can form the basis of a constructive argument.

It concerns stereoscopic television, and while it is obvious that one can go to some lengths in this interesting topic, I will try to keep this letter as brief as possible.

Most of us are conversant with the stereoscope popular many years ago with its two eyeglasses and two views, followed by the bi-coloured print and the tinted-lens spectacles. Then came the polarised lens method. The principle I would like to describe differs from all the others inasmuch as it allows an audience to view without any mechanical aid as used in the other methods.

I understand that when the BBC High Definition TV Service started, owing to the cameras being insensitive in bad light, that the depth of focus was very narrow as the lens was being used at its highest speed (largest "f" number). This "snag" can, I think, be put to good use.

Supposing, as an example, that the scene being televised was a stage set (actually the easiest, of course!). The usual method of camera focus we will ignore for the time being. The highest-speed lens obtainable is being used (resulting as I have mentioned in a very narrow depth of focus—this is important). During the transmission the lens is reciprocated backwards and forwards at a constant speed (frame speed, for instance). We could call that "distance scanning." At any given time some part of the stage will be in focus. At the receiving end the most difficult part of the system must be catered for—putting the picture back into its correct position! Most of us with "electronic" minds detest having to use mechanical methods (say a reciprocating screen in conjunction with a wide-depth-of-focus projection tube). Perhaps someone can suggest something—or why it will not work, or perhaps we ought to leave it to discussion.—A. V. TOMLINSON (Goole).

News from the Clubs

British Television Viewers' Society

MEMBERS of the British Television Viewers' Society attending the monthly meeting in Croydon heard a brilliant talk given at very short notice by film and television actor, Basil Appleby.

The speaker referred to the great advantages obtained from acting at the spacious Lime Grove studios as compared with the cramped conditions prevailing at Alexandra Palace. He also spoke on the merits of the new studio cameras in use to-day.

Part of the meeting was taken up by a discussion on sponsored programmes and other matters: also during the evening members were enabled to hear recordings of the speeches made at the Society's annual dinner..

At a previous meeting members heard a lecture arranged by the technical section of the British Television Viewers' Society, the speaker being Mr. G. J. Clack, a technical representative of Bush Radio, Ltd.

Several Bush television and radio sets were to be seen and heard in operation during the evening, and the lecturer gave a fascinating and instructive talk in lucid terms on such matters as the correct viewing distance in relation to eye-strain, the composition of the television picture and projection television: he also answered questions relating to receivers generally.

The Television Society

MR. ERIC ROBINSON, television's popular conductor, has, by a unanimous vote of the Council of the Television Society, been awarded the Society's silver medal for the year's most outstanding achievement in television.

Eric Robinson has been conducting for television for four and a half years, and originally joined the orchestra in 1935. During this time he has worked with all the ballet stars of the day and has taken part in programmes ranging from opera to all types of variety.

The Television Society's silver medal was inaugurated in 1948 to acknowledge outstanding artistic contributions to television technique, and in selecting the recipients the Society shows preference for artists or others who have not already made a reputation.

Previous winners of the silver medal were:

1948—Mr. George More O'Ferrall.
1949—Mr. Algernon Blackwood.
1950—Miss Annette Mills.
1951—Miss Joan Gilbert.

The medal was presented to Mr. Robinson by the President of the Society, Sir Robert Renwick, Bt., K.B.E., at the silver jubilee dinner.

HANNEY OF BATH offers: Viewmaster, complete kit, to designer's specification, **£31**, or may be purchased in stages at prices detailed in our current list. WB200, **18/6**; WB101, **6/-**; WB102, **18/6**; WB103, **42/-**; WB104, **15/6**; Frame Trans., **25/6**; Line Trans., **32/6**; Scan Coils, **33/3**; Focus Rings, **22/6**; Width Control, **10/-**; Boost Choke, **5/9**. Westinghouse Rectifiers, 36EHT100, **29/5**; 36EHT45, **22/6**; 36EHT50, **24/10**; 14A86, **20/4**; 14D36, **11/7**; WX3 and WX6, **3/9** each. Bulgin Kit, **13/6**; Morganite Resistors, **35/3**, or type "T" **6d.** each; type "R" **8d.** each; type "Q" Pots, **5/-** each; 6 Colvern Pots, **22/6**; CIR 901, **3/3** each; CLR 4089/22, **6/4** each. T.C.C. Condensers, complete kit, **£7/7/-**, or any single condenser sold separately; price as per instructional manual. Wearite Coils for all channels, including Wenvoe, **30/-**, including choke. Constructor's Envelope for all channels, inc. Wenvoe, **7/6**. Complete set of BVA Valves to specification, **£12/10/4**. Cathode Ray Tubes, 9in., Mullard MW22-16-17-18 and Mazda CRM92, **£13/13/8**; GEC 6504A, **£14/16/5**; 12in., Mullard MW31-16-17-18, **£18/4/10**; Mazda CRM121A and 121B, **£18/4/10**; GEC 6705A, **£19/7/8**. Regret no C.O.D. on Tubes. Wireless World TV Receiver, set of 20 coils, all channels, **45/-**; Formers for these coils are also available, also Pots, Resistors and Condensers as specified by the designer. Send 6d. for our current list which gives details of Components for "Viewmaster" "Wireless World," "Electronic Engineering," "Practical Wireless" and "Practical Television" TV Receivers. Take advantage of our large stocks now and save yourself time and trouble. Goods sent C.W.O. or C.O.D; all goods post free over £2, but 2/- is added to all C.O.D. orders under £5. L. F. HANNEY, 77, Lower Bristol Rd., Bath. (Telephone: 3811.)

50 SECONDHAND Televisions always for sale; famous makes. TOMLINS. 127, Brockley Rise, Forest Hill, S.E.23. (For. 5497.)

DIRECT T/V Replacements, 134-136, Lewisham Way, New Cross, S.E.14. Tideway 3696. Is a pool of T/V components for most makes of sets. Please send 4d. stamps for list. P.T.3.

WINWOOD FOR VALUE.—New, boxed Valves, EF91, EB91, 6V6, 5Z4, 6K6, 6X5, **9/-** each; Red EF50, **11/6**. Special offer, 6U7 (6KT), 4 for **18/-**; Battery types, 1T4, 1S4, **7/6** each; 1S5 1R5, 3V4, **9/6** each; 6K8, ECH35, KT61, 12K8, 12Q7, 35L6, 50L6, 35Z4, **10/-** each. V/cntrls, all values, **2/9**; W/sw, **4/3**. Fresh stock 500v Condensers, 8 mfd, **2/6**; 16, **3/6**; 8 x 8, **4/-**; Spkrs., 5in., P.M., **11/6**; list stamp. WINWOOD, 12, Carnarvon Rd., Leyton, E.10. (Post only.)

"VIEWMASTER" TV aligned at your home. Write R. MORTERS, 72, Cranwich Rd., London, N.16.

STOCKTAKING sale of guaranteed new boxed Valves; "Viewmaster" Valves, as specified, comprising 5, EF50, 1 6P25, 1 KT61, 1 EBC33, 1 EB91, 2 6K25, 1 6P28, set of 12, special offer, **£6/2/6** (postage and insurance, 2/-); PL38, PZ30, **18/6**; EY51, **14/6**; 6P25, 10C1, 6C9, ECH42, X78, ECH21, ECH35, X61M, **13/6**; 10P13, 10LD11, 10F9, 6F15, EC91, ECL80, **12/6**; 50L6GT, UL41, UF41, UBC41, **10/6**; AZ31, 5Z4G, UY41, U404, UU9, APV4, **10/-**; 6V6GT, KT61, **9/6**; miniature all-dry battery types, 1S5 (DAF91), 1R5 (DK91), 1T4 (DF91), 3V4 (DL94), **8/6** each; EF91, 6AM6, 6F12, Z77, EB91, 6AL5, **8/6**; 7Y4, 7C5, 7C6, 7B7, 7H7, 7S7, **7/6**; EF39, EF8, KT2, EF50, **7/-**; 6K7G, HVR2A, **6/3**; 9D2, **4/6**. Postage and packing 4d. per valve extra: c.w.o. READERS RADIO, 24, Colberg Place, Stamford Hill, London, N.16.

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

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WANTED, Valves, small or large quantities, 6K8, 6V6, 5Z4, 6AC7, 1R5, 1S5, FW4/500, 6Q7, 12K8, 80, VU39, EBC33, 3S4, etc., etc. Prompt cash. WM. CARVIS, 103, North Street, Leeds, 7.

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. If a postal reply is required a stamped and addressed envelope must be enclosed.

FEEDER PROBLEM

I have a small problem which I hope you will be kind enough to solve for me. My set is a Murphy V116 connected to a standard dipole aerial by 18yd. of balanced twin feeder. This gives very good results, with the exception of a fair amount of ignition interference.

In the December issue of "P.T." I saw an account of a new 20ft. tilted wire aerial to reduce this trouble. I obtained one and replaced my twin feeder with 50-ohm co-axial as per instructions. The results were very poor, low signal strength and four ghost images. I suspected a mis-match at the receiver end, and explained the matter to the suppliers, who say the aerial is faulty and have requested me to return it, also informing me they will not be able to replace it for a considerable time.

I now have a 50-ohm co-axial feeder which will not match either my set or aerial. In various issues of "P.T." I have noticed you mention a coupling coil or transformer, but details are not clear enough for me to make one.

Will you please inform me :

(a) Diameter of former ?

(b) Number of turns and spacing ?

(c) Are the coils wound one over the other transformer fashion, or end on end ?

(d) Shall I require two coils, one at the set end and one at the aerial end ?

My set has no earth connection and has a co-axial aerial plug. The results with the 50-ohm co-axial cable and dipole aerial are poor quality, strength and one ghost image.—L. Stoakes (Woodford Green).

The 50-ohm cable should match sufficiently well into the Murphy receiver and also to a standard dipole directly, and there seems no objection to its use in the normal manner. The use of a matching stub or transformer is not justified in these circumstances.

"PREMIER" FAULT

I have recently built the "Premier Long Range Magnetic Televisor," and for a short while had good results.

In the middle of a programme, however, the picture broke up, with a sharp click, and the raster completely disappeared. I have thoroughly overhauled the time-bases and found that the frame oscillator transformer secondary winding was shorted to earth. I have renewed this component, but can only obtain a 2in. vertical raster, without any sign of modulation. The sound is O.K., the vision signal can be heard on the 'phones, but a machine-gun-like rattle persists, which increases in rapidity as the width control is turned up.

All voltages have been tested on an Avo universal meter, and found to be O.K. I am unable to test E.H.T. voltages, however.

When the sound output valve is removed, the rattle appears to be in the line output transformer and the mains transformer. Both these components have been tested for continuity. The rattle ceases upon removing the anode caps of the E.H.T. voltage doubling valves.—George Naylor (York).

The shorted frame oscillator transformer may have damaged some other component or valve before you removed and replaced it, and so you should now check all components immediately associated with this part of the circuit, particularly the valves in the frame time-base. The rattle you are hearing comes from the frame oscillator stage and denotes that the H.T. line is being modulated in some way. Check on the H.T. rectifier and all smoothing condensers.

SURFACE CHARGE

I have a Marconi Model VC73DA which is twelve months old. There have appeared on the screen two blank spaces on the horizontal corners, which move to vertical corners, sometimes when set is switched off. There has also appeared a ghost image. Picture is very unstable, needing adjustment of horizontal hold. Can you explain cause of blank spaces ?—A. Keight (Birmingham).

The blank spaces you mention are probably areas of charge on the screen, and the beam is deflected away from these areas occasionally, so giving an area without picture. You should clean the tube face thoroughly with a dry cloth and the effect will probably disappear.

If the horizontal hold is very unstable, a fault exists in the line oscillator stage or in the sync separator feeding it ; you should check on the valves concerned and on the coupling components between the above stages.

SYNC TOO STRONG

I have converted the 3084A receiver as described in the March issue, and then used the compact television circuit from the EA50 onwards for time-bases, etc.

After a few adjustments a good picture was received, but I have one fault I am unable to remedy. The picture is cut off or folded over on the right-hand side. This can be switched to the left-hand side by the use of the line hold.—S. R. Fowler (Harrogate).

An excessive fold-over on the line scan which can be moved about by the hold control is usually caused by an excessive sync signal at the line oscillator ; you should therefore try the effect of reducing the input to the line oscillator by tapping further down the grid input divider resistances.

VIEWMASTER—SMALL PICTURE

I have recently completed my Viewmaster, which has been aligned using a signal generator. I am using a Mazda 12in. C.R.M.123 and I have made all the modifications as suggested in the Viewmaster booklet. After making the modifications I found that I could not fill the screen area from top to bottom. I have since increased R61 to 1 MΩ and decreased R60 to approx. 300,000 ohms. I find that I can now fill the screen area, but the top is stretched, the bottom is cramped, the left-hand side stretched and the verticals bulge towards the right-hand side of the picture. I tried the following, but with very little change :

1. Changed the 6P25s about.
2. Reversed the mains plug.

I have noticed that the 250 μF condenser G51 is dented in two places. Is it possible that this has lowered the capacity of the condenser, and thus cramping the bottom of the picture ? I can get a perfectly proportioned

picture, but then the top and right-hand side are short by about half an inch. As I am a "beginner," could you tell me where to look for the troubles and give me your suggestions for possible remedies?—E. Sutton (Nr. Bolton).

As you have a low line and frame scanning amplitude, it may be that your H.T. supply is low, possibly due to a low mains voltage. We suggest checking the voltage at the output of MR4 or the smoothing choke and comparing to the value specified in the Viewmaster booklet; if this is appreciably low then it may be necessary to either use an auto-transformer to step up the A.C. input voltage, or if the A.C. input voltage is correct, then the fault may lie in rectifier MR4, which may have too high a resistance. If the H.T. supply is correct and the frame amplitude is still low, then it may be due to incorrect bias on V12, which would cause both the low amplitude and non-linearity; we suggest checking voltages in V12 circuit and adjusting R65 and R66 until linearity is correct.

To improve line linearity, we suggest reducing the value of R46 to 47 KΩ and connecting in series with it a variable resistor 0.1 MΩ resistance adjusting this for best linearity.

INTERFERENCE

I should be very grateful for your help in regard to my Vidor Model CN4212 12in. console televisor.

I live on a main road, and am troubled with both ignition and electrical interference. Whilst this set is excellent on vision, the limiter working very well, the sound is very noisy, almost a continuous sound somewhat like "frying bacon," and when some types of vehicle go by it sounds almost like a miniature machine-gun. I find this very irritating, much more so than vision interference, and at times find it so troublesome that I have to switch off. I have had my dealer in and all he says is that in this particular make the sound circuit is not very well suppressed. My neighbours have televisors working under similar conditions (all of different make from mine), and whilst mine is much better on vision, none of them get *any* interference at all on sound.—P. Hindle (Buxton).

The sound limiter on the Vidor CN4212 is a conventional type of circuit, and should be reasonably effective in cutting interference. It appears from your remarks that the circuit is at fault somewhere, as the breakthrough is excessive, and your dealer is not justified in stating that the circuit is not sufficiently good for the job. You should check on the valve and circuit components concerned, and also ensure that the sound receiver itself is accurately tuned, as it is essential that the pulse characteristics of the interference are retained right up to the detector. Mistuning or too narrow a bandwidth in the sound receiver will cause integration of the pulses before they reach the limiter, and the latter will then be unable to suppress them effectively.

FEEDER LENGTH

In none of your articles appertaining to aerials have you mentioned the most effective length for feeder cables to give a maximum signal current across the coils.

My friends and I believe this to be most important, especially in fringe areas. Theoretically, we are assuming an odd $\frac{1}{4}\lambda$ would give best results, starting at, say $5\frac{1}{4}\lambda$. Are we correct in this assumption or should it be any number of $\frac{1}{4}\lambda$, starting at 1λ? We have found no reference to this point in any text books.—G. R. Whitehouse (New Malden).

Feeder length is not important apart from attenuation, and normally should be as short as possible. You can put a parallel $\lambda/4$ stub made up of the cable in parallel with the input to the set and tune the reactive component of the input impedance out if you wish, but only if the signal is very weak is this worthwhile.

FAULTY VIDEO STAGE

My Philips Model 383A has developed a fault during the past couple of months. When switched on I get a picture every time but suddenly the screen goes blank. Should I use more brilliance? All that is seen are white diagonal lines. This happens within a few minutes of switching on generally, and keeps recurring at regular intervals until the set has been on for about an hour, when it just disappears and the picture remains normal. Some evenings the trouble is very persistent, yet on others it may happen once or even on a few occasions not at all. At times the picture goes and reappears before you can touch a control, whilst at others it is a hit stubborn. The method I find which mostly gets back a picture without too much delay is more brilliance, plus more contrast, plus the flicking of the room lighting switch. Perhaps you can tell me if this is harmful. The only other fault is the fact that my width control only acts up to a point and so the picture is always a bit elongated though very little. I may add that when the picture is on the screen it is a very good one.—H. G. Tiltman (Stanmore).

It appears that the video stage is at fault in your receiver, and so you should try replacing the valve or changing it over temporarily with a similar one from another part of the circuit. If the trouble persists, check on the components associated with the stage, from the detector to the tube control electrode; an actual fault may not be apparent, but an open-circuited bypass condenser could lead to the effect. The cathode and grid circuit is the most likely place to look for the fault.

USING AN ALUMINISED TUBE

I have recently started building a Viewmaster and have now got to the stage where I must decide on the type of C.R. tube to be used. My choice lies between a 12in. aluminised tube or a 16in. English Electric metal tube.

I notice a mention of a modified circuit for aluminised tubes in the May issue. I should be grateful if you would give me details of this circuit or where it was published.

Regarding the 16in. tube, (a) is the Viewmaster capable of giving adequate interlace, etc., and (b) what modifications and replacements would I need for the standard Viewmaster circuit?—T. W. Moore (Edgbaston).

Aluminised cathode ray tubes may be used very satisfactorily with the Viewmaster if an EHT boost circuit is adopted.

Work is proceeding on modifying the Viewmaster for use with 16in. cathode ray tubes, though it is not anticipated that details will be ready for publication for some while, due to difficulties in obtaining suitable scanning components. New scanning coils, line and frame transformers, and possibly line amplifier valves will be required.

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