MODIFYING RECEIVERS FOR KIRK·O'SHOTTS

PRACTICAL TELEVISION

AND TELEVISION TIMES

1/-

EDITOR
F. J. CAMM

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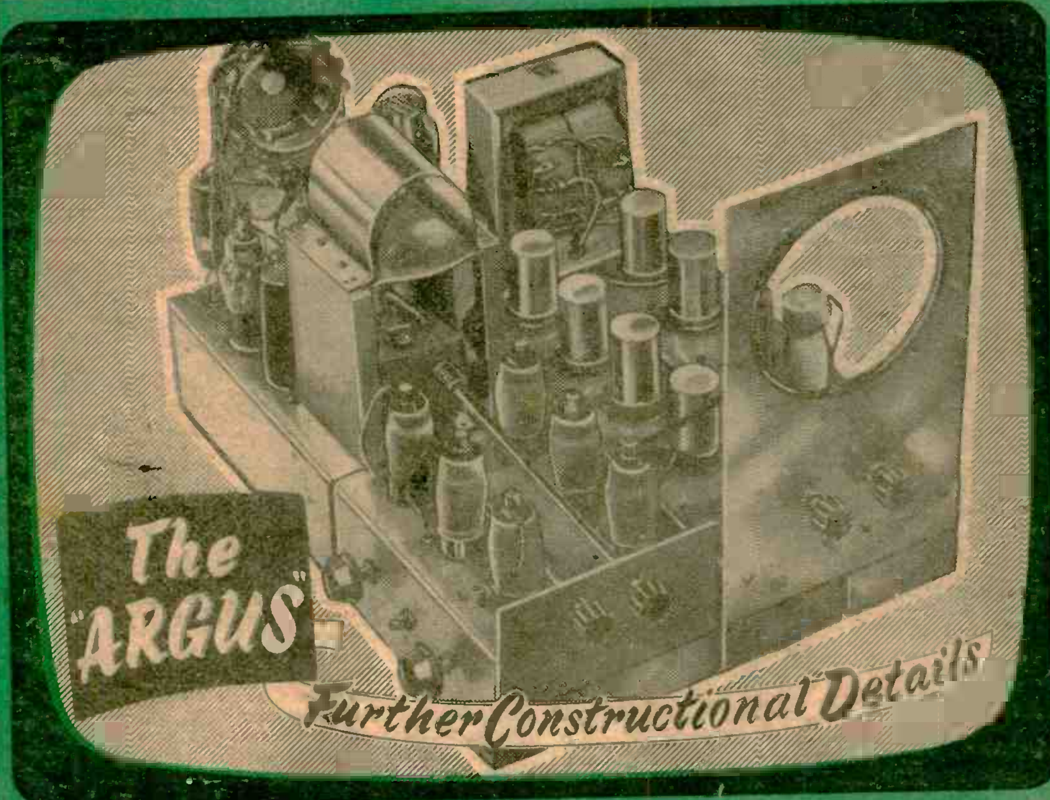

FEATURED IN THIS ISSUE

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Aerial Matching
Interference Limiters
A Boom in Documentaries
Tracking Down Pirates
Time Base Synchronisation

PRACTICAL TELEVISION

& "TELEVISION TIMES"

Editor: F. J. CAMM

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Televiews

Colour Television or Black and White?

IT will be agreed that the existing black and white television service can be improved by the use of better equipment, but the financial position does not permit the BBC to embark on the considerable expenditure necessary to effect this improvement. Manufacturers are debating whether further improvements should be concentrated on colour television to the exclusion of black and white television. Improvements in the black and white pictures would undoubtedly pave the way for colour television, and the use of electronic scanners for the superimposition of the three primary images must at present be ruled out, unless some auxiliary device can be used to ensure registration.

Up to the present time there has not been any practical demonstration of a receiver incorporating a tricolour tube which also incorporates such auxiliary registration on a full definition picture.

Problems connected with colour television are numerous and involved, but by concentrating on them, even on a laboratory experimental basis, must result, in any case, in an improvement of the black and white transmissions.

There are those who feel that experiments in colour television should proceed simultaneously with those in black and white. The problem in connection with the colour transmissions is to evolve a system which will provide a satisfactory service to viewers who possess receivers which at present are only capable of reproducing a black and white picture. There is plenty of room for improvement in the black and white system in this country, particularly in the direction of overcoming reduction in the signal strength at the upper end of the frequency range; camera technique is also in need of improvement, notwithstanding the turret lens cameras with which the Lime Grove studios are equipped. Whilst acknowledging that these have effected a considerable improvement, there is still need for electronically-controlled cameras so that too much reliance is not placed upon the skill of the cameraman.

Everyone knows that considerable financial resources would be necessary to develop colour television and that these are not available at the present time, even though the industry is prepared to embark upon the work. Colour television must, therefore, remain for at least ten years a possibility and a subject for development by private enterprise. On the whole it is our opinion that it would be unwise at this stage to embark upon colour television.

It is by no means certain, for example, that the cathode ray tube as it exists at present is the ultimate in television reception. Projection television, for example, may ultimately replace the glass tubes, and colour technique would be vastly different for such a system.

THE GROWING RISE IN EHT VOLTAGES

PICTURE brightness is improving as a result of design changes permitting higher EHT voltages. At present anode voltages are 8 kV. for 9in. tubes, 10 kV. for 12in. tubes, 14 kV. for 16in. tubes, and 17 kV. for 21in. tubes, whilst for projection TV EHT voltage is approximately 25 kV. The practice at present is to obtain EHT from the line flyback.

Screen sizes also are being increased, although the length of the tube is not suffering a similar increase. This is made possible because tube designers are increasing the angle of deflection of the electron stream from 50 deg. to 70 deg.

THE 1952 RADIO SHOW

THE 19th National Radio Show will be held at Earls Court from Tuesday, August 26th, to Saturday, September 6th.

The northern radio show which is to be held at the City Hall, Manchester, will be opened at 12 noon on Wednesday, April 23rd.

The radio components show will be held at Grosvenor House, London, from April 7th to 9th.

GREAT DEMAND FOR THE "ARGUS"

MANY thousands of Argus receivers are at present in course of construction as a result of the free blueprint presented with every copy of last month's issue. We regret that in spite of a greatly-increased print order the issue went out of print on publishing day. We have, however, made arrangements to re-print the blueprint and the articles detailing its construction.—F. J. C.

Time Base Synchronisation

PULSE SHAPERS, INTERLACE AND OTHER CIRCUIT DETAILS EXPLAINED

By Gordon J. King

THE composite picture and synchronising signal is fed to the input of the synchronising separator stage, which should—for successful synchronising—completely eliminate the vision content, leaving only the sync pulses such as shown in Fig. 1 (a) and (b).

Both line and frame saw-tooth oscillators are synchronised by these pulses, which ensure that neither line scan nor frame scan last too long—and keep the electron-beam in the receiver picture-tube exactly in step with that in the television camera.

The sync pulses initiate the commencement of frame and line flyback. They are thus radiated at the finish of each frame and line scan respectively. The repetition rate of the former being 50 per second and that of the latter 10,125 per second. Usually about eight frame sync pulses are radiated collectively to form the frame sync signal.

Obviously then, in order to supply either saw-tooth oscillator with its appropriate sync pulses a means is necessary whereby the line and frame pulses may be separated from each other. A popular method of achieving this function is to feed the line time base from the sync separator through a differentiating circuit and the frame time base through an integrating circuit.

The Differentiator

Essentially, a differentiating circuit is a "high-pass-filter"—comprised of a resistor-capacitor coupling. By its inclusion not only are the relatively high-frequency line sync pulses conveyed to the line-generator with little attentuation, but they also undergo a shaping process, necessary for correct "firing" of the line generator. The action of such a circuit is fairly straightforward and may be readily understood in conjunction with Fig. 2.

As will be remembered, a resistor R connected in series with a capacitor C produces a time constant T equal to CR, which is the time required, in seconds, for the voltage or current to grow or decay to 63 per cent. of its maximum value.

It will now be instructive to consider the effect such a circuit has on a square-topped wave. Let the square-topped wave be that of a line-sync pulse (Fig. 2 (b)) : as will be observed such a pulse occupies a time period of 10μ seconds.

Now, because the capacitor is uncharged the circuit responds suddenly to the leading edge of a pulse, and the initial current through CR equals *ein*/R. Therefore, *e*R equals *ein*.

As time goes on, however, C charges exponentially and the potential across R falls, so that *e*R equals *ein* minus *e*C. Thus, after time CR, *e*R will fall to 37 per cent. of its initial value, but by the time the trailing edge of the pulse is reached *e*R will have a relatively higher value if CR is greater than the pulse duration.

A change of input in the negative direction is created by the trailing edge of the pulse and *e*R is thus changed instantly from a positive to a negative magnitude depending on the initial positive value of *e*R, which is followed by an exponential return to zero.

Output wave-forms where CR is much larger than, and equal to the pulse duration are illustrated by Fig. 2 (c) and (d) respectively.

From the foregoing it will be obvious that if CR is smaller than the pulse duration, C will acquire a maximum charge before the trailing edge of the pulse is reached. Therefore, *e*R will rise to a maximum positive value ; reduce exponentially to zero ; rise to a maximum negative value and again exponentially return to zero. Fig. 2 (e) illustrates the resultant differentiated square topped wave-form.

Actually this operational mode indicates that CR must be appreciably smaller than the pulse duration since C charges fully. Theoretically a capacitor will reach nearly full charge in a period equal to 4CR seconds. Therefore, for true differentiating action T should not exceed one

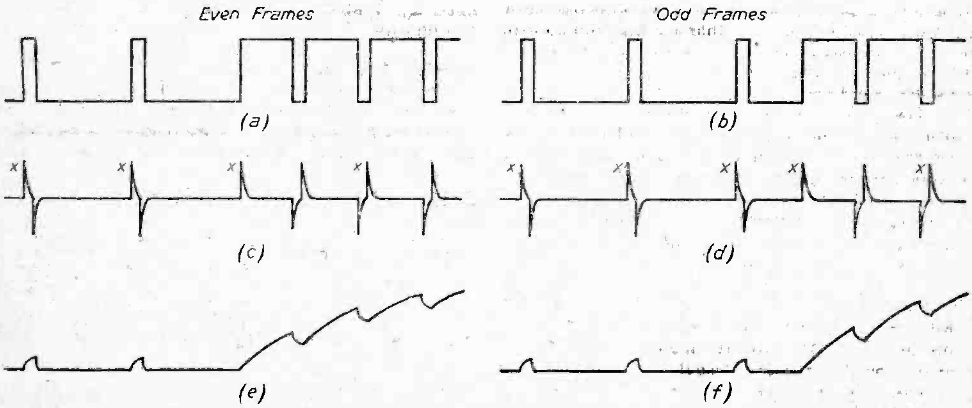


Fig. 1.—A train of line and frame sync pulses for even and odd frames (a) and (b), differentiated pulses (c) and (d), integrated pulses (e) and (f).

quarter of the pulse duration, or in the case of a line pulse, 10/4 μ-seconds equal CR.

Usually, in practice, C is about 50 pF. Thus :— 2.5×10^{-6} equals 50×10^{-6}R (it should be noted that C and R are expressed in microfarads and megohms respectively).

Therefore, R equals $2.5 \times 10^{-6}/50 \times 10^{-6}$, equals 0.05 megohms (50 Kilohms).

The Principle of Synchronism

The effect of feeding the mixed pulse train of Fig. 1 (a) and (b) into the differentiating circuit is shown diagrammatically at Fig. 1 (c) and (d). It will be seen that the frame pulses when passed through the circuit lose their identity and are also differentiated to form a set

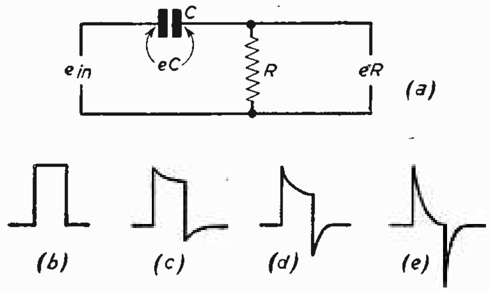


Fig. 2.—A basic differentiator circuit is shown at (a) and a line sync pulse at (b), while (c), (d) and (e) are the output waveforms for a time constant much larger than, equal to and smaller than the pulse duration.

of short duration peaked pulses, which keep the line oscillator in synchronism during the frame sync pulse.

This will be better understood in relation with the general operation of a saw-tooth oscillator. The potential on the grid of the oscillator valve increases exponentially until it reaches a value which "fires" the valve (flyback). In the unsynchronised (free-running) condition this potential build up is determined by the circuit constants (Fig. 3 (a)).

The oscillator is synchronised by the application to the valve grid of a differentiated positive-going sync pulse. The effect being that just before flyback conditions are reached, a sync pulse arrives and the valve is immediately "fired," thereby exercising complete control on the repetition frequency of the line saw-tooth oscillator (Fig. 3 (b)). This means then, that the line hold control should be so adjusted that the oscillator is running very slightly on the slow side.

The pulses employed for line synchronism are marked "x" in Fig. 1 (c) and (d). Therefore, it can be seen that during the frame pulses the line oscillator remains synchronised due to the differentiated leading edge of every other frame pulse; the sync pulse for the half line during odd frames being clearly indicated.

A condition may arise where the pulse which occurs in the middle of a line scan during a frame pulse "fires" the oscillator prematurely (Fig. 3 (d)). This will have the effect of causing the top of the picture to be tilted over to the right-hand side. Usually, such a fault indicates that the sync pulses fed to the oscillator are too large and steps should, therefore, be taken to reduce their magnitude.

The Integrator

The integrator circuit is also formed by an RC combination but with a modified time constant. The basic circuit is shown in Fig. 4 (a), and in this case it will be observed that the integrated sync pulses are developed across the capacitor.

Unlike the differentiator, however, this circuit responds only slowly to steep-fronted wave-forms, which is rather obvious when it is considered that an integrated pulse is nothing more than the exponential rise and fall in potential across C due to its charge and discharge.

Fig. 4 (c) shows the wave-form across the capacitor due to an input pulse such as (b). From this it will be seen that the amplitude of the integrated pulse is proportional to the duration of the applied pulse; since a longer pulse allows the capacitor to charge to a higher value. This feature enables discrimination to be made between the 10 μ-second line sync pulses and the 40 μ-second frame sync pulses.

The effect of feeding both line and frame sync pulses into the integrating circuit is shown diagrammatically at (e) and (f) Fig. 1. The short duration line pulses are distorted and greatly reduced in amplitude, since they

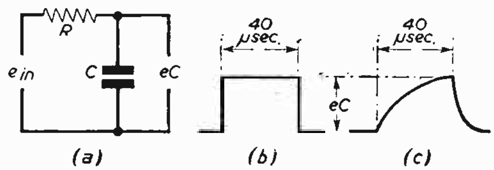


Fig. 4.—A basic integrator circuit is shown at (a) and a frame sync pulse at (b). (c) is the output wave-form across C.

have little effect on charging C. However, the first of the series of frame pulses, due to its longer duration, charges C to an appreciable value, and it discharges only slightly before the next pulse arrives. Thus, the next frame pulse charges C to an even higher value and so on, resulting in a build up of potential across C, which at some critical value "fires" the frame saw-tooth oscillator. It is necessary, of course, for the frame oscillator to be arranged to "fire" at a higher level than the peak output on a line pulse.

The values for C and R are larger than those forming a line pulse differentiating circuit, and it is usually found satisfactory to make T about 5 times the frame pulse duration, typical values being: R 20 Kilohms and C 1,000 pF.

Interlace Problems

From the wave-forms of (e) and (f) Fig. 1, it can be seen that the first pulse following an "even" frame is only displaced half a line from the first pulse following an "odd" frame. This means that to secure a good

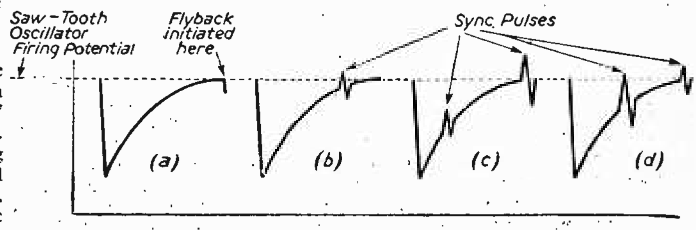


Fig. 3.—Firing points of a saw-tooth oscillator (a), free-running; (b) during a normal line scan, (c) during a frame pulse, and (d) fired prematurely in the middle of a line scan during a frame pulse.

interlace between successive frames the start of a frame scan must coincide with the start of a line scan every other frame only. Such conditions are difficult to achieve with the simple differentiator-integrator circuit of Fig. 5 and by its use a stable interlace is very rare.

The limitations offered by this simple arrangement may be better understood when it is considered that the frame time base has to be pulled only half a line at the

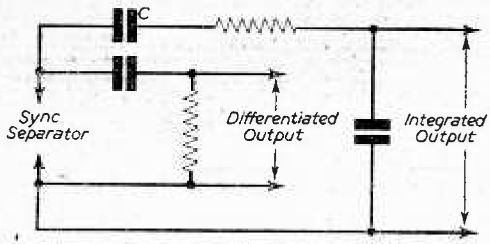


Fig. 5.—A combined differentiator and integrator circuit. The inclusion of C is for D.C. isolation only.

end of an "odd" frame and the beginning of an "even" frame to severely impair the interlace. This means, that for proper interlacing the frame time base will need to "fire" on exactly the same serrations of the integrated wave-form of Fig. 1 (e) and (f) every "even" and "odd" frame. In practice minor circuit disturbances, such as fluctuation of signal or mains voltage, prevent this happening and, therefore, noticeably impair interlacing.

Furthermore, matters are made worse since no protection from the line pulse is offered; for it must be remembered that during the line flyback high peak voltages are developed which cause quite a disturbance in the receiver and are liable to "fire" the frame time base, resulting in non-interlace.

A Frame Pulse Shaper Circuit

Usually, in order to prevent line pulses effecting the "firing" of the frame generator the integrator circuit is

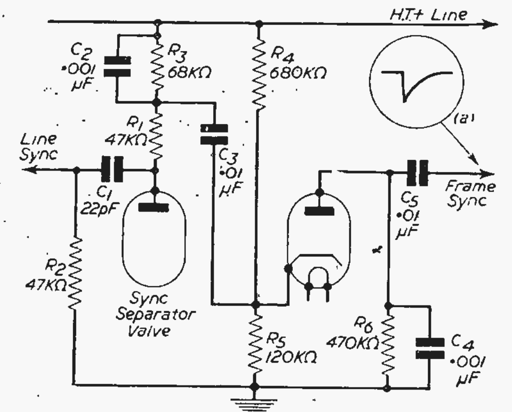


Fig. 6.—A frame pulse shaper circuit by G.E.C., showing the wave-form output at (a)

followed by a further circuit which eliminates the line pulses and shapes the train of eight frame pulses to form a single steep-fronted pulse. A pulse shaping circuit of similar function, used in certain G.E.C. receivers, is shown by Fig. 6.

Line sync pulses developed across R1 are differentiated by the action C1, R2 and are applied to the line generator in the usual way. The frame sync pulses, however, are mainly developed across R3 and C2. These components form a time constant such that the line pulses are severely attenuated. The thus modified sync signals are conveyed, via C3, to the cathode of a diode which is positively biased by a potentiometer comprising R4 and R5. Bias magnitude is arranged so the diode conducts during the negatively-going frame pulses only, resulting in a rise of potential across R6 and the charging of C4. Since these components form a relatively large time constant the 10μ-second interval between successive frame pulses has little effect on the discharge of C4. A single clean-cut frame pulse (Fig. 6 (a)) is thus produced and is transmitted via C5, to the frame generator.

Another Method

Another popular circuit is shown by Fig. 7. Both line and frame sync pulses are developed across the sync separator load resistor R1, which is in direct connection with the diode anode of V1 (a). During the time when no sync pulses appear across R1, the positive potential on the diode anode renders the valve conductive. A

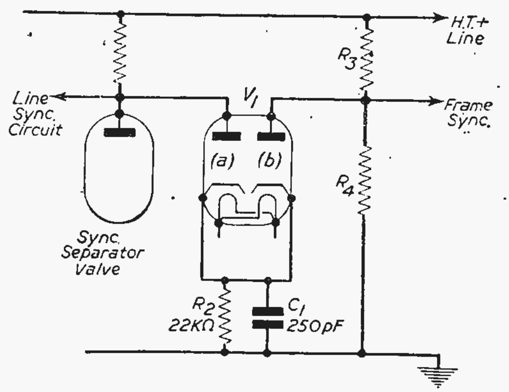


Fig. 7.—A frame pulse separator circuit.

positive potential is thus developed across R2, which charges C1 to the H.T. line voltage. Also, the anode of V1 (b) is held at a steady positive potential by the potentiometer R3 and R4, but less positive than its cathode, and of a consequence is non-conducting.

On every sync pulse the anode potential of V1 (a) falls below its cathode potential and the valve is cut-off for the duration of the pulse. C1 commences to discharge through R2, but owing to the relatively large time constant (50-60μ-seconds), the potential across the combination does not fall sufficiently during a line pulse for V1 (b) to become conductive.

During a frame pulse, however, the cathode potential falls below that on the anode and the valve conducts. A series of sharp frame sync pulses is thus developed across R4.

This circuit has not only the advantage of producing frame sync pulses of equal magnitude, but also since V1 (a) is non-conductive during a frame pulse disturbances originating from a line pulse are minimised.

In conclusion, it should be remembered that interlacing may be considerably impaired if stray capacitive couplings exist between the time bases. The line flyback pulse may also be radiated from a lead or component within the circuit to any of the post detector circuits with similar results. It is worthy to note that unless a receiver is interlacing correctly 50 per cent. of the transmitted picture may be lost.

Tracking Down TELEVISION PIRATES

DETAILS OF THE LATEST G.P.O. DEVELOPMENTS FOR THE ACCURATE LOCATION OF A WORKING TELEVISION RECEIVER

A TECHNIQUE has recently been developed at the Radio Experimental Laboratories of the Post Office at Dollis Hill for the detection of television receivers irrespective of whether an indoor or an outdoor aerial is used.

This new technique is so sensitive that the majority of working television receivers can be detected, and the positions of houses containing the receivers can be pin-pointed, by means of equipment fitted in special Post Office vans. The equipment used is quite easy to operate, and with a little practice houses containing working receivers can be located while the van is on the move.

Equipment of this type will be used to carry out "combs" of certain areas in London and the Provinces for illicit television receivers, i.e., those whose owners have not obtained television licences.

Popularity

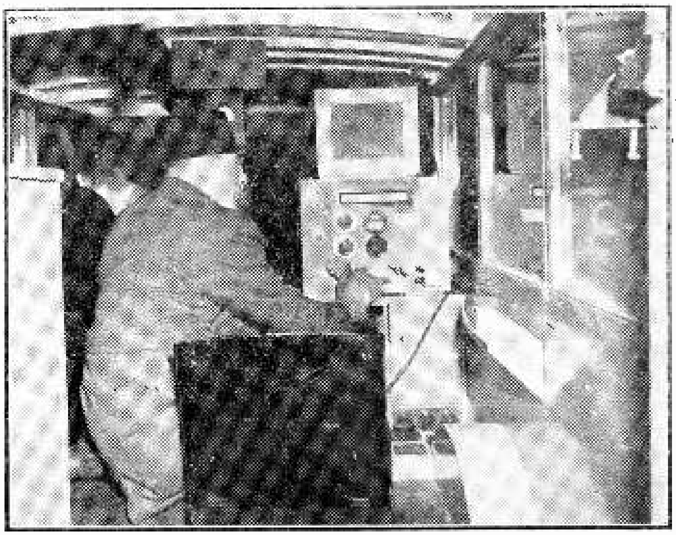
An interesting sidelight on this technique is that it also provides a means for assessing the popularity of a television programme by counting the number of receivers switched on in a given area.

Principles

The detection equipment makes use of the induction magnetic field set up by the line-scanning coils of the television receiver; this field contains strong harmonics of the fundamental line-scanning frequency of 10·125 Kc/s, and these harmonics can be picked up by a sensitive receiver at distances of up to 100ft., or more in many cases.

Three horizontal loop aerials are mounted on the roof of the van in an "L" formation; these are tuned to the second harmonic (20.25 Kc/s) of the line frequency. The outputs of the loops can be switched in turn to the input of a specially-adapted radio receiver, and the audio output is heard on a loudspeaker or indicated on an audio level meter. By noting the relative levels of the signals from the three loop aerials the operator can obtain a clear indication of whether the television receiver is in front of or behind, or to right or left of, the detection van. For example, when the van passes in front of a house on the same side of the road containing a working television receiver, the indications obtained from the fore and aft loop aerials are equal, and that from the off-side loop aerial is weaker than that from the other two. In addition to the indicators mentioned, the van which we had the privilege of seeing also had four small lamps with associated buttons mounted beneath the visual meter. The buttons carry the references "Front," "Rear," "Right" and "Left," and pressure on the buttons lights up the appropriate lamp. It will be seen, therefore, that the location of a receiver is almost foolproof and can be made very rapidly by any one of three different methods.

The strength of the induction magnetic field varies inversely as the square of the distance, and this fact enables receivers even in adjacent houses to be separately detected. The brick walls of ordinary houses have little or no effect on the induction magnetic field at the relatively low frequency (20.25 Kc/s) used.



An operator at the controls inside the detection van seen in the heading illustration. The visual indicator and lamps are hidden by the operator's head.

Kirk o'Shotts Experimental Transmissions

DETAILS OF THE TEST PROGRAMMES

IN order to bring television to Scotland by the earliest possible date, the BBC brought into service the low-power transmitter at the new television station at Kirk o'Shotts on Friday, March 14th, on an experimental basis. At 7.30 p.m., Mr. James Stuart, Secretary of State for Scotland, opened the service from the BBC studios in Edinburgh, and the ceremony was broadcast from Kirk o'Shotts. Programmes during the following week included outside broadcasts from Scotland. As we go to press, tests are in progress on the radio link which the Post Office is installing between Manchester (the most northerly point on the television network at present) and Kirk o'Shotts; an experimental picture has been obtained, but neither the radio link nor the transmitters are scheduled for use before March 14th, and then only on an experimental basis.

It is emphasised that this is an experiment for the first few weeks; interruptions to the service may therefore be necessary from time to time for adjustments to the radio link and to the equipment at Kirk o'Shotts.

Programmes

The Kirk o'Shotts station will carry the same programme as the existing stations at Alexandra Palace, Sutton Coldfield and Holme Moss, except that between 10 a.m. and 12 noon on weekdays during the first few weeks a still pattern (Test Card C) will be broadcast instead of the morning film that is normally radiated by the other stations.

Service Area

It is expected that the low-power transmitter will provide satisfactory service over a considerable area of Central Scotland, including Edinburgh and Glasgow; but reception will be more liable to interference, particularly in fringe areas, than it will be when the high-power transmitter comes into service.

Details of the frequencies of the new transmitter will be found on pages 511 and 512, together with a diagram showing the field-strength (estimated) of the high-power transmitter when this eventually comes on the air. It is emphasised that this contour has been calculated, and cannot be taken as a guarantee of the strength of signals finally in any locality. Preliminary tests, when the transmitter was put on the air temporarily for the relaying of the funeral procession of the late King, showed that excellent reception was obtained in certain areas which it was not expected to cover satisfactorily, and therefore it is emphasised that the present transmissions must be regarded purely as experimental. The actual transmitter which will finally be brought into use is identical with that used at the Midland and Northern stations and the details which we have already published concerning these stations may be taken as being applicable to the final Kirk o'Shotts transmitter.

First photographs of the new Marconi medium-power Television installation at Kirk o'Shotts. These illustrations show the control desk and part of the 5 kW. transmitters with Marconi and BBC engineers during preliminary tests.

BLACK LEVEL CLAMPING

A PRACTICAL BLACK LEVEL CLAMP

By M. Lock

IT is well known that one cannot adjust the contrast of a television receiver without re-adjusting the brightness control because, in adjusting the contrast, one inevitably changes the voltage applied to the cathode (or grid) of the cathode-ray tube corresponding to "black" in the picture signal. Therefore, a new value of bias must be applied to ensure that the tube is dark once more when "black" is being transmitted. This can be very irritating, and if, in fact, we could use a circuit to maintain the cathode-ray tube at "black" whenever black was being transmitted, independently of the relative settings of the contrast control it would be a great improvement. The brightness control would become a means of setting up the black level in the first instance, and, provided nothing drifts, it need not be touched again, all further adjustment being a true adjustment of contrast carried out with the IF or RF gain controls. We would also notice that most aeroplane flutter merely became a change in picture contrast instead of alternate glare and darkness on the screen. Such a circuit is called a black level clamp, and is not very difficult to devise.

Obtaining the Required Voltage

Firstly, we must examine the transmitted waveform to discover what we may use, which will not vary with picture content. Clearly it is no use attempting to clamp the black level to anything but a voltage which is both always available (recurrently) and quite independent of the picture. Fortunately there is a period, when the frame sync signals are transmitted and for a short time afterwards, when the picture signals are blanked for a period of about 1,400μS. (Fig. 1). We must therefore use a device which will be out of action all the time that picture signals are being transmitted, but immediately comes to life during this period of the 14 lines when no picture is present. This occurs once every frame, i.e. at a rate of 50 c/s. The means used to achieve this is to desensitise our clamping circuit with a heavy bias, but obtain a large pulse at the right moment to overcome the effect of the biasing, and let the clamping circuit (for the duration of this large pulse) respond to the signals contained in the television waveform. Therefore, looked at from the point of view of the clamping circuit, for 391 lines it "sees" nothing, then it becomes "turned on" at the right moment by the pulse so that it "takes notice of" the signals present during the blanking period as shown in Fig. 2. In fact it responds to their amplitude and provides us with the required D.C. voltage for our clamp. The pulse for "turning on" the circuit is obtained naturally enough from the frame time-base, since this will be recurring at a suitable timing to sensitise the clamp to the frame sync signals, which have already synchronised the time-base which provides the pulse to work the clamp. Of course, as we must wait for this chain of events to take place, we shall not get all of the 14 lines through to the clamp but this is not of practical importance.

The Circuit (Fig. 5)

The valves used are not important so long as we are able to obtain sufficient output with convenient values of anode or cathode load resistors, and provided that the valves have sufficient mutual conductance to respond, in the case of the "gated" clamp valve V1, to the "gating pulse." For example, if the available pulse from the frame time base is of only 50 volts amplitude, V1 must be capable of being well and truly turned on by such a pulse. EF50's triode-connected work very well, and no doubt VR65's would be as good. A single 6SN7.

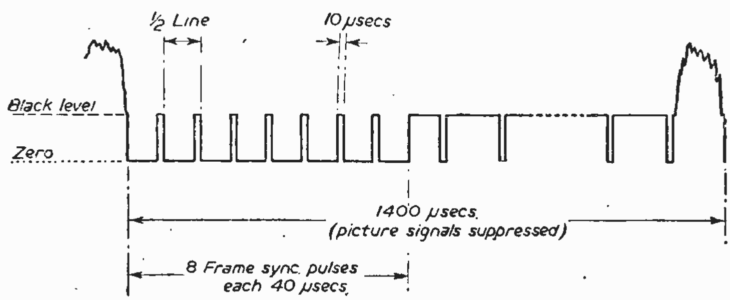


Fig. 1.—Essential portion of the transmitted signal referred to in this article.

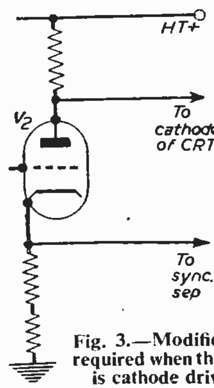


Fig. 3.—Modification required when the tube is cathode driven.

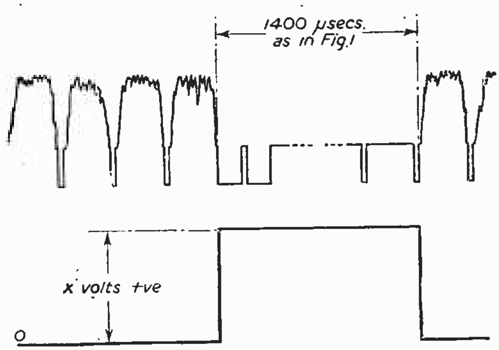


Fig. 2.—Idealised gating pulse to turn on clamp during No-picture period, at other times clamp biased off.

to mention a readily available ex-surplus type, is also suitable although it needs slightly more drive than the others, but has the advantage of a single valve construction.

The anode and cathode loads of V2 are chosen to give adequate frequency response, and sufficient output

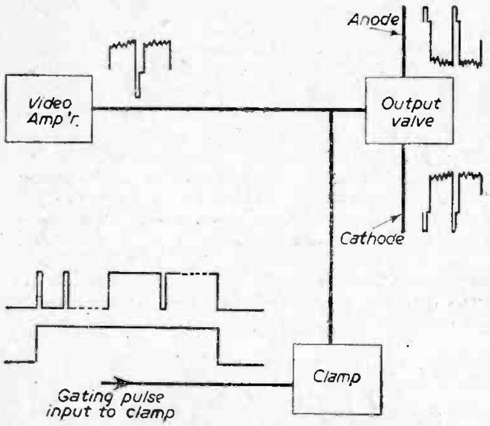


Fig. 4.—Clamp only "sees" waveform shown above which is coincident with gating pulse duration.

fully to modulate a Mazda CRM121 with full EHT, and therefore more than enough for other available types, and to give adequate drive to all commonly used sync separator circuits. These values may be varied somewhat, but the above explanations should be borne in mind. The reason for carefully arranging the voltage to which the cathode of V1 is taken is that, apart from biasing the clamping valve, we must ensure that the black level is sufficiently above earth at the grid of V2 as not to cause V2 to compress the sync pulses appreciably. In practice the reduction from the nominal 30 per cent. sync ratio is quite small, only a few per cent. Finally the coupling condenser of the D.C. restorer which connects the grid of V2 to the anode of the video amplifier must be of high quality, and a metal cased type is desirable as these condensers maintain a high insulation resistance much longer than the waxed cardboard type, which should never be used in restoration circuits since their low leakage resistance prevents such a circuit from functioning. Owing to the cathode follower action of V2 the time-constant of the 0.05μF and 1MΩ grid return of V2 is multiplied several times, and gives a value which is adequate to prevent appreciable "sag" in the black level over the course of one frame.

It has been assumed that the majority of home-built sets will be employing grid modulation of the C.R.T., and that the video amplifier valve gives positive picture and negative sync output. If cathode modulation is required it is only necessary to reverse the sync/C.R.T. connections to V2, as negative going video is available across the anode load (Fig. 4).

It may be found that the clamp valve does not get turned on for a long enough period. This will give a less effective black level clamp as full use would not be taken of the whole 1,400μS of transmitted black level on which we are attempting to clamp. This effect, if it appears to be present, may be improved by adjusting the grid circuit values of V1, the clamping valve. If, however, the difficulty is due to the frame flyback being "too good," i.e., taking place too quickly for our purpose (this may be estimated by observing the existence or not of a large amount of frame blanking pulse at the top of the picture with the brightness control turned up too far for normal viewing) it will be necessary to use very large values of components in the grid circuit, or a separate square-wave generator. In the latter case, probably the easiest circuit to use would be the one shown in Fig. 6, a phantastron which gives a positive square-wave on its screen. The trigger pulse may be the frame flyback, taken from the anode of the frame output valve as before. The time constants are not important in this case as all we require is a fairly short duration trigger pulse of sufficient amplitude. The width of the square-wave needs to be about 800-1,000μS and may be adjusted over wide limits by the 100 KΩ potentiometer. This circuit, although simple to get working, is much easier to adjust if an oscilloscope is available, and in any case the vast majority of frame time-base pulses in

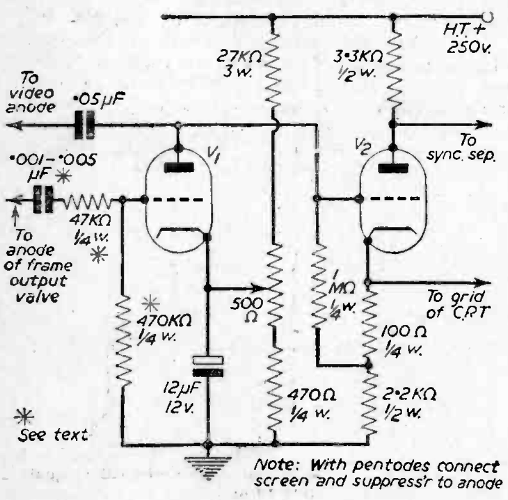


Fig. 5.—Circuit of the black level clamp.

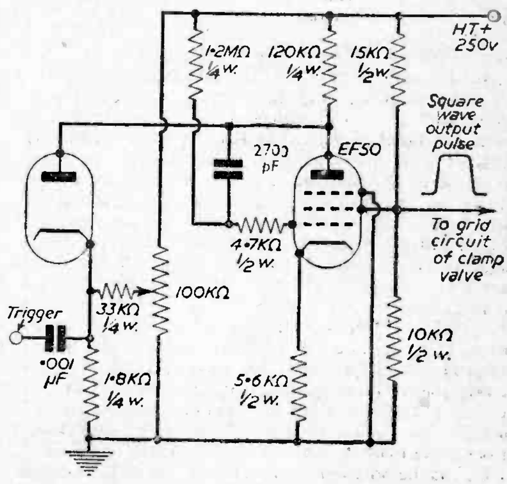


Fig. 6.—Additional circuit required for "gating" under certain conditions.

amateur built receivers will prove quite adequate for use as gating pulses without resource to this complication.

Final Adjustment

To make certain that V2 is working properly on its own, temporarily connect the grid and cathode of V1 to earth, thus making V1 a simple diode D.C. restorer between the video output valve and V2. Under these conditions the television receiver should function almost exactly as it did before the black level clamp circuit was added. If this is so, i.e., adequate video output to the cathode-ray tube is still available, and the controls have much the same effect as before, all is well. It must be remembered however, that the *position* of the brightness control will be different owing to the voltage across the cathode load of V2 being between about 1 volt and 40 volts above earth (for a black or peak-white picture) instead of something like 200 volts to 240 volts above earth in the case of connecting the grid of the C.R.T. directly to the anode of the video amplifier, which was presumably the method of operation before the new circuit was added. So we may expect the brightness control at "maximum" to refuse to produce any light on the C.R.T. screen. This means only that the range of the brightness control must now be reduced to operate over something like 40 to 150 volts which is no problem.

Now take off the temporary earthing connections and connect the grid circuit of V1 to the frame output value anode and, even if the clamping is incomplete, some results will immediately be obtained. According to the nature of the positive pulse available at the anode, some adjustments to the grid circuit of V1 may be required as indicated earlier. It should then be possible to set the brightness, and changing the contrast setting will not require the brightness control to be retouched. One final word, if all seems to be going fine, but after the set has been switched on for a quarter of an hour you should find it necessary to re-set the brightness control, it is probably due to the slope of the C.R.T. changing as it warms up. You cannot do anything about this unless you can design a black level clamp to operate on *current* instead of *voltage*. The effect however is not likely to be very bad.

Interference Limiters

A REVIEW OF SEVERAL COMMERCIAL SYSTEMS

By S. A. Knight

INTERFERENCE suppressor circuits now form a part of every television receiver manufactured and the following notes are intended to cover a few of the more interesting forms that such circuits have taken in the past two or three years. The most ingenious adaptations have occurred on the sound side of receivers as it is here that ignition interference can become really objectionable, and so attention will be paid mainly to these systems. Vision suppression will be dealt with later on in the article.

General Systems

There are two basic systems for sound interference suppression, the principle in both cases being the provision of a means of chopping out all spiky interference pulses while allowing audio signals to pass on unhindered. The obvious solution lies in the construction of a circuit that can discriminate against signal amplitudes; for, with interference pulses superimposed on the audio signal, as shown in Fig. 1, it is apparent that the amplitude of the interfering pulses is such, in relation to the general amplitude of the audio signal, that a form of amplitude filter should provide an answer to the problem. Such filters may be either of the series —or parallel—gate type, that is, the detector circuit might be open- or short-circuited on the high amplitude interference pulses, depending upon the kind of filter used.

The simple series diode that open-circuits in the presence of interference is illustrated basically in Fig. 2 (a). The signal voltage V is developed across R and so appears between the cathode of the limiter diode and earth. The diode anode is maintained at a positive potential with respect to earth by the battery E connected through the load R1, and so the diode will pass current so long as the potential at the anode exceeds the potential at the cathode. The magnitude of the diode current will depend upon the relative magnitudes of the voltages at cathode and anode and will be more or less proportional to the difference between them provided that the anode is a few volts positive to the cathode. Neglecting the impedance of the diode by assuming a high value for R1, the voltage developed across R1 will be equal to the signal voltage V.

If now the value of E is so chosen that the positive signal excursions of V at their maximum do not quite exceed E but peak interfering pulses exceed this voltage by an amount depending on the individual pulse amplitudes, the diode cathode is driven positive on interfering peaks and is then momentarily above the potential on the anode. Under these circumstances the diode is cut off and the anode potential rises to the steady voltage E.

The difficulty with this simple arrangement is its inability to do more than limit the interfering pulses to a level determined by the distortion that can be tolerated on the signal itself. The value assigned to E determines the level of input at which the diode ceases to conduct: if no audio signal distortion can be tolerated the value of

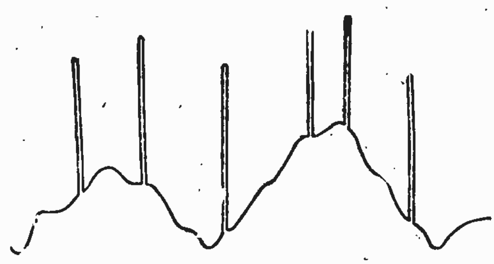


Fig. 1.—Interference pulses superimposed on the signal waveform.

E must be just greater than the maximum possible positive excursions of V, as proposed above.

Fig. 3 (a) shows the action of this limiter on an audio signal carrying interference pulses when E is set to the optimum position; it is seen that at certain signal levels the noise remains practically unsuppressed. For incorrect settings of E the audio signal itself is distorted as shown in Fig. 3 (b). Some circuits have been produced that cause the level of E to vary with the amplitude of the signal, but in general the amount of pulse noise remaining is still too great to be tolerated. Only the loudest interfering signals are reduced in volume; while on the lower audio levels there is little or no improvement.

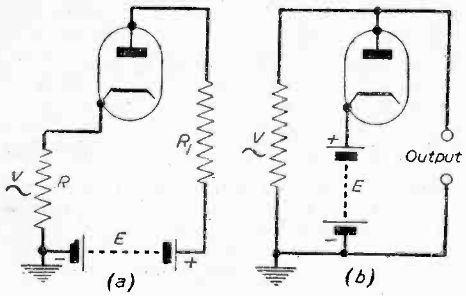


Fig. 2.—The diode circuit as used for the basis of certain suppressors.

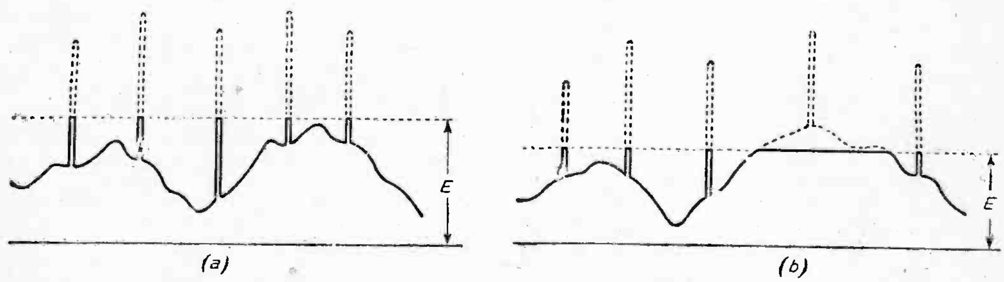


Fig. 3.—Cutting of interference peaks and how distortion can be caused.

The other variation of the simple limiter is the parallel-gate or shunt type where the diode is arranged to short-circuit the detector load on signal amplitudes greater than those equivalent to the maximum possible audio modulation. Fig. 2 (b) shows a circuit system of this sort and its operation is self-explanatory. It suffers, of course, from the same objections as those outlined for the series filter above.

A circuit based on the above simple limiter is included in some Cossor receivers, and is shown in Fig. 4. The limiting diode is positioned between the sound I.F. valve and the detector, and is biased by the steady voltage drop developed across R1 (30 kΩ) in the anode circuit of the I.F. valve. At a level determined by the setting of R1 the diode conducts and by-passes the noise pulse from the anode-tuned winding. In this circuit the I.F. amplifier is operating at 2.2 Mc/s and retains a wide bandwidth, thus ensuring retention of the peak characteristic of the interference with its consequent easy removal.

Audio-biased Systems

The previous circuit discussion forms a useful introduction to a different approach to the problem of interference suppression. Instead of chopping interference peaks whose amplitudes exceed a fixed D.C. level, a better method lies in a circuit that can discriminate between short-period pulses and the audio signal and which can suppress those pulses whose amplitude is greater at any moment than that of the audio signal. The method should not be confused with a modification of Fig. 2 to adjust the voltage level of E to the mean audio level at a given time; the audio level itself decides the point at which suppression begins, and the effect on pulse signals is therefore something as shown in Fig. 5.

A circuit working on this principle is used in certain H.M.V. receivers and is illustrated in Fig. 6. The left-hand section of the double-diode is the detector, the load resistance being R1 (6.8 kΩ) shunted by C1 (47 pF). This output is fed to the cathode of the right-hand section of the valve which forms the limiter proper; this diode is arranged to conduct, the anode being positive with respect to cathode, and there is also a condenser C2 (0.001 μF) connected effectively between cathode and earth. On reception of a signal the cathode of the detector goes positive and carries the cathode of the limiter with it. The anode of the limiter rises by the same amount and the potential across C2 follows in sympathy with the output of the detector. When, however, an interference pulse is superimposed on the audio signal the anode of the limiter cannot follow it closely, due to the limitation imposed by the charging rate of C2. The effect, therefore, is that instead of an interfering pulse of high amplitude being passed on to the L.F. stage it has been reduced to a blip that is only slightly greater in amplitude than the audio signal at that particular instant.

It will be noticed that the detector load has a value very much lower than usual. The reason for this is twofold; first, a low value ensures retention of the peak characteristic of the noise pulses, and second, for large values of load in this circuit the detector input cannot be permitted to fall below minimum value without severe sound distortion. The reason for this is that the limiting diode biases the detector so as to prevent rectification over

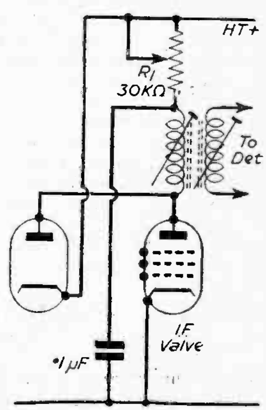


Fig. 4.—A Cossor circuit.

a part of the cycle; above some critical voltage input no distortion occurs. There is, of course, a reduction in detector efficiency for a low diode load, but this is of minor importance.

A method of obviating the tendency to distortion at low input levels while retaining a high value of detector load is illustrated in the circuit of Fig. 7, which is used on many commercial receivers and is often included in home-built designs on account of its simplicity. The essential circuit system of Fig. 6 remains, but the diode cathodes are coupled by a condenser C3 (.01μF). The D.C. bias is therefore removed from the detector cathode, yet the limiter can still follow the audio signal since its cathode in conjunction with the capacity will operate to restore the D.C. level.

In the above circuits the anode-earth capacity of the limiter will charge up to the potential of the limiter anode, after which the maximum rate of any further change is determined by the time-constant of this condenser and the diode anode load. This time constant is arranged in practice so that the condenser can charge and discharge at a rate fixed by the highest modulation

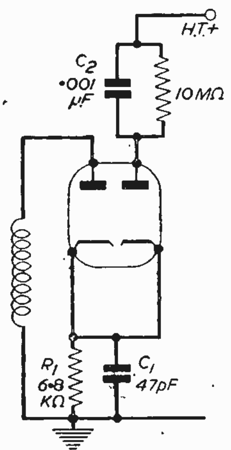


Fig. 6.—An H.M.V. circuit.

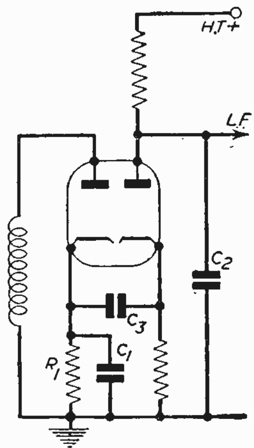


Fig. 7.—Retaining a high detector load.

frequency to be handled. Typical values are 300 pF for the capacity and 2 MΩ for the resistance.

Thermionic diodes are not always used in such simple filter circuits and it is not unusual to find crystal rectifiers incorporated. The circuit of such an arrangement is shown in Fig. 8, and its similarity to the circuit of Fig. 7 is at once apparent. The limiter crystal is normally conducting and is maintained so by the positive potential applied from the H.T. line through R3. The audio signal appears across R2 and is developed with only a small loss across C2. On the arrival of an interfering pulse the voltage across this condenser cannot change with sufficient rapidity and the crystal cuts off for the period determined by the time-constant of R3C2.

A metal rectifier is used on Bush model T.91 and the circuit is shown in Fig. 9, slightly simplified for clarity. Here the signal is rectified by the diode D1 and the audio voltage is developed across the detector load R1 (470 kΩ). Across this load is connected R2 (560 kΩ) and R3 (500 kΩ), the normal receiver volume control, in series. When a signal changing at audio rates appears across R2 and R3, condenser C1 charges through R4 (2.7 MΩ) and develops a voltage approximately equivalent to that existing across R3. Reducing the circuit to a bridge as shown in Fig. 10 reveals the action somewhat better; here the crystal has its faces maintained at the same D.C. level throughout the audio-frequency range and the crystal is normally non-conducting. Now C1 can only charge through R4 at a certain rate; therefore if a pulse of interference drives the junction of R2R3 in a positive direction at a rate

Fig. 5.—Effect on the pulses of some circuits.

greater than this, the opposite face of the crystal will be left behind, rendering the crystal conductive. The volume control is then virtually short-circuited and the receiver is muted for the duration of the pulse. The diode D1 is part of a double-diode-triode valve in the actual receiver.

A further modification to the circuits so far discussed has been introduced in Murphy Models V114 and V116 so as to give a constant ratio of signal to noise by arranging for the bias on the anode of the limiter to be obtained not from the H.T. rail but from the audio output of the final sound amplifier. By means of this arrangement (to be shown next month) the mean anode current of the limiter D1 thus varies according to the mean (rectified) audio output, and the interference is suppressed according to the strength of the signal. This is a great advantage for it means that on quiet passages the interference is almost non-existent, and only on loud passages does it approach the overall strength experienced with the previous circuits.

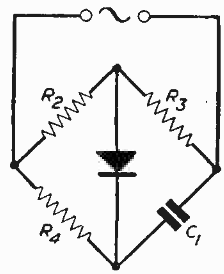


Fig. 10.—The arrangement of Fig. 9 in bridge form.

(To be continued.)

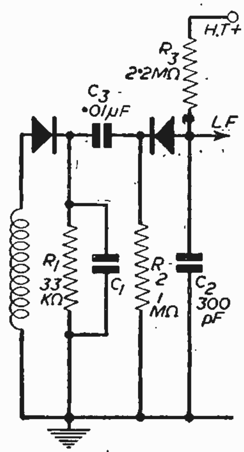


Fig. 8.—The use of a crystal for limiting.

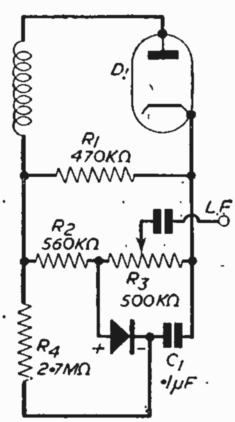


Fig. 9.—A circuit used by Bush.

Filming the Royal Funeral Procession

By Philip H. Dorté, O.B.E.

Head of Television Films, British Broadcasting Corporation.

AN individual newsreel company making a film record of the Funeral Procession for showing in the cinema will have had as its target a film of less than one reel in length, running some eight and a half minutes, and due to be shown in cinemas all over the country three days after the event was over. During the evening of Friday, February 15th, the day on which the Royal funeral was held, Television transmitted some 13 reels of film running well over two hours: the funeral was over at half-past two: the first reel of film was transmitted at 8 o'clock. There is one more pertinent comparison: the commercial newsreel will have been shot, in the main, with silent cameras, and commentary, music and effects will have been post-recorded, whereas the television film will have been wholly recorded at the time of shooting.

I would make it clear immediately that I am not trying to suggest that we in television are more skilled or more alert than the film-makers of Wardour Street. Our problem is an entirely different one and has to be met in a different way. The typical newsreel company will have fielded a round dozen cameras. Television had in the field twenty-two cameras, of which twelve were electronic and the balance of the standard types as used for ordinary filming; and because the output of the electronic cameras was filmed at Alexandra Palace the film of these at least could be rushed to the laboratory for processing and dispatch riders had to be allocated only to a selected few of the "straight film cameras" in order to get their film back to the laboratories through the dense crowds.

The Plan

The plan was basically quite simple. The electronic cameras (whose output was going to be broadcast at the time as well as being filmed for reproduction in the evening) were located at Westminster, at Hyde Park Corner and at Windsor. Had there been more of these available, they would have been located, too, at Paddington Station, at Windsor Station and between the two, so that the cortège would have been in sight for virtually the whole length of its sad though impressive journey. But, lacking these additional electronic cameras, we located at the railway stations (and in between them) film cameras of such a design that sound could be recorded simultaneously with picture and to each, as to the groups of electronic cameras, was assigned a commentator whose duty it was to describe in detail anything and everything which might not be clear in picture and to explain the impressive traditional ceremonial which attends Royal occasions, even of this sombre kind.

Additionally, not only because at this stage of the art of filming the output of an electronic camera ("telefilming," as we call it, or "kinescoping," as the Americans call it) the quality of the resultant film is not quite as good as it is with normal filming, but also because with the various radio and line links between Windsor and Alexandra Palace there *might* be a technical breakdown, Television Film Unit cameramen equipped with ordinary "silent" cameras were stationed at vantage points in London and Windsor so as to make it possible ultimately to fill in gaps resultant on breakdowns and to ensure the placing in the television film archives of as perfect a record of this historical event as can be achieved to-day. This additional film has, in fact, been placed straight away into the library which, it is not uninteresting to note, now contains some eight million feet of television film.

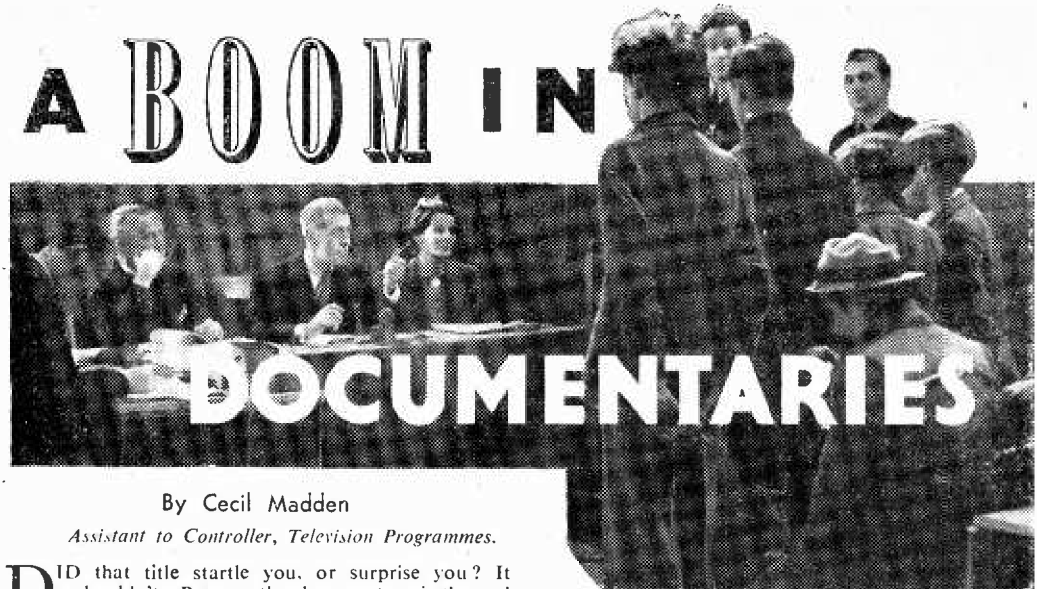
There is little else to add. The Alexandra Palace telefilm was, as already related, rushed directly to the laboratory for processing. Army Dispatch Riders speeded from Paddington Station, from the railway embankment at Iver, Buckinghamshire, and from Windsor Station (in two deliveries) the sound-films which were made on the spot there. At 3 o'clock the thousands of feet of processed film began to return from the laboratories to the film cutting-rooms at Alexandra Palace, where they were checked, edited, cued, re-checked and spooled up in their right order. This process was still going on with the final reels whilst reel one was being transmitted just after 8 o'clock and reel seven at 9 o'clock. The closing sequence was finally televised at ten minutes past ten, and the many technicians who had been involved went home, not necessarily satisfied with their work, but feeling without exception that they had made their contribution to the obsequies of their King.

"Canadian Journey"

DUNCAN ROSS, television documentary scriptwriter, sailed for Canada in the *Queen Mary* on March 6th to take up a six-month seconded appointment as scenario adviser to the National Film Board of Canada. Before taking up his appointment, which is directly linked with the start of television in Canada this year, Ross hopes to study television in America. In this country he was one of the pioneers of television writing, and was, in fact, the first full-time scriptwriter ever appointed to the BBC service. With producer Stephen McCormack he started "London Town" in 1949, and he will be remembered by many viewers for his series "Magistrates' Courts," "The Course of Justice," and, more recently, "The Loch Ness Monster."

Ross, a 43-year-old Scot, lives with his wife and four children almost under the shadow of the mast at Alexandra Palace. He came to television after 21 years' experience in film and theatre work. At one time he was the youngest manager in the Gaumont British circuit, and immediately prior to joining the BBC he worked with Paul Rotha as scenarist, director and producer.

A BOOM IN DOCUMENTARIES



By Cecil Madden

Assistant to Controller, Television Programmes.

DID that title startle you, or surprise you? It shouldn't. Because the documentary is the real future of television. I say this categorically, not because I co-ordinate the work of the documentary producers, but because I sincerely believe it and always have (though much of my working life has been in variety), and since documentary television is based on life itself. There is nothing stronger or stranger than life; certainly not fiction. The TV documentary has a fine reputation and the department a big programme and this is on the way to viewers.

Television is probably the greatest coming medium for the projection of personality as such. And what is life but a dovetailing of personalities? The reaction of one person to another, love, hate, birth, death. One sells, another buys, one earns more, another less. One acquires too much, another exists on too little. It is the way of the uneasy universe man has created. To do justice to itself and its own purpose in existing side by side with its stable companions, television drama and talks, television documentary must reflect this faithfully and without distortion.

So never let it be said that the word "documentary" sounds dull. The mere word may spell a certain dryness—the deadness of a document. But this is most unfair to the result when it comes alive on your home screen. It must never be a series of interesting pictures on a given subject. At all costs a documentary must tell a story.

Television documentary owes much to certain programmes reckoned as milestones, notably: "I Want to be a Doctor," "Promise of Tomorrow" (about young actors), "Shout Aloud Salvation!" and the law series from juvenile courts to assizes: "The Course of Justice." "I Made News" followed this with a number of real-life cases of detection, some British, some from American F.B.I. files, some Continental, but always presenting, in addition to the players, some personality (in one case a prominent French detective) who was actually present at the unravelling and who could vouch for its authenticity by being able to say "I was there." This is what gave these true thrillers their genuine character as pieces of live documentary evidence.

Albert Schweitzer says that "the great sickness of man is that he is constantly seeking entertainment and more entertainment." But the public's insatiable appetite must be appeased somehow. I quote Ned Depinet, president of R.K.O. Radio Pictures: "New and costlier devices must be created to keep it thrilled, amused or merely interested. This is nothing new; it is merely more intense now, due to the whiplash of new and vigorous competition, maturity, and therefore greater selectivity, in public taste and a new and vital force which we can call the 'shrunken clock.' No longer is there 'time to kill'. The leisure hour is crowded with things to do. The public's problem is no longer a matter of spending money, but of profitably spending time."

Time

Time is television's greatest bugbear. In America you can have "video" on tap from breakfast till long past bedtime, with choice (in New York) of thirteen stations and many stars and commercials. In Britain adult TV is confined to certain hours which to the majority is its time off, that is to say, mainly at night. How much more can the public profitably want, or even take?

So it may well be that the TV documentary, when it reaches its own maturity, will tend to bridge the gap between grind entertainment and the search for something more serious (let us avoid the ghastly words culture or education). People may well turn to the documentary as a half-way house in the curious world of tomorrow that is rushing towards us so fast.

What is a "Documentary"?

I have been trying to find a simple description of the documentary, so perhaps it is fair to call it the creative interpretation of reality or a dramatisation of life as it is around us. It is a way of presenting true stories that have come from documents. That way can be found by filming, by presenting real people (as themselves) and by adding actors (impersonating real people) or by using actors exclusively to dramatise a particular point, joined in from actual film of real places. The next secret is a good shape. So the answer is a well-written script from the start.

There is also the documentary play, the play with a social problem to discuss. I would place most of Galsworthy in this class. He was at heart a reformer as well as a story-teller. He used the world around him as his subject matter, the theatre as his platform. His impact would have been swifter if in one night his *Justice* had been seen by a million or so licence-holders or, say, five million viewers, but he would not have made so much money in royalties with long runs in single playhouses to a few hundreds at a time. Nevertheless, his plays live on to-day as moving TV documents of a past period. But as messages they are museum pieces (though still fine vehicles for actors) because the social injustices he pleaded for have now been put right by succeeding governments.

A good example of a modern documentary play in television is *Albert*, by Guy Morgan and Edward Sammis. This told a true story in fictional form of a naval P.O.W. camp in Germany in the recent war, of a single room filled with British, American and Canadian naval types of all ages and all ranks—and the inevitable topic of escape. An artist among them created a dummy person, "Albert," who could be assembled in sections by detachable limbs, taken to the washhouse wrapped in towels and put together there as a complete man for the march back while one of their number made a bid to escape. In fact, "Albert" did provide a real means of escape for a prisoner and the authors have it that the original dummy turned up later in a German war museum now in the Russian Zone. The memory of the original "Albert" is likely to live on again on the stage and in the films as it is both novel and humorous and yet so stirring to the emotions.

Noel Coward's remarkable play, *Peace in Our Time*, which showed Britain under a Nazi occupation, though written for the theatre, could well be adapted and handled as a TV documentary subject both as a thrilling piece of imaginative writing and as a warning to us all. How would people we all know behave in similar circumstances? Who knows who would be the Quislings? It is a fascinating speculation.

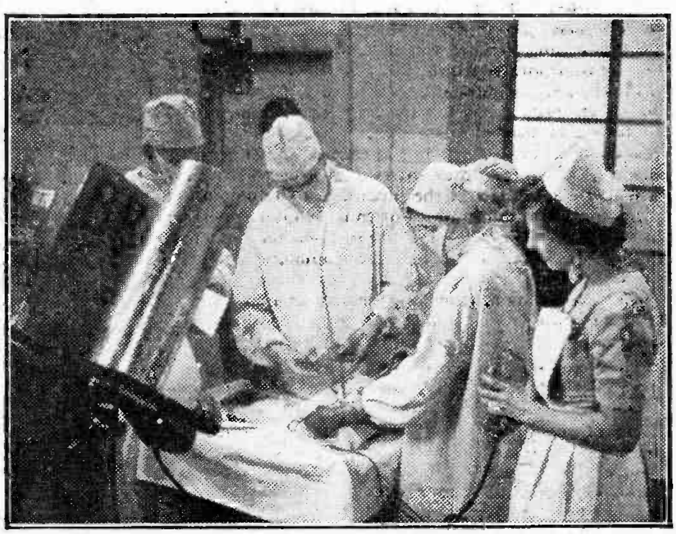
Viewers have recently had a taste (many without knowing it and more without caring overmuch) of the application of a new technique in T.V. the producer and the director both billed in a single production. The layman has a right to ask what exactly both do? It has been current practice in films for years—the producer who assembles the production, finds the money, script, writers, scenery, costumes and artists, and the director who directs the whole on the floor and (in TV) from the control room in action too. It is the same relationship in legal practice as the solicitor has to the barrister. The solicitor talks sitting down (in his office), the barrister talks standing up (in the court).

I asked Robert Barr, the outstanding exponent of the documentary programme in television, how he would describe the difference between a play of social interest and a documentary. Both have a place in television schedules. His answer is that it all comes down to the intention. If it sets out primarily to entertain, as in the theatre, to make certain effects on the emotions, such as strong curtains, it is strictly a play; if the work's intention is to inform, to state balanced opinion, it is legitimately a documentary. *Morning Departure*, the drama of men in a sunken submarine lost on manœuvres, is a good example of the former; *To Save a Life* (a night shift in a hospital) was a real documentary.

The "Rising Twenties"

Television rightly does a lot for children, its junior viewers from three to five and from five to 15, but so far little or nothing for the genuine teen-agers—boys and girls between 16 and 20—"the rising twenties," as they have been called. This is being put right from now on in a series which will cover such varied phases of struggling adolescence as a Boys' Club in the North of England, the Call-up, a Salesgirl in a Chain Store, The First Job, and the group that stay on at Grammar School for training in technical colleges. They will all be dramatised and their stories acted out by professional actors. They may succeed in a dual purpose—to assault the imagination by their human values and also to make the youth of to-day think ahead constructively about what lies before them.

The secrets of Scotland Yard have always had a fascination for law-abiding taxpayers of all countries. The celebrated American bandleader, Major Glenn Miller, only a few days before his untimely and still unexplained death crossing the Channel by 'plane, when in London as conductor of the giant war-time musical export, the American band of the A.E.F., had only one request—to see inside "The Yard." This wish was granted cheerfully by the Big Five. Together we walked round the Black Museum, were told about the marvellous criminal filing system where even a miscreant's odd table habits may be known (one criminal was traced from boarding-house to boarding-house by a quirk of dicing bread); we even saw the results of an overnight raid on



A demonstration by a famous surgeon, with a model in the studio, of bloodless surgery featured in one of the most popular documentaries: "Matters of Life and Death."

a haunt of vice. The brilliant modern police methods of detailed photographic evidence, with vast enlargements of every exhibit, sit oddly alongside corridors so old-fashioned that it would not be in the least surprising to run into Sherlock Holmes and Dr. Watson on their way out from a friendly call. Which brings me to the thought that the documentary can have lighter moments, too, and an idea soon to be exploited will be *Six Against the Yard*, in which six leading novelists will each be invited to concoct a perfect crime, and each one may be unravelled by a different professional detective. My hunch is that the real detective will win hands down every time.

But there is the serious side of police work, the every-day work of the "Blue Lamp" police stations up and down London. The daily workaday round will form the backbone of another set of television programmes taking you inside and then outside again in the pursuit of daily human doings—some simple, some sinister, all absorbingly interesting. It might turn out to be a case of a common car thief or a case of homicide. But all sorts and conditions come into the ken of a modern bobby as he pounds the familiar pavements.

London's landmarks are familiar all the world over, even to Londoners who take hundreds of years of history for granted, but not so much is known by everyone of another aspect of London. I mean its little-known quarters, its queer trades, old monuments, odd characters, many almost directly descended from Dickens's London, with its Fagins, cutpurses and squalor, and its quaint traditions. Intimate glimpses of "London Town" are now a necessary ingredient of British TV. But with television's tentacles stretching (like the caravans from Bagdad) "always a little farther," our documentary writers and researchers are now footloose in the counties of England with a parallel series called *About Britain*, concentrating first on the Midlands, then the North, followed by Scotland with its wealth of music, crafts, clans, castles and customs. With foreign travel necessarily restricted by the economic situation of our country, television will be facing the matter squarely and may well succeed in selling Britain's beauties to Britain, something no one has ever managed to achieve before.

Is television a menace to movies? The Documentary Department is out to prove it is not—in fact it offers a gesture of co-operation by showing trailers of films in "Current Release." The very first week of this new experiment gave us Sir Laurence Olivier and Robert Donat together, as well as a wild rhinoceros charge, so who knows what the future may bring? Bing? Bob? Marlene? Where there's life there's always hope!

Do you remember the Van Meegeren forgeries of Vermeer? Have you ever given thought to confidence tricks, drugs that are dangerous, attempts to swindle the Customs and Excise, the Loch Ness monster's latest doings, the Scottish Law Courts, the story of Show Business, life in the WRNS in the past war, travelling repertory, spy stories of the first world war?—these are just a few of many other stories ultimately coming the way of viewers from Southampton to Salford, from Dover to Dundee. It is a sobering thought, but stimulating, too. And it is only a beginning of an attempt to bring home a social realisation of our problems in acceptable form by a group of enthusiatic and talented professional producers. Documentary can never die, because at its heart it is really the story of you and me.

American Commentary

From Our American Correspondent

TWO interesting developments are announced from the U.S.A.—both connected with picture tubes. The first is from Stromberg-Carlson and is announced as "Panoramic Vision."

"Panoramic Vision" (patent applied for), is the new feature incorporated for the first time in three new models using the new cylindrical-faced rectangular 21in. picture tube, with 241 sq. in. (1,554 sq. cm.) of viewing surface. In these receivers, the curved-face picture tube hugs the removable safety-glass, also curved and extending across the entire front of the cabinet, to provide an extraordinarily wide view of the picture and to eliminate all room glare and reflection. For those who are interested in circuit features, these new receivers include automatic focusing, automatic re-trace line suppression, keyed automatic gain control, intercarrier tuning, and two-stage video amplification for high-contrast pictures at increased brightness. There are four stages of wide-band video I.F. amplification.

The second development is a small electronic device that, it is stated, can be applied to home television receivers to test and reactivate the picture tube without removing the tube from the set, resulting in renewed brightness and considerably longer useful life. This unit has been placed on the market by a New York manufacturer, Transvision, Inc., of New Rochelle, New York.

In some cases, it was said, the picture tube may be made almost as good as new and given as much as a year's useful life before replacement is necessary.

The instrument is small and compact. It weighs 3lb., costs little and is simple to operate. It is claimed that picture tubes, some of them new and never in a receiver, have shown remarkable improvement in brilliance and definition after a few minutes of reactivation.

Although the principle of its operation is not new—cathode-ray tube manufacturers have used it for years in the initial making of picture tubes—its incorporation in a small box as a separate instrument for use by the public or TV service men is, so far as is known, quite new.

New picture tubes can be tested and reactivated without removing them from their cartons, and tubes in TV sets without removing the tubes from the receivers. It is done by attaching a standard picture-tube socket to the tube, linked by wires from the new instrument, turning a switch on the tester-reactivator, and noting the glow of a small neon bulb as a dial on the tester is watched. The condition of the tube is indicated directly on a dial of the tester, which is plugged into an A.C. home electric socket. The receiver, meanwhile, is not turned on.

In some cases the test and reactivation is accomplished in less than 15 minutes. In more severe cases one hour, or even two hours, is required.

Engineers of Transvision, Inc., described the ageing process in picture tubes as one "strictly of poisoning." When tubes are made they are heated, then evacuated of air and "cooked" alternately until gases are removed. Some traces of gas, however, always remain inside the glass bulb, and these, released gradually "on the shelf" in stores or in sets in home use, adhere to the electron-emitting cathode in the tube and render it less able to do its work.

The "Practical Television" Receiver

AN ANALYSIS OF SOME OF THE DIFFICULTIES WHICH HAVE BEEN EXPERIENCED WITH THIS RECEIVER, WITH REMEDIES

By W. J. Delaney (G2FMY)

ALTHOUGH first designed in 1949, this receiver, which has been constructed in considerable numbers, has been remarkably free from recurring troubles. Those queries which have been received have been, in the main, different from each other and no particular fault has been experienced by all constructors. When referring to faults we intend, of course, to indicate troubles which are not due to deficiencies or inaccuracies in design. A good instance of a fault is that wherein a receiver works satisfactorily for a few weeks and then when switching on one night the raster opens only half-way. Or where, whilst the picture is running satisfactorily, it suddenly breaks up and it is impossible to obtain a clean raster again. It is obvious that faults such as these are due to breakdowns in some part of the circuit and it is these which cause most trouble. The initial setting up seems to be found quite simple, and it has not been found necessary to publish any change in the circuit although, owing to the discontinuation of manufacture of the mains transformer, it is necessary to use an alternative model in this position. The following faults will be dealt with because they are common to many commercial receivers and are of the type which seem to present most trouble to the reader who has no access to a C.R. oscilloscope—without which the proper testing of time-bases is almost impossible.

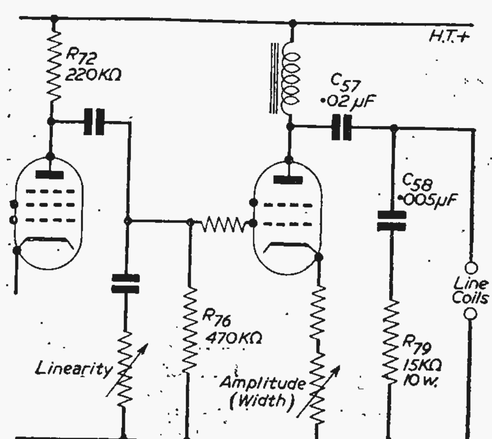
Line Linearity

The commonest fault is in the line linearity, and unfortunately this can be the result of several different breakdowns. Across the line coils in this particular model, and those employing a similar arrangement, a condenser is connected in series with a resistor (C58, .005 μF and R79 15 kΩ 10W). A similar arrangement will be found in a large number of receivers, and the purpose of these two components is to damp the oscillation which occurs in this part of the circuit. As most readers know, the peak potential which occurs here can be quite high and is, in fact, in modern commercial designs, utilised to provide the E.H.T. for the tube. In the Practical Television receiver the actual peak value developed across a working receiver is about 1.5 to 2 kV, and the scanning coils specified are designed to withstand this. It has been found that when experiencing difficulty in obtaining the specified condenser (2,000 volts working) for this part of the circuit some constructors have, not realising the high voltages developed, used an ordinary type of low-voltage condenser in this part of the circuit. This has soon broken down, and the resultant open circuit permits the peak voltage to rise up to 6 or 7 kV and, as a result, the scanning coils will no doubt break down. For a similar reason it is imperative that the constructor should not disconnect these components and try to operate the receiver with them out of circuit. A short-circuit across C57 is not so harmful as an open-circuit across the two items mentioned. Wrong values in these two components can, however, modify the linearity, and only the specified components, values and ratings should be used here.

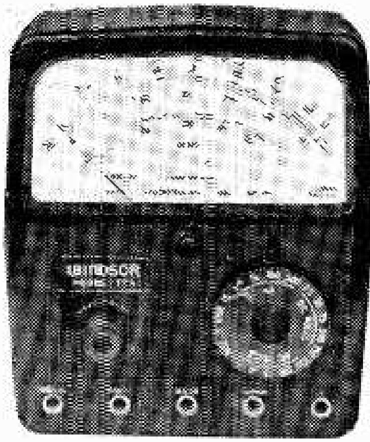
Cramping Sides

Another fault, which is experienced very much on commercial receivers, is a cramping on one side or the other of the frame. It has been shown in past issues that the oscillator produces a waveform of a certain shape which is usually modified by the following amplifier, and the two together should produce a linear scan. It has also been pointed out before that when first setting up a receiver it is necessary to adjust linearity and width together, as it is generally found that the width control affects one side more than the other, whilst the linearity control functions on the opposite side. In certain modern designs, of course, the amplitude or width control does not affect linearity, or the linearity control has only a small effect on the total width. Although a linearity control is provided in the oscillator stage of the line time-base, it has been found in some instances that this does not permit a complete adjustment for perfect linearity. The other component in this type of oscillator which will affect linearity is the load resistor of the oscillator stage—in the P.T.R. this is R72. If it is found, for instance, that the left-hand side of the picture cannot be contracted sufficiently to balance both sides of the picture, an increase in the value of R72 should be tried. It will be remembered that in the P.T.R. no high-tolerance components were specified, practically all components being of the standard wide tolerance. It may therefore happen that the components in the stage may all vary in one direction, and as a result a modification of one or more is called for. When designing the receiver I tried various values outside the normal tolerance ratings, and it was found that this particular type of time-base would function with very outside values, but it has since been seen that this particular resistor, carrying very

(*Concluded on p. 524*)



Circuit of the line time-base of the receiver.



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Pioneers of Television

2.—VLADIMIR ZWORYKIN, MAKER OF MODERN TELEVISION

MOST people take it for granted that television is a completely new thing, something which has only been invented during the last few years. The truth however, is far from this. The idea of television, or "electric seeing" as it used to be called, goes back a round eighty years at least, whilst the principle of modern television technique was first enunciated in London in 1911.

Evidently, the idea of television is no merely modern thing. Nor, for that matter, is television as we know it nowadays the brain-product of any one inventor. Quite a number of clever inventors toyed (and fumbled) with the notion of "seeing by electricity" before finally relinquishing the project as being hopelessly impracticable for any ordinary use. And, perhaps, they were quite justified in so doing because, almost without exception, they one and all lacked the electrical knowledge and practical facilities which have gone to make the long-sought art of television or electrical-seeing the practical proposition which it is in our modern days.

A Practical Pioneer

If, perhaps, there is any one individual pioneer who is more responsible than any others for the phenomenal, practical success of up-to-date-television, that individual is a one-time totally unknown Russian worker, a former technical college student by the name of Vladimir Kosma Zworykin, who, on emigrating from Russia to America, gave to the world the first really satisfactory television camera which was based on the principle of the cathode-ray tube.

A present-day portrait of Dr. V. K. Zworykin, vice-president and Electronics Research Director of Radio Corporation of America.

Zworykin was born in Russia in 1889. His parents were middle-class *bourgeoisie* people who, as such, were able to provide for his early education and to finance his entry into the famous "Institute of Technology" in the then St. Petersburg (Petrograd). Perhaps, if Zworykin had been of very humble parentage he might never have been heard of.

It happened, however, that one of the professors at the St. Petersburg Technological Institute was a person named Boris Rosing, a man who had made a minor name for himself in the then infantile sphere of electronics and who had, indeed, actually devised some experiments on the practicality of working out and constructing a system of television or, as he called it, "electrical vision." As time went on, Rosing became more and more television-minded. It was his constant enthusiasm, his constant endeavour and, no doubt, his constant dream. Such earnestness was picked up by his pupil, the youthful Zworykin, who assisted the professor in all his work and at all his practical demonstrations. Rosing and Zworykin became firm friends. Together they worked for the development of the technique of the cathode-ray tube. The cult of the cathode ray seems, indeed, to have become the keynote of Zworykin's subsequent life and activities, for it was at the St. Petersburg Institute that Vladimir Zworykin first began to realise the enormous potentialities held forth by these electric tubes, a realisation which subsequently became, in due time, such a motive force in his future path to technical, inventive and commercial success in the sphere of the one-time "electrical-seeing."

Zworykin graduated in electrical science in the St. Petersburg Institute. Then came the time for him to leave Professor Rosing and, in 1912, he entered the "College of France," a Parisian Institution, to undertake X-ray research under the direction of Professor P. Langevin, another enthusiastic worker in the science of electrical vacuum tubes. When the 1914-18 war broke out, Zworykin felt too restless and uneasy in Paris. So he returned to Russia and served his country during the war as an officer of the Russian Radio Corps, as it was in those days. But after the war he left Russia and emigrated to the United States, becoming a naturalised subject of that nation within a year or two of landing there. Before this, he had joined the research staff of the Westinghouse Electrical and Manufacturing Company, of Pittsburgh, and it was here that he first began to devote himself seriously and energetically to the many problems which then awaited the successful creator of any system of television working.

There were, of course, other minds working in the same direction. Inventors in Germany were actively attacking the long-standing television problem. Von Milhaly, of Budapest, was then rising to the height of his reputation as an electrical inventor who desired to achieve fame in the realm of television, whilst in England the now famous John Logie Baird, at that time almost an amateur, and a rather impecunious one at that, was creating scientific sensations by demonstrating, in London, the crude, half-shadowy television images on poorly lighted, orange-red flickering screens. The vision systems of all these inventors were based on mechanical principles only, some of which, particularly those of Baird, were holding out great possibilities of eventual success. Zworykin, however, saw, if he had never seen before, that, for any successful television working, no purely mechanical device could possibly be given the speed and the flexibility of an all-electric system of image transmission and reception which was necessary to provide high-definition television working. His first professor—Boris Rosing—at St. Petersburg itself had, as far back as 1908, more or less confidently preached the all-electric principles of image reproduction by means of cathode rays, and so, too, had an English experimenter in London, one Allen Archibald Campbell Swinton, who, perhaps before Rosing himself, had worked out on paper a complete television system based on cathode rays, in considerable detail.

Enter the Iconoscope

It was on the principles originally advanced by Rosing and Campbell Swinton that Zworykin began his inventive work on the cathode-ray tube as a means of successful television in the laboratories of the American Westinghouse company. This work led quickly to his conception of the basic principle of the *Iconoscope*, a revolutionary type of television pick-up tube designed on a cathode-ray basis. Under Zworykin's direction, a group of young engineers working with him made this tube suitable for practical picture transmission.

Others, particularly in America, were hot on the same trail, but Zworykin, with his *Iconoscope*, got there first. The cathode-ray pick-up tube which Zworykin first chose to designate by the name of *iconoscope* (Greek : *eikon*, an image ; *skopein*, to see) quickly revealed its value by making possible the first entirely satisfactory television camera for both interior and outside use. Unlike other image-pick-ups of the time, the Iconoscope had no moving parts of any sort. It was essentially a 100 per cent. electrical device, the first really successful and relatively simple implement for "seeing at a distance." The Iconoscope invention not only made the first of the modern television cameras, but it has also formed the basis of all the subsequent important developments in this field of applied science.

First appearing on the laboratory scale in 1933, Zworykin's Iconoscope principle was applied to television cameras in 1935, that is to say, a couple of years later, and it was first perfected for practical television purposes in 1945. Had not World War II intervened, the Iconoscope camera would, naturally, have been forthcoming at a considerably earlier date. During the period 1935-1945, Zworykin worked incessantly on the perfection of his camera. He developed (1935) the Zworykin "electron multiplier," a device for stepping-up the intensity of the electron-flow of electrons emitted from a cathode element under the impact of light, natural or artificial. By this device alone, the television camera greatly increased in sensitivity to all forms of light. From being an entity only suitable for the strongest of natural illuminations, it was transformed into a device which could function quite well under relatively weak artificial light. Electron multipliers are, nowadays, not only applied to television cameras, but, also, to many forms of talking-picture screen reproducers.

The "Kinescope"

Incidentally, Zworykin brought out, during his earlier days in America, what he called his "Kinescope." This was actually an improved form of cathode-ray tube specially designed for television reception. It was a device which, in association with the original Zworykin "Iconoscope," made practical the first beginnings of modern all-electric television as practised nowadays by all the leading nations of the world.

Thus, we see that besides being the first creator of the modern television camera, Zworykin functioned, too, as the originator of our present-day television cathode-ray receivers.

Other Inventions

Perhaps it will be unnecessary to remark that the research activities of Vladimir Zworykin were by no means confined to television alone. Our pioneer had begun his student days at St. Petersburg with photo-electric studies, and these he kept up at the present stage of his career. His attentions, besides television, were being given over to many phases of electronic and electron optics. Such work led to the development of a number of electronic image-tubes which were devoted to a host of important light-controlled optical devices and mechanisms, electrical gadgets which now serve various industries throughout the world. The study of electron optics guided Zworykin's practical interests to the subject of the electron microscope, an implement which was not his actual creation but which has been benefited by his work to a large extent as a result of the concentrated, long-term effort which he bestowed on its design. Since 1928, Vladimir K. Zworykin has been exclusively associated with the Radio Corporation of America, a company which has its main research centre at Princeton in the State of New Jersey. Before moving from the celebrated Westinghouse Electric Co. to the R.C.A., Zworykin had been awarded the degree of Doctor of Philosophy by the University of Pittsburgh. This honour was only the first of a long succession of academic distinctions which have been subsequently conferred on him, mainly, perhaps, in well-deserved recognition of the indispensable pioneering studies which he has made in the extended field of modern electronic and television advancement.

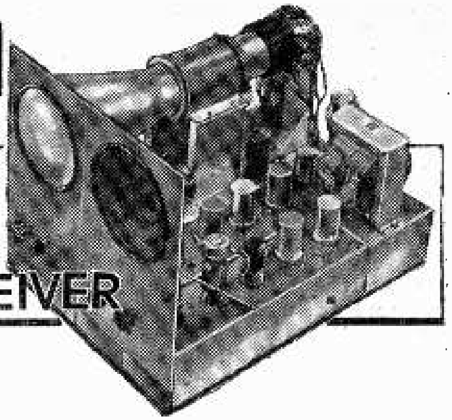
Dr. Zworykin is, at present, not only vice-president of the gigantic R.C.A. organisation, of Princeton, New Jersey, but also the Director of Electronic Research of that company. He has received various honours and distinctions from most nations of the world. Thus does civilisation value the coming of television in practical, everyday form. Vladimir Kosma Zworykin, world-acknowledged maker of modern television, is not only a man who has been in the right place at the right time and who has been shrewd enough to fasten-on to opportunity when it first arrived at his door. But, more than this, by his interest in and by his long-lasting practical devotion to a specialised and entirely modern field of electronic studies and experiment, the new claim which has been made on his behalf to have reared, developed and, at last, to have virtually perfected one of the world's modern scientific wonders must, so far as we can tell, remain for ever practically unassailed.

A Near Disaster

Only once did Zworykin's Iconoscope invention nearly end in practical annihilation. This was when he had planned to install a model of his device in the American dirigible, *Akron*, just before the war. The airship was to fly high above the clouds and then to lower the Iconoscope camera on a cable until it was substantially below cloud-level so that the pilot would be able to see what was going on below without, at the same time, exposing the dirigible to view from the ground. For one reason or another, the inventor did not accompany the camera in its flight. But the *Akron* did proceed on its flight. Ultimately, it crashed badly. The Iconoscope camera model was destroyed completely, but its inventor, fortunately, survived the disaster.

The "ARGUS"

BUILDING OUR *Free Blueprint* TELEVISION RECEIVER



MAKING THE CHASSIS, AND FURTHER CONSTRUCTIONAL NOTES

The Time Base

THE time-base circuit is given in Fig. 6. It follows normal practice and has been proved to be very reliable in operation.

The input is taken via C40, and V12 forms the D.C. restorer. V13 is the phase splitter, the picture signal for the C.R.T. being taken from its cathode while its anode supplies a correctly-phased signal for the sync separator.

An SP61 is used in this position with screening grid, suppressor grid and anode connected together to give normal triode conditions. This type of valve is used merely as a convenience; they are cheap and easy to obtain and its use in this position makes the top of the chassis layout appear uniform.

The coupling condenser C41 cuts off the D.C. component of the signal provided by V12, but as the cathode of V14 is directly earthed, the valve works on the lower portion of its curve and the D.C. component is thus artificially restored.

C58 is made variable so as to obtain the best amplitude of line sync pulse to trigger the line oscillator. The pulse obtained from V14 is fed to the line oscillator via the differentiating circuit. The frame pulse is obtained from the junction of R39 and R40 and is fed to the frame oscillator via the integrating circuit.

Both oscillators are of the Miller integrater and transitron type and each is accompanied by a companion valve to provide paraphase amplification and hence an output which is in push-pull for application to the deflector plates. V16 works in conjunction with V15 and the outputs are obtained at C54 and C55. Both these condensers need be only 450 volts working for the reasons explained later.

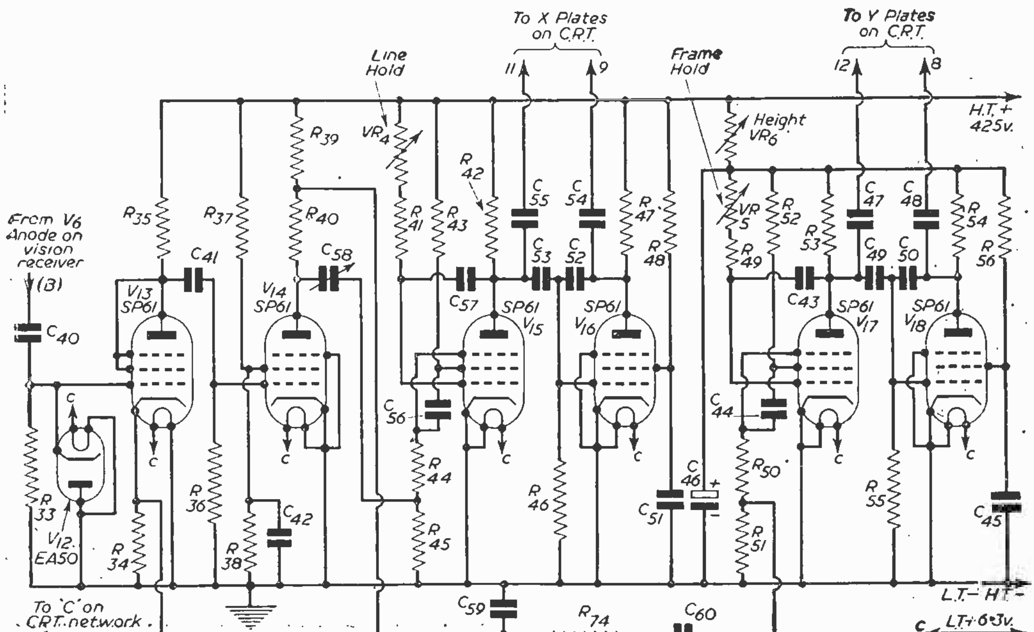


Fig. 6.—Theoretical circuit of the time base.

V18 performs the same function for the frame oscillator and the "Y" plate feeds are taken via C47 and C48. These condensers also need be only 450 volts working.

VR4 is the "Line Hold" control and VR5 is the "Frame Hold" control. The H.T. supplied to the frame time base goes through the variable potentiometer VR6, which thus exercises control over the height of the picture.

Building the Time Base

The chassis is constructed as shown below. After the holes have been drilled from the Blueprint and the chassis made up, the wiring can proceed.

The valveholders should be mounted first and then the component strip. This is formed by bending two pieces of soft iron strip ¼in. wide ⅛in. thick into an L shape and mounting on it tag strips, which are cut from a standard strip.

The filaments of the valves are wired first, the earthed side going to the valveholder fixing bolts. The components are fixed as shown in the diagram and those attached to the tag strip are fastened as the work proceeds. Start with the D.C. restorer, then the phase splitter, sync separator line time base, and frame time base.

The leads to the deflector plates are fixed at the bottom terminals of the tag strip and are taken out through the chassis and labelled one by one as they are wired.

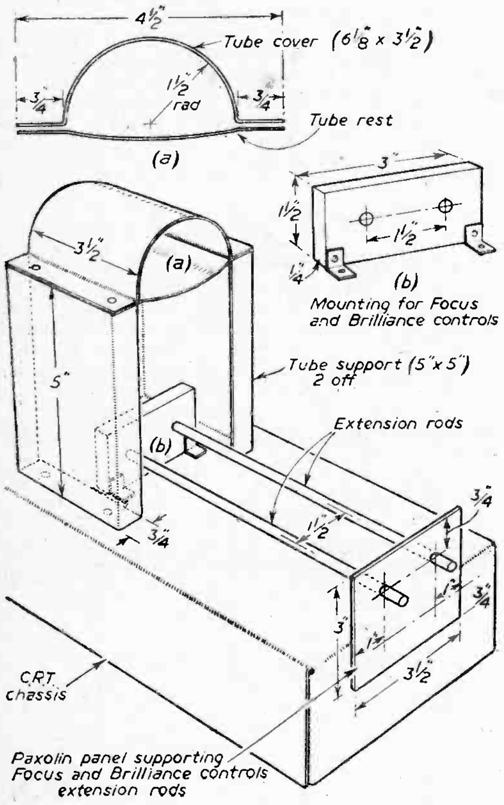


Fig. 7.—Details of the tube mount.

Finally the H.T. and L.T. leads are brought out of the chassis.

E.H.T. and C.R.T. Network

The circuit is shown on page 506. E.H.T. is obtained by using a transformer directly from the mains. The main advantage is that should the E.H.T. winding break down, one is faced with the cost of replacing a single small transformer, whereas if the E.H.T. and the rest of the power supply is obtained from one transformer, the cost of replacement in the event of a breakdown in the E.H.T. windings is very heavy.

It should be noted that the E.H.T. positive is earthed and not the negative. The reason for this is that it keeps the peak inverse voltage (which amounts to 5,000 volts) away from the transformer and transfers it to the valve. This greatly reduces the risk of breakdown in the transformer.

A further advantage is that the coupling condensers to the deflecting plates need only be 450 volts working, and the time base H.T. supply can be used for biasing the plates.

One disadvantage is that the grid of the C.R.T. cannot be directly coupled to the time base and the condenser used for coupling (C61) must be 2.5 kV. working. Due to the use of this coupling condenser the D.C. component is lost and has to be reinserted by use of the EA50 diode.

It should be remembered when dealing with a circuit of this nature that the cathode and filament of tube and diode are at E.H.T. potential with respect to chassis, and care should be taken in the wiring and handling of these points.

The bias on the C.R.T. is varied by VR9, which varies the cathode potential in relation to the grid. This control forms the Brilliance Control. The E.H.T. voltage applied to the second anode is made variable

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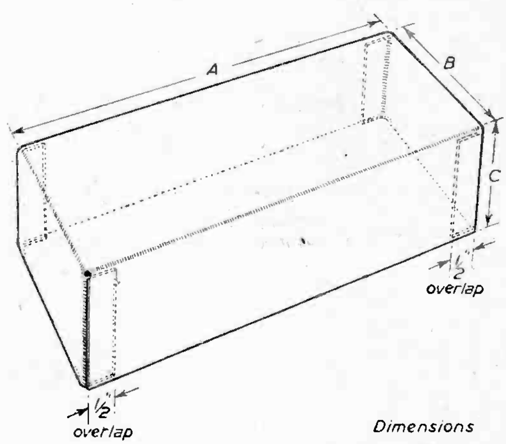
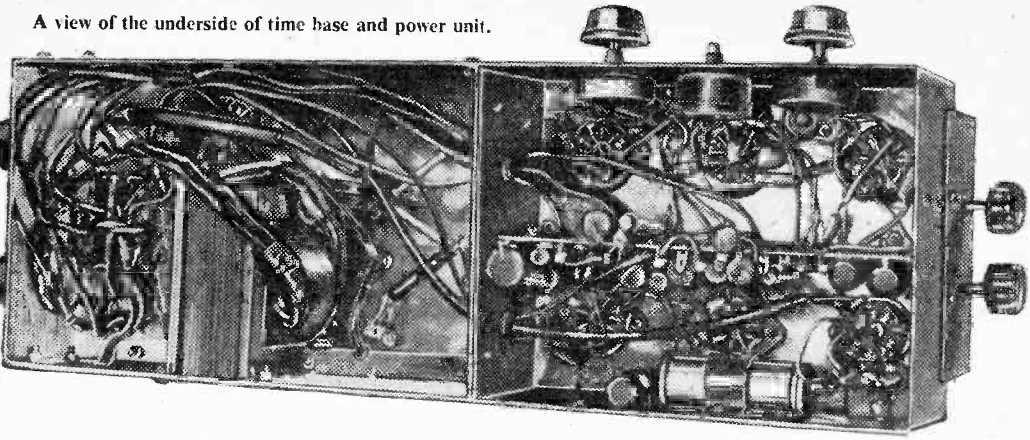


	Dimensions A	B	C
Sound Chassis	13"	3½"	3"
Vision Chassis	13"	3½"	3"
Time Base Chassis	10"	6"	3"
C.R.T. Chassis	8"	6"	3"
Power Pack Chassis	5"	7"	3"

Fig. 8.—Dimensions of all the 5 chassis.

A view of the underside of time base and power unit.



by the potentiometer VR10 and thus enables accurate focus to be obtained.

The X and Y plates are biased by voltage obtained from the time-base H.T. One X plate and one Y plate is provided with variable bias (VR7 and VR8), which form the shift controls to enable the raster to be accurately centred.

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Building the E.H.T. and C.R.T. Network

The chassis should be constructed as shown below, and Figs. 7 and 9 show the method of constructing the tube mount. It is in two parts, one for the tube holder and the other for the neck of the tube.

Most tubes have two rubber rings round the neck and they should be moved forward so that they act as a buffer between the metal of the tube holder and the glass of the tube. If you should happen to have a tube which has not got these rings, then a strip of sponge rubber can be used, or even a strip of felt.

The holder should not be clamped down too firmly or the neck of the tube may be fractured.

The E.H.T. transformer should be fixed first, followed by the bleeder network. The bleeder resistors (R68, R69, R70 and R71) are mounted so that they are ½in. clear of the chassis.

The Focus and Brilliance controls are mounted on a

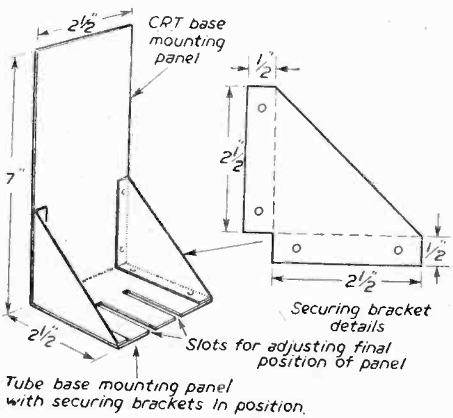


Fig. 9.—Details of the tube base support.

thick paxolin strip which is fastened to the chassis by L-shaped connectors, as shown in Fig. 7. This holder is mounted in the position shown and the controls fastened to it. Extension rods 10in. long carry the controls to the front panel, but are not fitted at this stage.

The tube holder should be mounted next together with the D.C. restoring diode, which is fastened to the tube holder by a small piece of L-shaped metal, using the existing screws on the tube side of the holder.

R66 is retained in its vertical position by the wiring.

After fixing all the components the wiring can proceed, bearing in mind that the R61, R62, R63 and shift control network is 450 volts above earth potential, but the rest of the circuit is at E.H.T. potential.

Commence the wiring with the biasing and shift control network. Room is left on the resistors R57, R58, R59 and R60 so that leads from the respective coupling condensers in the time base can be "teed" at these points.

R65 and C64 are mounted as shown in the wiring diagram, and the resistor R64 is mounted directly across the diode holder. All this part of the circuit should be wired with double insulated wiring, using 2 mm. sleeving over the bare wire and enclosing the whole in 5 mm. sleeving.

The leads from the primary of the E.H.T. transformer to the mains are brought out at the side of the chassis together with the time-base H.T. lead. The time-base H.T. lead is connected to the top end of R61, and this forms the common point for the H.T. to be connected to the time base itself.

When this part of the work has been completed, the time base and C.R.T. chassis can be bolted together. The X and Y leads from the time base should be connected to their respective resistors, and the L.T. for the time base extended through the side of the C.R.T. chassis. H.T. for the time base is connected to the top of R61 in the manner mentioned previously.

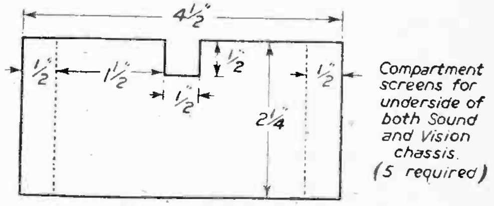


Fig. 10.—Details of the compartment screens.

A coaxial cable link is run from R34 in the time base to C61 in the C.R.T. network, and the screened covering should be earthed at both ends.

When the wiring has been completed it should be checked very carefully. Finally, the 10in. long extension rods should be connected to the Brilliance and Focus controls, the rods being insulated with P.V.C. covering from a length of coaxial cable. The front ends are supported by a paxolin strip. When the knobs are fitted, the grub screws should be sunk well inside the knob.

Power Supply

The transformer should have an output of 425-0-425 volts and the time-base H.T. is taken directly from the receiver side of the smoothing choke. R72 and R73 teed the vision and sound receivers respectively. Adequate smoothing is applied and the raster will be found free from traces of ripple.

As an additional precaution an iron shield can be erected between the power unit and the vision and sound receivers, if desired.

The mains input is taken via the switch, and the transformer side of this switch is connected to the appropriate voltage tap on the transformer. The mains input to the E.H.T. transformer is wired directly across the power transformer, and thus comes under the direct control of the switch.

Building the Power Unit

The chassis is constructed to the dimensions shown in Fig. 8, and the components should be fixed and wired as shown in the blueprint.

After all the wiring has been checked, a test should be made to ensure that no contacts exist between H.T., E.H.T., L.T. or earth. The separate units can then be connected together by long leads, not forgetting the coaxial links from the time base to the vision receiver, and from the vision receiver to the aerial socket.

Do not bolt the units together at this stage, as it is much easier to make adjustments or correct faults with the units separate.

Insert the valves in their respective sockets and fit the C.R.T. in its mount.

Operating Instructions

Set all the controls to their minimum positions: plug in the mains lead, and switch on. After allowing time for the televisor to warm up, advance the brilliance control until a trace appears on the screen. This should be roughly square in formation and is termed the "raster." Now adjust the focus control until the lines forming the raster are clearly defined: the height control can then be adjusted to obtain a suitably dimensioned pattern, and the shift controls operated to bring the raster centrally on the screen.

Now reduce the Brilliance control until the raster just fades out. This is the normal operating position for the brilliance control. Advance the contrast control and a varying pattern should now appear on the screen. Adjustment of the line-hold control should resolve the pattern into a picture and adjustment of the frame-hold control should lock the picture vertically.

(To be concluded next month.)

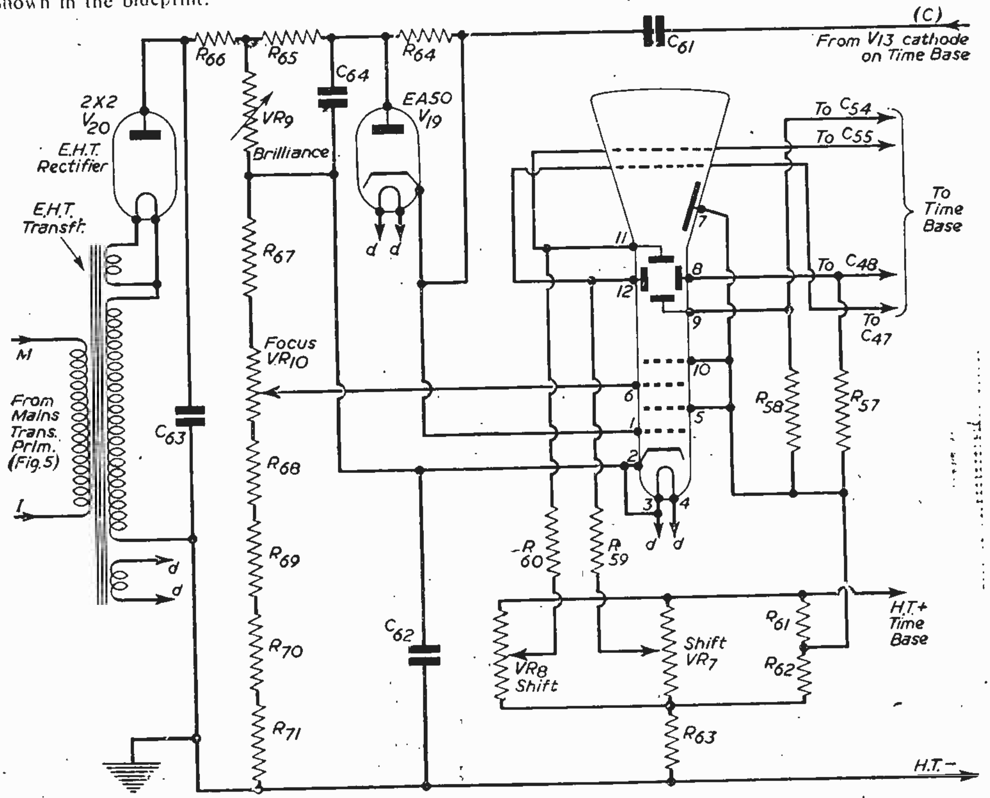


Fig. 11.—Theoretical circuit of the E.H.T and tube unit.

Aerial Matching

FURTHER DETAILS OF UNBALANCE TO BALANCE TRANSFORMERS

By "Erg"

IN order to obtain the transfer of the greatest amount of signal picked up by a dipole aerial to the televisor, the transmission line is chosen so that its characteristic impedance matches the characteristic impedance of the aerial. This is especially important in the fringe areas and at points where the signal is weak, as a mismatch will reduce the amount of signal available at the receiver.

Another important factor is the symmetry of the

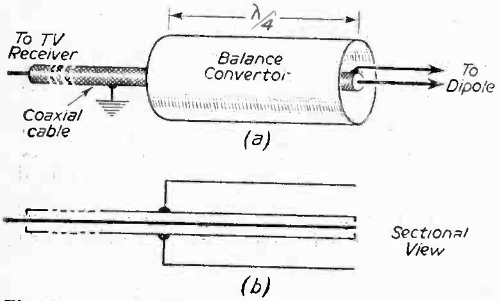


Fig. 1.—General illustrations of the form taken by one type of matching transformer.

connection between the aerial and its transmission line. In TV practice there are two general types of transmission lines used, (a) twin lead, and (b) coaxial cable.

Now a dipole has two equal arms which form a balanced pair and must therefore be connected directly to a balanced line in order to obtain maximum results.

Twin-lead cable is made of two parallel conductors which form, in themselves, a balanced pair. When such a cable is connected to the balanced dipole they form a complete symmetrical system, and the maximum results are obtained, provided that both impedances are equal.

Coaxial cable, however, is inherently unbalanced, and if direct coupling is made between the balanced aerial and the unbalanced cable, losses are liable to occur.

H.F. currents circulate in the "skin" of a conductor and with coaxial cable we have the condition where the outer skin of the outer conductor is at earth potential, whereas the outer skin of the inner conductor has quite a high impedance to earth.

At the lower frequencies the unbalance is not excessive especially so when the diameter of the line is small compared with the length of the aerial. When dealing with television frequencies, however, the unbalance becomes much more noticeable and losses due to standing waves in the transmission line are liable to occur.

It is not a difficult matter to convert an unbalanced coaxial line so that it becomes balanced as far as the aerial is concerned; losses due to standing waves are then avoided and the full benefits of accurate matching obtained. It is accomplished as explained briefly in the February issue by using an unbalance to balance convertor.

The Principle

This may take various forms, though the principles governing their use are the same, and depend mainly upon the fact that a piece of transmission line which is exactly one quarter of a wavelength long (measured in terms of electrical length) will possess a high impedance at the operating frequency if short-circuited at the far end.

Fig. 1 shows one form of unit. It consists of a metal shield one quarter of a wavelength long fitted round the aerial end of the transmission line; the back end of the shield is bonded firmly to the outer conductor of the coaxial line while the top end is left free. Thus the inside of the shield and the outside of the outer conductor form a $\frac{\lambda}{4}$ section of line which is short-circuited at one end.

A similar method which is more practicable for television is to run the coaxial cable up through the bottom half of the dipole. This is shown in Fig. 2. The outer skin of the coaxial together with the inner skin of the dipole forms a $\frac{\lambda}{4}$ short-circuited section of line resonant at the frequency of the dipole.

Now a line such as this displays a high impedance at its open end, i.e., between A and B. Assume a voltage is generated in the dipole, then a potential will exist at D with regard to the centre of the dipole; B also possesses a potential difference between itself and the centre of the dipole. (Fig. 3 makes this clear.)

The centre of the dipole is at earth potential: D has a high impedance with regard to the centre of the dipole and therefore it has a high impedance with regard to earth. B has a high impedance to the centre of the dipole and it also has a high impedance to earth due to the effect of the short-circuited $\frac{\lambda}{4}$ section, i.e., due to the high impedance effect between A and B. The equiva-

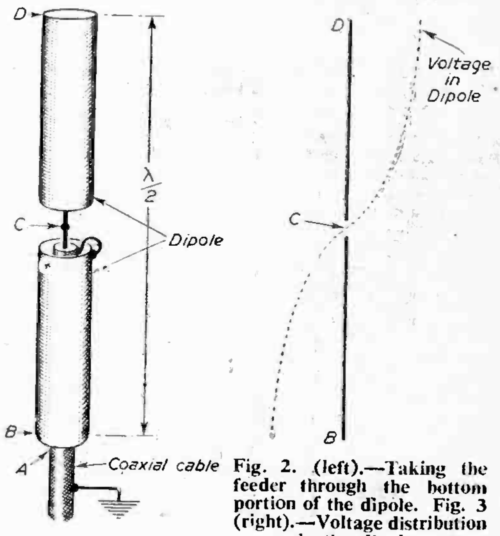


Fig. 2. (left).—Taking the feeder through the bottom portion of the dipole. Fig. 3 (right).—Voltage distribution in the dipole.

lent circuit diagram in Fig. 4 shows the conditions which bring about the balance.

An Alternative

Where the diameter of the dipole does not permit the use of the above scheme another method, as shown in Fig. 5, may be used. Here the transmission line and

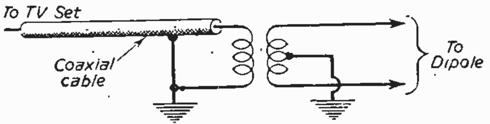


Fig. 4.—Circuit showing the transformer arrangement.

unit are mounted side by side. The bottom end of the unit is short-circuited and the top end connected as shown in the figure. Both transmission line and the unit should be brought off at right angles to the dipole for at least one quarter of a wavelength. The short-circuited end causes the unit to offer a very high impedance at the frequency to which it is tuned.

One snag with this method is that the velocity factor of the cable must be included in the calculations of the length of the unit. A formula is given below :—

$$L = \frac{246 \times V}{f}$$

where L = length of unit in feet.
f = frequency of the dipole in megacycles.
V = velocity factor of the cable.

V depends upon the class and type of cable being used and can be obtained from the manufacturers of the cable. As a general guide 75 ohm coaxial cable such as is used for television has a velocity factor of about 0.66.

Once the unbalanced condition of the coaxial cable has been overcome the writer prefers this type of cable

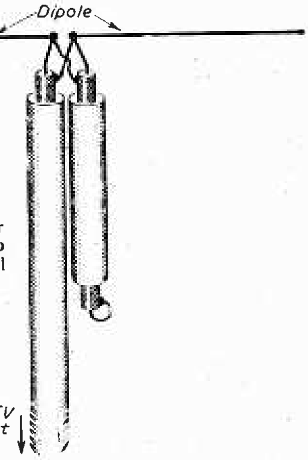


Fig. 5.—Another method of making up the matching aerial feeder section.

to twin lead. With coaxial cable the outer sheath can be fully earthed and thus form a screen from interference in its passage down to the receiver ; at the same time it provides an efficient safeguard against heavy electrical discharges when lightning is about.

Club Reports

THE BRITISH TELEVISION VIEWERS' SOCIETY

Hon. Sec.: E. W. Gregg, 15, Convent Hill, Upper Norwood, S.E.19.

TELEVISION'S popular feature, Café Continental, formed the subject of the British Television Viewers' Society's meeting, held at Kennard's Restaurant, Croydon, on Monday, February 4th, when its producer, Henry Caldwell, addressed a large gathering of members.

The speaker explained the origin of this successful show in the Middle East during the war and gave details of the difficulties encountered and complicated formalities required in the course of booking foreign acts for the Café.

The relating of his experiences whilst searching for suitable talent on the continent and elsewhere provided some amusement at the meeting, but members were nevertheless fully appreciative of the very hard preliminary work done " behind the scenes " before Café Continental becomes a reality on their television screens each month.

NORTHAMPTON AREA TELEVIEWERS' SOCIETY

General Sec.: G. T. Wilson, 95, Ennerdale Road, Northampton.

AT the society's January meeting, a Viewers' Forum discussed the question : Is the presence of Harding in " What's My Line ? " a cause of embarrassment, and should he be removed ? Opinions from the floor included the view that he should be retained. Other questions under discussion included O.P. transmission from the Midlands, such as motor racing from Silverstone, Northamptonshire, and County Cricket sponsored programmes. Mr. G. T. Wilson, secretary, stated that he had a letter from Mr. Barrie Edgar, TV Outside Broadcasts Producer, stating that they hoped to be at Silverstone this year.

The society recently voted on the question of Leslie Mitchell being dropped from " Picture Page." Our views were sent to the chairman of Viewers' Viewpoint. (British Television Viewers' Society).

For our February meeting on Thursday, February 21st, we had as our guest, Mr. Eric Robinson, B.B.C. Television Musical Director, and on March 20th, Mr. Cyril Page, B.B.C. Newsreel Cameraman, who was in Korea, will visit the society.

ADMIRALTY ELECTRONICS SOCIETY

Hon. Sec.: W. J. Green, Esq. (G3FBA).

MEMBERSHIP of this society is open to civilian and service members of the Admiralty, and to members of other Government Departments at the discretion of the committee. Full workshop facilities are available, including test equipment, radio and TV aerials, and transmitting facilities to licensed members, the society's call sign being G3BPT.

PROPOSED MANCHESTER CENTRE FOR THE TELEVISION SOCIETY

IN view of the rapid increase in the interest in the North of England in television, it has been decided that an attempt shall be made to form a centre of the Television Society in Manchester, and with this idea in view a meeting was recently held.

Further details about the meeting, and all correspondence, should be addressed to Mr. R. Lawton, 10, Dalton Avenue, Whitefield, Near Manchester. (WHItefield 2781.)

THE TELEVISION SOCIETY
REVISED PROGRAMME OF MEETINGS

All meetings, unless otherwise stated, are held at the Cinematograph Exhibitors' Association, 164, Shaftesbury Avenue, W.C.2, and commence at 7 p.m.

Thursday, March 20th.—Fleming Memorial Lecture, " Guided Waves." Prof. H. M. Barlow, Ph.D. (University College).

Held in the Anatomy Theatre, University College, Gower St., W.C.1, at 6.30 p.m.

Friday, March 28th.—The Mechanism of Signal Generation in Storage Type Picture Tubes. Dr. R. Theile (Pye Radio, Ltd.).

Wednesday, April 2nd.—A New Television Recording Camera. W. D. Kemp, B.Sc. (B.B.C.P.&I. Dept.).

Joint meeting with the British Kine Society at Film House, Wardour St., W.1, at 6.45 p.m. (Tea).

Friday, April 25th.—Silver Jubilee Dinner. The Waldorf Hotel.

Thursday, May 1st.—A Discourse by Mr. Richard Dimbleby : " London Town."

Held in the Lecture Theatre of the Institution of Electrical Engineers, Savoy Place, at 6.30 p.m. Visitors tickets will be limited.

Thursday, May 8th.—Image Orthicon Camera Tubes. Baldwin Banks, B.Sc., and K. Frank, Ph.D. (English Electric Co.).

Friday, May 23rd.—The H.M.V. 21in. Tube Receiver. J. J. Billin (E.M.I.Eng. Development).

A Summer Meeting will be held in June, 1952.

Non-members of the society are admitted to meetings on the presentation of a signed ticket obtainable from any member, or from the Hon. Lecture Secretary, Mr. G. T. Clack, at the Society's London office, 164, Shaftesbury Avenue, W.C.2.

Modifying the "P.T." and "Viewmaster" Receivers for Kirk o'Shotts

DETAILS OF THE ALTERATIONS REQUIRED AND THE NEW PEAKING FREQUENCIES

AN examination of the frequency spectrum allocated to the BBC television system will show that the new Scottish transmitter has frequencies midway between those of Holme Moss and Sutton Coldfield. Kirk o'Shotts is on what is known as Channel 3, whilst the Northern transmitter is Channel 2 and Sutton Coldfield Channel 4. The sound and vision carrier frequencies for each channel are separated by 3.5 Mc/s, and the separation between each vision carrier and the sound carrier of the channel next above it is fixed at 1.5 Mc/s. It is obvious, therefore, that in some areas it may be found difficult with ordinary circuits to obtain adequate separation between the vision and the sound channel of the adjacent transmitter, but the geographical location of the stations and their frequencies have been so chosen that this will only present trouble in very few localities.

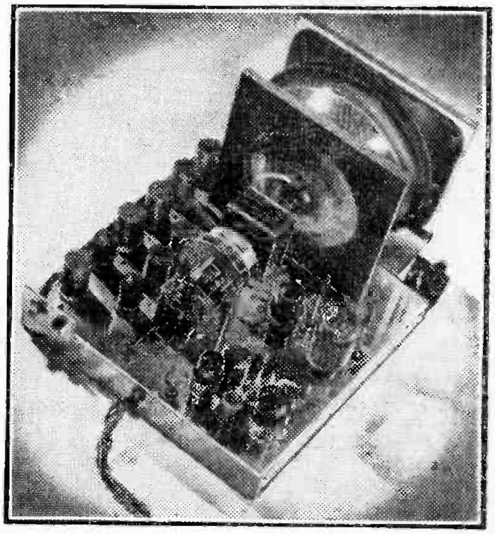
In the booklet dealing with the "Practical Television" receiver we have given coil data for Channels 1 and 4, whilst later issues carried a separate instruction data sheet for modification to the coils for Channel 2. As the new station in Scotland is midway between the Midland and Northern transmitters the core coverage under normal conditions should enable either of the coils for these two transmitters to be tuned to the required 53.25 Mc/s signal for sound or 56.75 Mc/s for vision. The only drawback to using coils for these frequencies will be that the core will be almost out at one end or the other, but much depends upon the stray capacities in the circuit wiring, and these differ for each individual constructor.

Coil Modifications

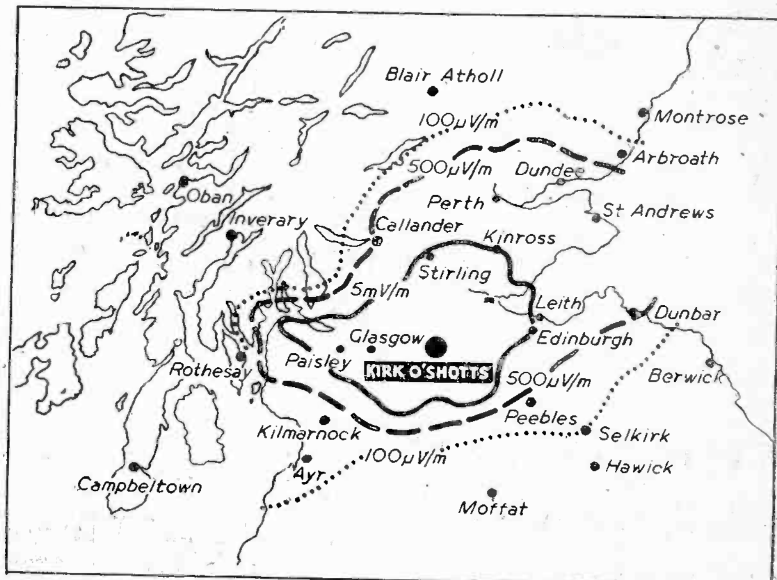
If it is desired to wind new coils the following data will apply:

Aerial Input Coil........6 (Tap at 1½)
V.F. Coupling Coils (4 required)............5
Sound Coupling Coil.... 6 and 5
Sound Input and Rejector Coil(s) .. 5 (Tap at 1)

If it is found that the core has to project too far, half a turn may be opened out at the end, but it is emphasised that in view of the flat tuning which is necessary and is produced by the damping resistors, together with the stray wiring capacities, exact half-turn coils are not called for and the core adjustment with the closely wound coils should enable the exact frequencies to be found. The peaking frequencies upon which the circuits should be aligned with the aid of a signal generator will be as follows:—



A three-quarter rear view of the popular "Practical Television" receiver.



Official estimated field strength contours of the Kirk o'Shotts station when on full power.

Vision	L1—54	Mc/s.
	L2—56.75	„
	L3—55	„
	L4—56.75	„
	L5—54	„
Rejector	L9—53.25	„
Sound	L6—53.25	„
	L7—53.25	„
	L8—53.25	„

The Viewmaster for Scottish viewers is the Model D, which is exactly the same as Model C (Holme Moss), with the exception of the coils. To convert a Model C to the Kirk o'Shotts' frequencies it is only necessary, therefore, to change the set of Wearite coils. There are no other alterations whatever in the circuit or in any of the other component values..

Kirk o'Shotts coils can be identified by their numbers L301 to L315 (instead of L201 to L215 as listed in the Model C (Holme Moss) Viewmaster booklet), and are enumerated in the table below.

Scottish constructors should bear in mind that the sound and vision transmission frequencies quoted in the booklet refer to Holme Moss only.

Inductance	Kirk o'Shotts Coil Reference Number
Aerial Coil	L301
V1 Grid Coil	L302
V1 Anode Coil	L303
V2 Grid Coil	L304
V2 Anode Coil	L305
V3 Grid Coil	L306
V3 Anode Coil	L307
V4 Anode Coil	L308
Aerial Filter Coil.. ..	L309
V1 Anode Filter Coil ..	L310
V2 Anode Filter Coil ..	L311
V3 Anode Filter Coil ..	L312
V6 Grid Coil	L313
V6 Anode Coil	L314
V7 Input Coil	L315

Alignment Instructions

The instructions given on page 21 of the Holme Moss booklet are exactly the same for Kirk o'Shotts and the following is the correct aligning procedure with a signal generator for the Kirk o'Shotts' frequencies.

Generator Connected to	Tune Coils	Peaking Freq. Mc/s
Grid of V6	L314, L315 for MAX. sound output at	53.25
Grid of V1	L313, L310, L303 for MAX. sound output at	53.25
Grid of V3	L308 for MAX. output at ..	56.75
	L307 for MAX. output at ..	56.00
	L312 for MIN. output at ..	58.25
Grid of V2	L306 for MAX. output at ..	56.00
	L305 for MAX. output at ..	54.00
	L311 for MIN. output at ..	53.25
Grid of V1	L304 for MAX. output at ..	56.00
	L303 for MAX. output at ..	54.00
	L310 for MIN. output at ..	53.25
Aerial input feeder	L302 for MAX. output at ..	54.00
	L309 for MIN. output at ..	58.25
	L313 for MAX. output at ..	53.25

Film Testing by Television

TELEVISION is now being used in British film studios for the first time. A complete three-camera unit, supplied by Marconi's Wireless Telegraph Co., Ltd., is installed at the Elstree studios of Associated British, and Robert Clark, executive director in charge of production at Elstree Studios, is to use television as a means of testing whether film stories mooted for production are likely to prove box-office winners. The method by which he will accomplish this is both new and ingenious. For the first test pre-fabricated film sets will be standing ready on one of the large sound stages at Elstree Studios. A cast of well-known players, headed by James Donald and Isabel Dean, will then perform a full-length story. But instead of the usual film cameras, they will be "shot" by television cameras. As the story is performed it will be transmitted into one of the large viewing theatres at Elstree where the "film try-out" will be viewed by a representative body of executives and film and television technicians. By this method, the experts should be able to assess whether or not the televised story will be a likely subject for filming in the normal manner.

Cutting Out Gambles

It is believed that this is the very first time in history that this method of pre-filming by television has been carried out in Britain. The scheme has many advantages. Showmen normally judge a film's potentialities by a complete visualisation of the script. This new method will allow executives and technicians to view an actual performance on a cinema screen, thereby probably ensuring that fewer gambles and more certainties will emanate from studios.

The story forming the subject for the initial televised film performance is "The Human Touch," a script by J. Lee Thompson and Dudley Lesley, from the successful play of the same name which had a long run at the Savoy Theatre about three years ago.

Film production chief Robert Clark, in his determination to achieve the best possible results from this performance, engaged one of the BBC's senior television producers, George More O'Ferrall, to direct the performance.

Reducing Costs

Another advantage of this harnessing of television in film studios will be that film tests of individual artists may be speedier, less costly and more advantageous than the normal motion picture artist test.

It must be emphasised that this new project is very much in the nature of an experiment. But it is an experiment that is likely to pay dividends after film and television technicians have had the opportunity of working closely together and blending their respective techniques as is being done at Elstree. If the experiment is successful it could mean that producers in this country will be able to assess the value of, as it were, a finished product instead of having to try to assess the screen potentialities of a story from the script alone.

It is highly probable, moreover, think the television experts, that this "marriage" of film and television techniques might easily prove beneficial to television studio productions.

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SPANNERS.—4 B.A., **6d.** Five for **2/-**. Box type, set of three Flat Type, 2 B.A., 4 B.A., 6 B.A., **1/-**.

FILAMENT TRANSFORMERS.—Midget dimensions, finished in green crackle. Primary 210/240 v. to 6.3 v. 1.5 a., **8/6**; to 6.3 v. 3 a., **12/6**; Multi purpose type for instruments, models, etc., tappings 3 v. to 30 v. at 2 amp., **24/-**.

SPEAKER TRANSFORMERS.—Super Midget for personals. DL92, 3S4, 1S4, **5/-**; Standard Pentode, **4/6**; 60 : 30 : 90 : to 1, **6/6**. 30 : 1, **4/-**. Mains Pentode Midget, **4/-**.

COILS.—Wearite "P" Coils, **3/-**; Wearite Viewmaster coils, per set, London, **20/-**; Midland, **28/-**; Holme Moss, **30/-**; MW/LW TRF Matched pair with circuit, **7/6**. Weymouth CT3W3, **9/6** pair, CS2W2 **11/6** pair. K.O. Coils, **4/9**. "H" Coils, **3/3**.

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FORMERS.—Aladdin with cores, ¼in., **7d.**; ⅜in., **10d.**; ½in., **9d.** Cores, ¼in., **3d.**; ⅜in., **4d.**

BOOKS.—Viewmaster Book and Circuits, **5/-**. London or Midland Easybuilt Televisor, **2/6**; Portable Televisor, **3/-**; Personal Portables, **2/6**.

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Trans-Atlantic Relay Off

IT is understood that the National Broadcasting Company of America has decided that its plan to televise the Coronation of Queen Elizabeth by using 'planes, flying at a height of five miles and equipped with microwave relay apparatus, contains too many technical difficulties and entails too much expense.

Growth of Television

THE BBC is making a film on the development and growth of television. The early days of John Logie Baird's experiments and discoveries will be included in the film, which is intended primarily for exhibition overseas, although it will be seen on the BBC service in this country.

Television for Italy

BY next year Italy should have television. The standard of 625 lines and 25 frames interlaced has been fixed, and transmitting stations will be situated in Rome, Miland and Turin, seven to be built within the next two years.

A television staff has already been engaged by the Italian radio, and both the television and radio services will come under Government control and finance.

Our Films Earn Dollars

MORE and more British films are being flown to the United States to be shown on television screens over there.

The films, mainly murder and psychological thrillers, are mostly made by a London firm and are specially designed to suit American tastes.

Old Favourite

OLD pre-war English films are still shown in America and are very popular.

Probably the most televised of them all is John Buchan's "Thirty-nine Steps," starring Robert Donat and Madeleine Carroll. Although filmed as long ago as 1935, it appears on American screens at least three times a year.

Fish Location

UNDERWATER television apparatus, which can detect fish within a distance of fifty feet, even at a depth of five hundred fathoms, is to be installed in the Fleetwood trawler *Red Rose*.

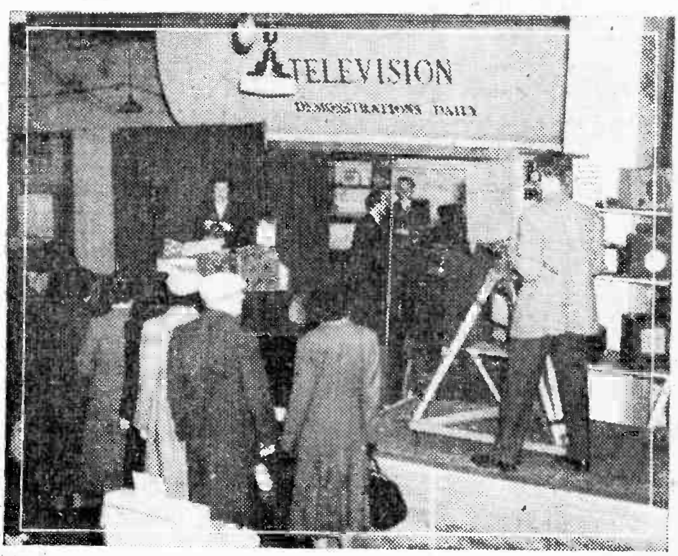
U.N. Equipment Flown to Britain

A SILVER CITY AIRWAYS Bristol Freighter landed at Southend Airport recently with a full load of television equipment brought from the United Nations Organisation in Paris.

The particular freighter concerned had spent the previous day carrying 25,000 lb. of cheese from Le Touquet to Lympne. It flew on charter to Paris in the evening and brought the television equipment to Southend on the following morning, landing at 10.30 a.m. By 12 noon the television gear had been disgorged and four tons of aircraft spares loaded. These were delivered to an aircraft company in Amsterdam by 2 p.m., and the aircraft finally returned to Lympne in the late afternoon with a full load of large metal containers.

Pye Contract

MR. CINGOLANI, president of "Radio Minerva," Milan,



Television was used for the first time in this country in an Oxford Street store, when demonstrations were shot by a Marconi camera and shown on the sets in the shop

recently visited Cambridge to sign an agreement for the manufacture of Pye television receivers under licence in Italy.

With television transmissions now beginning in Turin, there is a good potential market for television receivers in Italy.

"Radio Minerva" is a well-established name on the Italian market. Their factory is situated in Milan, where they have a very modern plant manufacturing radio receivers and other electronic products.

Lesson Tests

WHEN the schools educational service opens in May, six London schools will hold test classes to see what benefit can be derived from this form of education.

Two of the schools are the Chase School for girls and the Albany School for boys, at Enfield. The classes will last half an hour and will be televised every afternoon for four weeks.

Wenvoe Progress

CONSTRUCTION of the new transmitter at Wenvoe has proceeded so smoothly that it is expected that the first tests will be made in June.

After only seven weeks' work the 610ft. main part of the mast was completed. The fitting of the tubular section and the 40ft. dipole will be carried out soon, so that the proposed opening date in September now seems certain.

The transmitter will bring 3,500,000 more viewers within range of television.

Committee Approval

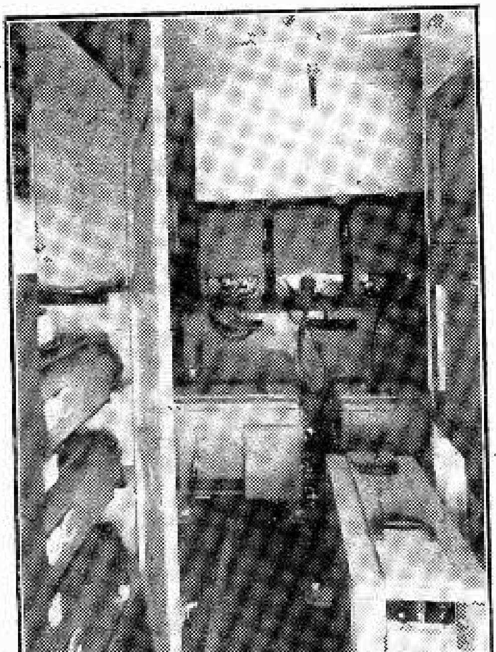
TWO devices were approved by the Anglo-French Television Liaison Committee last month for making French pictures fit English screens.

New Rush

A FURTHER boost was given to the sale of receivers in Scotland when the Kirk o'Shotts station transmitted the funeral of the late King.

Crowds collected round display windows of Glasgow dealers and many of the fortunates already possessing receivers invited others to share with them the initial delight of viewing.

Many people paid cash down at the last minute in order to have a set installed in time.



An interior view of the new Outside Broadcast television vehicle fully equipped for the BBC by Marconi's Wireless Telegraph Co., Ltd. The picture shows the rear of some of the camera control monitors, while on the floor are three Marconi Mark II television cameras on their shock-absorbent travelling mounts. At the left can be seen three electronic viewfinders in their travelling apartment.

"About the Home"

IN a recent edition of "About the Home," one of the guests introduced by Joan Gilbert was Mr. F. J. Camm, editor of PRACTICAL TELEVISION.

The subject for Mr. Camm's short talk was not on this occasion television, but bicycles. Viewers were given hints and points for which to look when choosing a new bicycle.

Churchill's Speech

THE Gramophone Co., Ltd., have the privilege of publishing on "His Master's Voice" records the memorial speech made by the Rt. Hon. Winston S. Churchill, O.M., C.H., M.P., to the memory of our beloved King George VI, broadcast on Thursday, February 7th.

This tribute is contained on two 12in. plum label records, Nos. C.7900 and C.7901, which have been available since Saturday, February 16th.

The profits from these records are being given to a charity nominated by the Prime Minister.

Commonwealth Link

DIRECTORS-GENERAL from India, Pakistan, Australia, New Zealand, South Africa and Canada will arrive in London in June to discuss with Sir William Haley, Director-General of the BBC, plans for a two-way television and radio link between this country and the whole of the Commonwealth.

The outcome of the discussions is likely to be kept secret for a time.

"What's My Line?"

WITH the leaving of Professor Jimmy Edwards from the "What's My Line?" team and only occasional appearances of Richard Dimbleby, the panel of experts for this popular programme consists once again of the faces that were with the show in the first editions back in the autumn. The faces belong, of course, to Elizabeth Allan, authoress Marghanita Laski, Jerry Desmonde, and the one and only Gilbert Harding.

Eamonn Andrews still reigns supreme in the role of chairman.

Dusty Screens

VIEWERS are reminded that a dark circle on the face of the cathode ray tube does not necessarily mean that deterioration has set in.

The dark patch may be caused by dust collecting on part of the tube. A quick test for a true diagnosis of this type of complaint is to stand by the side of the receiver with the ordinary room light on and look at the glass from a downward angle. If dust has accumulated, it will show up as a dark patch.

Lack of Electronic Mechanics

SPEAKING at the annual dinner of the Institution of Electrical Engineers, in London, Field-Marshal Sir William Slim, Chief of the Imperial General Staff, said that one of the great shortages in the Services was the electrical mechanic, together with electronic equipment.

He said that he wished employers would release skilled men for service in the Regular Army and the Territorials.

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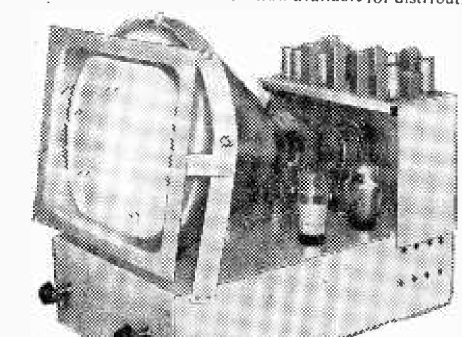

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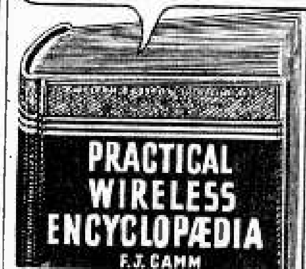

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FILAMENT TRANSFORMERS. All inputs 200/250 A.C. 6.3 v. 1.5 A., 7/6. Igranic 6.3 v., 2½ A., 10/- ; 6 v. or 12 v. 3 A., 20/- ; 6.3 v. 12 A.; 37/6.

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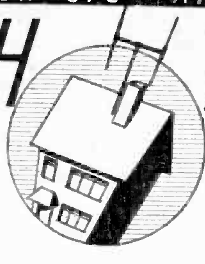


By Iconos

TO free TV—or not to free? That is the question. The battle warms up, with politicians, radio traders and even viewers penning their views to the newspapers. Christopher "Quo Vadis" Mayhew, M.P., who is the likeable politician who showed his dislike of that super-colossal epic film by stalking out in the middle of its première, writes in favour of the *status quo* so far as television is concerned. His persuasive pen makes short work of the problem and he passionately declared in the *Sunday Times*: "I hope and pray that commercial advertisers will be resolutely kept out of British television."

MR. MAYHEW'S EARS

MR. MAYHEW is a knowledgeable man who has become well acquainted with both sides of the television camera. He has appeared in several TV features, including the recent "World Survey" series, which was a study of power in world politics. In this he dealt with the case of the United Kingdom in much the same way as he now deals with the prospective television advertising sponsor. He seemed to have convinced himself that both are merely fourth-rate powers! Fortunately, there are many others who do not hold that point of view, including a certain compartment full of irate viewers on the 8.10 train to town the following morning. If Mr. Mayhew's ears were burning at that particular time, that was the reason!

A COMPROMISE?

MOST viewers feel that the case against sponsored TV programmes cannot be proved until they have an opportunity of seeing a few samples. In the very early days of broadcasting, when Lord Reith (then plain "Mr.") presided over the three solitary BBC studios at Savoy Hill, a Sunday newspaper was allowed to promote a "celebrity" radio concert which was highly successful. The name of the newspaper was announced only at the beginning and end of the programme, which seemed a fairly reasonable sort of arrangement to me. Occasional TV programmes put over in the same manner would, I feel, have a tonic effect upon the whole service.

That is a vastly different proposition from the three-minute (or more) commercial blurb permitted every half an hour on American television programmes. There must be a midway compromise between these two extremes which would be acceptable to British viewers.

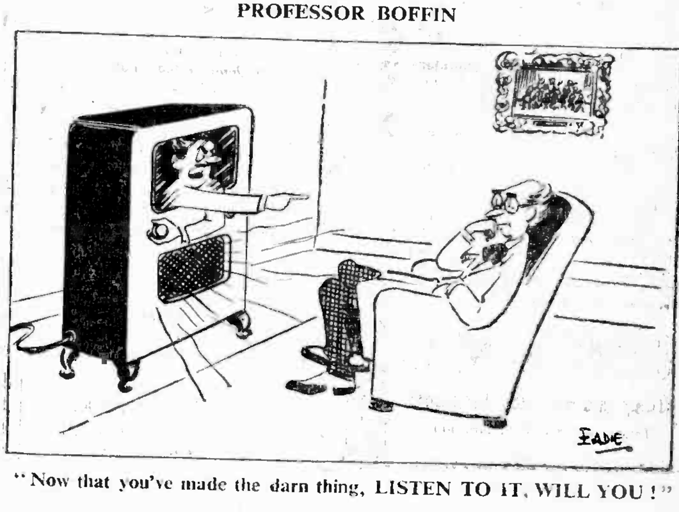
HIGH-DEFINITION FILMS

TELEFILM recording is a useful device for filming events televised during the day, for subsequent retransmission. Great as the progress has been in improving the quality of telefilm recordings, it still lacks the definition, sparkle and quality of the normal TV newsreel, for which ordinary cine cameras have been used. There are certain fundamental snags which are almost insuperable in photographing scenes off a 405 line interlaced picture on a C.R. tube. Norman Collins and T. C. Macnamara, both former BBC executives, are now developing a system of high-definition film recording, using upwards of 600 lines with sequential scanning, and the recording takes place on a closed-circuit. The system is primarily intended for use in film studios as a time-saver in production, but I feel its most useful place is actually back in the television studio.

TEN-MINUTE TAKES

IF it can be demonstrated that recordings can be made which show no loss of quality when reproduced, compared with direct transmissions on 405 lines, interlaced, then here is a tool which should interest the BBC far more than the film industry. All the important TV plays could be recorded in advance instead of being televised direct, thus enabling plays to be split up into several sections and photographed in the course of a day or so. This would give both artistes and producers a better opportunity of getting the best out of each scene. The tension which develops behind the scenes when a long and elaborate TV play is being produced has to be seen to be believed. Photographed in, say, a number of separate ten-minute sections, there would be fewer artistic and technical fluffs, and a really bad take could be scrapped. Furthermore, the film record could be retransmitted any number of times and also exported to other countries—in exchange for dollars! Mind you, British Actors'

PROFESSOR BOFFIN



"Now that you've made the darn thing, LISTEN TO IT, WILL YOU!"

Equity might have something to say about it!

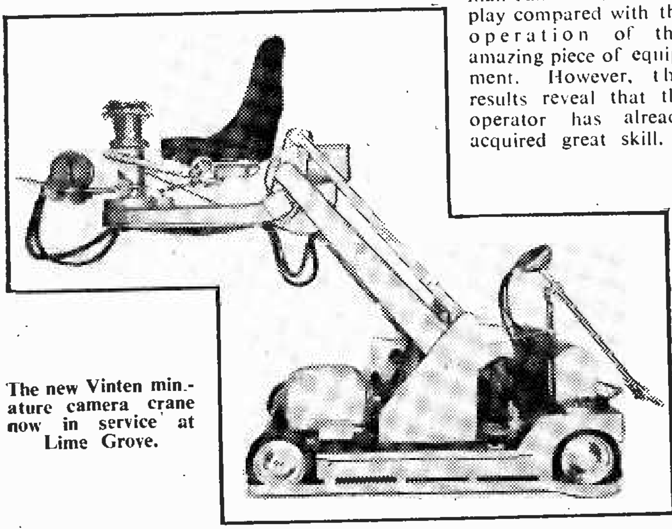
DEPTH OF FOCUS

SOME of the TV cameras at Lime Grove certainly seem to be super-sensitive. I am told that some of the image orthicon cameras are so sensitive that a reasonable picture can be picked up with the light of a few candles. On the other hand, with fairly normal studio lighting, the lens aperture can be closed very considerably, even to f/22 or smaller, giving an extraordinary depth of focus. A person's head in the immediate foreground, for instance, will then be quite sharp while the back wall of a large set is also sharp. Of course, such extreme depths of focus are not always desired, but it is quite easy to lose this sensitivity electrically or by means of a neutral density filter in the optical system. A fine example of extreme depth of focus was seen in the TV interview with Eugene Goosens.

THE MINIATURE CRANE

THE Vinten miniature camera crane, put into service at Lime Grove a few months ago, is a remarkable piece of equipment and the results must have provoked curiosity on the part of mechanically minded viewers. It is a power-operated truck, fully motorised, with elevation and rotary movements controlled by foot pedals operated by the cameraman's feet, leaving his hands completely free to manipulate the camera. By varying the angle of the pedal, the camera will ascend or descend at controlled speed, and all the time the camera platform is automatically maintained in a horizontal position. The two foot pedals can be operated together or independently, giving a great variety of movement, under the direct control of the cameraman, while the tracking movements are worked by an assistant at the rear of the truck, who can turn it sharply almost in its own length or propel it in a straight line.

I should think that the manipulation of all the instruments of a one-man-band are child's play compared with the operation of this amazing piece of equipment. However, the results reveal that the operator has already acquired great skill.



The new Vinten miniature camera crane now in service at Lime Grove.

JAM TARTS DEPT.

"BILLY BUNTER of Greyfriars School" certainly caught the attention of the Press. Rarely has a TV series of playlets induced so much comment from the radio correspondents of Fleet Street, who tried to outdo one another with interpolations of the traditional dialogue in their communiqués and critiques. Apparently, most journalists and nearly all radio men of the crystal-set generation devoured Frank Richards' weekly stories of the famous schoolboys, headed by Harry Wharton & Co., and made quite certain that they did not miss the first theatrical version, presented on TV. Personally, I liked Joy Harrington's production, in spite of the self-conscious acting of some of the boys in the cast. As the series proceeds, week by week, no doubt the young actors will sink more naturally into their parts and give smoother performances. And so, following the TV course of the immortal Sherlock Holmes, Billy Bunter has now secured his place in history. Next please! Paging Mr. Sexton Blake! Calling Mr. Sexton Blake!

"90 deg. SOUTH"

I HAVE several times mentioned various old films, including silent pictures, which would make interesting viewing. One of these, "90 deg. South," was screened when the programmes were reorganised following the death of His Majesty King George VI. "90 deg. South" was a re-edited version, with sound, of Ponting's film of the South Pole Expedition of Captain Scott. In 1914 or 1915, Ponting lectured with the film and with lantern slides. Both still photographs and movies have been combined in this comparatively new version which was first shown in about 1934. It is still a first-class documentary film, and its photographic qualities stand up to the test of time very well. This is all the more creditable because only orthochromatic stock was used by Ponting, and the developing of the negative was carried out by Ponting under the most primitive conditions. His still photographs were very cleverly edited into the film narrative. "90 deg. South" is a most moving film, which could be repeated on TV from time to time. I, for one, would like to see it again.

DOMESTIC TV

NOT too long ago David Sarnoff, chairman of the RCA, decided he wanted a TV set in his private dining-room, one that he could operate by remote control from the table. Under the table top at one corner he had a drawer fitted containing the TV set control. First, he presses a button and an oil painting on the wall disappears. In its place, a TV screen lights up. Next, he selects the channel he wants on a telephone-type dial. The programme comes on. There are other dials to control volume and adjustments.

As soon as the engineers got this remote control arrangement working in Sarnoff's room, another was installed just like it in the private dining-room of the President, F. M. Folsom, which is an almost exact duplicate of Sarnoff's. These two sets are not playthings by any means. Both Sarnoff and Folsom consider them as prototypes of what will be made and sold to thousands in the future.

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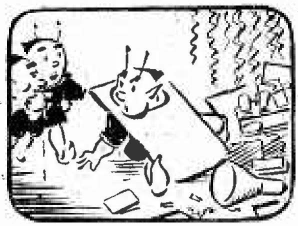

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CORRESPONDENCE

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

SLOT AERIAL

SIR,—Scottish readers may like to know of results obtained with the slot aerial described recently in these pages. The only alteration from the published description was in the length of slot, which was 10in. shorter, to allow for the increased frequency of the Kirk o'Shotts station. Being pressed for time, as at the time of writing there are only two hours' transmitting time per week-end, the aerial was erected without the reflector, and within half an hour I had lined up from scratch a home-built "Viewmaster" circuit, on both sound and vision.

The position is some 35 miles from the transmitter, and I should add that the house is of the semi-permanent steel-frame type, there being just sufficient space between the steel girders in the attic to allow the slot an uninterrupted "view" in the direction of the transmitter. —J. R. STEWART (Markinch, Fife).

SIR,—I note in your February, 1952, issue of PRACTICAL TELEVISION an article on a slot aerial made of wire-netting and, in this connection, surely the reflector should be vertical for vertically polarised transmissions rather than its major axis horizontal as in the article described.

We have, in fact, tried this type of aerial and agree that a horizontal slot receives vertically polarised waves, but a plain reflector should be vertical.—E. MOULTON (Aerialite, Ltd.).

AERIAL FEEDERS

SIR,—In your reply to K. S., of Hampstead, in the March issue (on the subject of ex-Service feeder cable) it is stated that: "In the case of the aerial being used with an A.C./D.C. receiver, the screening of the feeder cable will be joined to the chassis, which is probably live to one side of the mains."

Surely, direct connection of the aerial to the supply mains is expressly forbidden by the conditions of the receiving licence? There must be many exposed coaxial plugs and sockets, skirting-board outlets, attentuator boxes, etc., being used in conjunction with A.C./D.C. sets, and if there are, in fact, direct connections to the mains in these instances it is surprising that there have not been more cases of severe shock reported in the Press.

I hope I am right in saying that commercial A.C./D.C. sets incorporate aerial isolating condensers or, in the case of twin feeders, adequately insulated coupling coils.—J. R. MILLBURN (Redhill).

A.C./D.C. RECEIVERS

SIR,—In suggesting the use of a neon tube when operating an A.C./D.C. receiver, your correspondent, Mr. Long, writes: "The receiver is now plugged into the mains and *switched on*." This point should be emphasised as, in a number of receivers, a single-pole switch is fitted, one side being connected to chassis.

Thus, if the test is made with the switch *off* and the plug the correct way round, the neon would be connected to the mains via the heaters and would thus glow, giving the indication that the plug connection was incorrect.

No indication would be obtained with the plug the wrong way round and the switch *off*, which would lead one to suppose that the plug was in order.—ROBERT C. BELL (Ambleside).

THE 7BP7 TUBE

SIR,—Here are some details of cathode-ray tube 7BP7, as requested by F. E. Profaze in the November issue.

Tubes 7BP1-2-4-7 and 11 are classed together, and according to my information are suitable for oscillograph and television.

Data

Heater volts, 6.3; current, 0.6 amp.; A1 or anode No. 2, voltage 4,000 or 7,000; G2 or anode No. 1, voltage 250; G1, grid cut-off voltage—45. Screen may be either green, blue or white.

Socket Connections

Viewed from rear: Pin No. 1—blank; pin No. 2—heater; pin No. 3—G2 (or anode 1); pin No. 4—blank; pin No. 5—G1 (control E); pin No. 6—blank; pin No. 7—cathode; pin No. 8—heater; ext. conn.—A1 (or anode 2).—FLT.-LT., R.A.F. (BAOR5).

ENLARGER LENS

SIR,—I wonder if readers will be interested in this method of using a television enlarger?

My object was this: I have a 9in. tube but wanted a larger picture without having an enlarger positioned in front of the cabinet in the usual way.

I required a cabinet which later might be converted to take a larger tube without having to make large structural alterations.

The set is a "Viewmaster" with a 9in. tube, the cabinet is made up of hardboard and then veneered (incidentally, at a cost of less than £3 (less enlarger)).

The enlarger is slotted in position and secured by a wooden rail immediately below the enlarger, two sliding panels uncover screws securing rail locating enlarger. Thus enlarger may be quickly removed and when a larger cathode tube is later used it is only necessary to fit safety glass in place of enlarger.

The sliding panels also make the set very accessible although, of course, the chassis can be removed as a complete unit from the back of the cabinet.—A. F. BOLTON (Bromley).

USES OF TUNING SLUGS

SIR,—Here is an additional note to the article in the February issue. Heater chokes for R.F. stages may consist of about 20-50 turns of enamelled wire wound on a dust-iron slug. No insulation is needed; the wire may be wound directly upon the slug which is itself an insulator (see the section entitled "Iron"). The resulting low-resistance choke may be wired directly into the chassis in the same way as a resistor, supported on its own leads.

The line output stage in the high-efficiency receiver now uses dust cores to adjust the inductance of coils controlling line frequency, linearity and amplitude. The line output transformer is wound on a moulded dust-iron core resulting in higher fly-back E.H.T. Scanning coils also are now constructed around a circular core of dust iron. The term "iron" is used all through this article, but the substance actually used may be any of the ferro-magnetic substances, depending on the circumstances.—F. R. PETTIT (Herne Bay).

ACR2X

SIR,—Since your magazines started dealing with television there have been many surplus televisors shown, all of which use the popular VCR97. From my own experience I find this tube has far too much praise. Half these tubes suffer from cut-off—they require a large input to the control grid to obtain any depth of contrast; the screen colour is green and their cost has now risen to an average of about 45s.

Some time ago, whilst in London, I noticed that Premiers were selling ex-R.A.F. ACR2X tubes for 5s. These make excellent TV tubes and will give a very much better picture than the VCR97. The screen colour is either light yellow or light blue, the diameter being 5½in. They are fitted with a special anti-astigmatic electrode assembly which ensures perfect focus over the whole picture, and most important of all they only require a very small input to the grid to give a very well-contrasted picture. The after-glow is slightly less than that of the VCR97. With 2,000 volts on the final anode a perfect undistorted picture, easily viewed in normal room light, is obtained.

The only disadvantage about this tube is its length. It is 20in. long and the connections to the deflector plates are brought directly out of the side of the tube.

I hope this information will be of use to those who, like me, were not satisfied with the picture given by the VCR97.—J. MUIR SMITH (Northwich).

CAMERA DIFFERENCES

SIR,—I think it is about time some complaints were made regarding the variations in light values which are experienced during a night's viewing. We first have the still of the tuning-signal, upon which, I am told, we are supposed to adjust our receivers. Next comes the announcer (studio) with usually the need for turning up the brilliancy. Then if it is an early newsreel night we have the telecine, which calls for a reduction in brilliancy. Then back to the studio, and if it is at Lime Grove I have found that there is considerable difference between cameras, especially when close-ups and long shots are transmitted. I am also certain that many close-ups result in serious black after white, although I would not guarantee that this is not my receiver, but the trouble is aggravated by the closeups. Cannot something be done by the BBC to ensure that an even value of picture is transmitted, no matter whether it comes from a studio at A.P. or Lime Grove, or from the telecine apparatus?—H. G. HELTON (Cambridge).

[*We would remind our correspondent that a wrong adjustment of the contrast control can give rise to the troubles which he mentions, although the BBC admit that cameras differ. There is an even black level transmitted, and although all cameras have a black level clamp there is also a clamp in the transmitter. The fitting of this device to a receiver will also prove advantageous and an article on this subject appears in this issue.*—Ed.]

"LOOK OUT, MRS. MOSS"

SIR,—Your correspondent who signs herself (himself?) Aunt Jane is surely in an unfortunate domestic position. We have had our receiver now for two years and apart from the minor troubles which any domestic change can bring we have found that our general conditions have been considerably improved as a result of the advent of television into the home. We have made friends with neighbours who before were just casual passers-by; we find immense pleasure in sitting down together now of an evening where previously I was inclined to go out to the club or the local in order to get a change; my wife finds immense relaxation after the day's work, when the kiddies have gone to bed, and does not now sit down darning and doing similar jobs which previously she did merely to pass the evening. They get done in the daytime, and a better re-arrangement of household duties seems to have arisen as the result of endeavouring to make the evening free. This gives her better health, too, and in general I think Aunt Jane is taking a far too serious view of her own misfortunes.—F. WYNN (Guildford).

PROGRAMME PLANNING

SIR,—In reply to the grievance of Mr. H. Turner (Hayes, Kent), surely he must realise that the main difficulty in week-end programme planning is the question of staff. How would Mr. Turner like to work a seven-day week? Although I know next to nothing of the staff situation at the BBC, pure logic tells me that for a transmission of any sort, a complete crew of transmitting engineers is necessary, whether the programme be a gala variety show or the plain showing of a dated Western film.—K. NORTON (Tolworth, Surrey).

THE "PRACTICAL TELEVISION" RECEIVER

(*Continued from p.* 498.)

little current, does play a fairly large part in the waveform of the oscillator and its value may be increased, in the event of a very stretched left-hand side, up to 470 kΩ.

Right Versus Left

In this connection there is one point to bear in mind, and that is whether the left-hand side is unduly stretched, or whether the right-hand side is cramped. Obviously, both these faults produce the same visual result, and if an increase in R72 fails to balance both halves of the picture, or the resultant raster is too narrow to fill the mask, then obviously the fault is a cramping of the right-hand side, and the simplest remedy for this is to increase R76. This may be pushed up to 1 MΩ without difficulty, if required. It should, of course, be increased in stages if it is found that the characteristics of the particular valves call for the modification.

Frame Circuit

No troubles have been reported on the frame side, all the controls functioning perfectly satisfactorily here, and having sufficient tolerance to take care of any minor variations in other components.

Sync Circuit

A few readers when considering building the receiver have asked whether the sync circuit could not be modified to use the KT61 (V12) alone, as in normal commercial practice, and although it is possible to arrange for this it is not recommended, as one of the main features of this receiver is the very high quality of the picture resulting from the perfect interlace which the three-valve sync separator provides. If it is found that after a period of use the sync fails to hold properly, it is recommended that the KT61 be changed round with the frame output valve (V16), as the two valves are of the same type and may be used to check one against the other. Neither the L63 nor the D63 is likely to give any cause for trouble.

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YOUR Problems SOLVED

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

VERTICAL DISTORTION

"I have recently completed my 'Viewmaster,' and although I get a very good picture it is spoilt by the sides of buildings being curved instead of straight. It is noticed even on small objects, and no amount of adjusting of the controls will rectify it. I hope you can help me to overcome this."—H. Wild (Eccles).

Vertical distortion which you complain of may be due to insufficient smoothing of the H.T. supply, and this can be checked by reversing the mains plug when the curvature should then be reversed in direction. If this change does not occur, then the distortion may be due to faulty scanning coils or to a stray magnetic field from either a transformer or a piece of iron or steel mounted close to the tube.

PULSE INTERFERENCE

"My set is eight months old, and has given and continues to give very good results except that the definition is not quite as good as it might be.

"I realise now from references to interlacing in February's 'Practical Television,' that this poor definition is due to faulty interlacing. The raster consists of rather heavy black lines and the white ones between them are only slightly split.

"I have tried adjusting the vertical hold and over its locking range I get the following effects :

"At the clockwise limit the raster is made up entirely of heavy black and wide white lines, complete superimposition. Turning anti-clockwise the raster narrows and then suddenly there seems to be a point at which the white lines split and a wide black appears between them, giving exactly the same result. This point is so terribly critical and impossible to hold that it is difficult to believe that it is there even when the 'height' control is used to open the raster right out! Further anti-clockwise turning has no effect.

"I would be very grateful indeed if you could give me some advice on this matter. I am quite capable of adjusting a trimmer or padder or anything like that."—S. H. Boor, B.Sc. (Leeds).

As it appears from your letter that no reasonably critical setting of the vertical hold will make the picture interlace correctly, the trouble is caused by line pulses reaching the frame time-base generator in some way. If this has been present since you purchased the set, the most likely reason lies in the underchassis wiring; in some way the wiring is run in such a manner that coupling is taking place across from the line to frame oscillators, or the integrator system feeding the frame oscillator has a faulty component which is allowing line pulses to reach the oscillator. You could try the effect of a new sync separator valve, or experiment with small capacities to earth from the point on the separator at which the frame pulses are taken. An oscilloscope would be ideal for checking such a fault as this, and if you can borrow a model you should do so.

TUBE HEATER-CATHODE SHORT ?

"My receiver has been in use for eight months and is completely standard. Performance has been perfect until two weeks ago when a serious defect appeared. The picture pulls out of focus and becomes blurred in horizontal strips, which eventually cover the whole screen when the set has been on for 20 to 25 minutes—the picture will occasionally revert to normal, however, for a second or so, but again become blurred and defocused.

"The horizontal strips must not be confused with normal line tearing as the picture is at all times outlined fully but so indistinct as to be valueless.

"My first suspicions were the sync and integrator circuits, but new 6AL5 and substitution of all frame and line interlace resistors and condensers has failed to effect a cure."—S. R. Field (Birmingham).

From your description we suspect that your cathode-ray tube has developed an intermittent heater-cathode short which is thereby destroying the definition. There is little which can be done to cure this defect except to change the tube.

FOCUSING MAGNET

"Some time ago I purchased a Marconi 10in. TV (Sutton Coldfield), which had been modified for the Holme Moss frequency, and the picture has always been displaced towards the bottom left corner.

"When I attempted to centre the picture I noticed two other faults were introduced:

"1. The picture was cut off by a shadow in the top right corner.

"2. The focusing ring had to be turned off-centre to such a degree that great pressure was exerted on the neck of the tube, and the edges of the picture became less sharply focused than the centre.

"I have now fitted a new ion trap of a different make and have got rid of the shadow.

"I have also tried an 'Elac' low flux focusing ring (R17/6) and find that the picture can be centred perfectly, but I cannot quite obtain sharp focus although best results were obtained with the gap tightly closed (giving, I believe, minimum flux).

"In view of the above I should be very grateful for your help.

"1. As I have adjusted the ion trap to give maximum brightness, will the C.R.T. be harmed in any way due to using an ion trap not supplied by the makers of the tube ?

"2. Can you suggest a focusing ring which would give the desired results ?"—J. Pounder (Cottingham).

Focusing depends upon the position of the magnet along the neck of the tube as well as the actual intensity of the field. It appears from your letter that the magnet you are using at present is too strong for perfect focusing, since you have the gap tightly closed; try the effect of moving the magnet further towards the *base* of the tube and then open the gap to secure focusing. There is no danger of damage occurring to the tube by your use of an alternative ion trap provided this is set up and adjusted according to instructions.

ELECTROSTATIC CHARGE

"When I switch my set on, several minutes elapse before I gently turn up the brilliance, and then I get the

top half blacked out completely, and if I leave it at that it sometimes stays as long as ten minutes before my picture arrives all over the screen, and even then it keeps coming on and off for several minutes. Is this a faulty component? Perhaps you could enlighten me as to its cause.

"I bought the set in April, 1951, and had quite a bit of trouble at the time: there was an arcing in the set at periods and it does that now and again; it sounds like a spark jumping from one point to another."—W. C. Knight (Littleborough).

The blacking out effect you mention may be due to an electrostatic charge forming on the screen during the off-periods, and this charge deflects the electron beam when it arrives at the screen. Does the picture "creep" gradually on to the blank areas during the warming-up period, or does it suddenly cover it? If the former, the above explanation is probably the correct one. Try wiping the face of the tube with a dry cloth to remove all damp and dust.

LONDON RECEIVER ON HOLME MOSS

"I have done a considerable amount of experimenting with a manufacturer's surplus vision and sound unit, which is a London type. I have peaked the coils, and I am receiving sound from the Holme Moss transmitter perfectly, but I have come up against a difficulty about receiving the vision. I can get a 'raster' on the tube and also the vertical black lines, and when trying to focus the lines jump from top to bottom. I have been experimenting four months trying to overcome this difficulty, but with no success. Can you help me with this circuit? The tube I am using is a VCR/97, which is supposed to be a good tube for TV."—R. Sanderson (Bury).

The R.F. chassis you are using is quite unsuitable for reception of the Holme Moss transmission.

This chassis was designed for reception of the upper side band of the London transmitter and no sound rejection circuits were included. As the Holme Moss transmission operates on single side band close to the sound frequency, the continuous jumping from top to bottom which you experience is due to sound interference. We suggest that to overcome this you modify the circuit to a design intended for reception of single side band transmission. For this purpose we suggest you obtain a copy of the "Viewmaster" booklet and incorporate the tuning coils and rejector circuits as specified in that publication.

VCR97

"There are two queries which I would be grateful if you would help me to clear up.

"The first is with reference to the VCR97 C.R. tube and its associated circuit. In all circuits I have seen in P.T. the tube is heated by a 4 volt supply of A.C., and the associated EA50 D.C. restorer is heated from the same supply. But surely the EA50 is rated at 6.3 volts—does it do it no harm to be underrun like that?

"The second is with reference to a power supply unit. I have purchased a transformer with a secondary H.T. winding rated at 500-0-500 at 250 mA., but when I came to look for a rectifier to use with it I found that there was no valve on the lists I have in my possession which was rated to take 500 volts R.M.S. on each anode with a condenser input to the filter. I would be obliged if you would help me on this point (5 volt heater preferred)."—H. G. Lavington Evans (Cambridge).

The EA50 has a 6.3 volt heater, but when a restorer is used that is fed from the tube heater of 4 volts, the 4-volt equivalent of the EA50 is best employed, i.e., the D.1. The EA50 will function when used on 4 volts, but it is best if the correct diode is used.

You must use two 500 volt, 120 mA. rectifiers with your transformer, the anodes in each valve being connected together. A suitable valve is the Mullard FW4-500, 4 volt indirectly heated; or the 5U4G, 5 volt directly heated, or equivalents. Use only a 4 μF reservoir condenser rated at 650 volts with either of these valves. Separate heater supplies may be necessary as each consumes 3 amps.

MAINS VOLTAGES

"I am the owner of a Holme Moss model TV and I am writing to you over the following:

"With contrast on full I could only just hold a decent picture, and this only if I was prepared to stand near the set, altering the horizontal hold, so I arranged a visit of the service representative in my area, and this is what was done: after taking a reading of the mains voltage, which was 208 volts, he altered the input tags at the back of the set from 220-235 to 200-220, and the result, of course, was that my contrast was reduced two-thirds, and the picture held. Here is my problem: in the event of a return to normal mains voltage, say of 235 volts, what effect will it have on my set, and have you any alternative to the above you can advise?"—S. Wood (Stockport).

A TV receiver should always be operated at the correct mains voltage.

The cathode-ray tube heater is specified to run within a tolerance of $\pm$ 7 per cent. of its rated heater voltage. An incorrect operating temperature can therefore affect the life of the tube. In the same way, certain components in the receiver may be designed with a maximum working voltage equivalent to the voltage operating in the receiver when correctly adjusted to the mains.

There is no way of obviating the mains adjustment, and it is always necessary that the correct adjustment be made for the particular mains voltage.

VISION FAULT

"My Ultra receiver (Model V710) has recently developed a fault as follows.

"After being in operation for about 20 minutes, picture disappears, leaving rectangular white patch. By switching off set for a few minutes, normal picture can again be obtained, and will then operate satisfactorily as long as required.

"I would appreciate your opinion on this, please."—B. Hardy (Hove).

The trouble lies somewhere in the vision receiver or in the coupling to the tube. Check on the valves in the vision strip, particularly the detector and video-amplifier, and ensure that the valves are firmly seated in their holders.

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