THE MILLER TIMEBASE

PRACTICAL TELEVISION

AND TELEVISION TIMES

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EDITOR F. J. CAMM

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FEATURED IN THIS ISSUE

Radio Component Manufacturers Exhibition Reviewed
Corona Discharge
Flyback Suppression
The RF 24 & 26 Units
Servicing The Ekco EK
Your Problems Sol
A TV Engineer'

Practical Television

& TELEVISION TIMES

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Televiews

INTERFERENCE STATISTICS

THE Post Office Engineering Department has recently published an interesting analysis of interference complaints which it has received and investigated. These figures may not, however, show the magnitude of the interference problem, because the number of viewers or listeners whose reception is affected by interference is usually much greater than the number of complaints received, and also more than one source of a given kind may be concerned in some complaints, and more than one complaint may be made about a common source. The statistics are presented in the form of two tables, the first dealing with the number of complaints attributed to specific sources, and the second with the number arising from defective receiving conditions.

Thus, in the first table there were 578 complaints about bedwarmers interfering with sound broadcasting, and 1,183 with television ; 342 complaints concerning calculating machines with sound broadcasting and 818 with television. Comparable figures for other sources of interference are : drills, 1,177, 2,792 ; external cross-modulation, 1,177, 2,492 ; faulty electrical wiring of premises, 2,194, 494 ; hairdriers, 598, 6,954 ; ignition systems of petrol engines, 49, 1,313 ; industrial and medical R.F. equipment (valve), 91, 736 ; industrial and medical R.F. equipment (spark), 105, 151 ; lighting, filament type lamps, 66, 2,569 ; lighting, fluorescent tubes, 1,676, 233 ; street lighting, all types, 712, 113 ; neon signs, 416, 1,444 ; power lines, overhead, less than 650 volts, 260, 230 ; 650 volts to 11 kV, 200, 2,052 ; more than 11 kV., 222, 1,447 ; underground, faulty, 132, 60 ; radiation from TV timebase circuits, 6,805, 3 ; superhet, local oscillators, 62, 1,604 ; radio transmitters, amateurs, 125, 303 ; others sited in U.K., 142, 476, foreign, 533, 146 ; refrigerators (compressor, fan, or thermostat), 1,228, 1,587 ; sewing machines, 1,577, 8,956 ; smoothing irons, 399, 198 ; vacuum-cleaners, 1,043, 3,269 ; unknown, 12,206, 21,877. All other identified sources amount to 6,376, 12,104 respectively.

These figures are illuminating. They show that with the exception of external cross-modulation, faulty electrical wiring, fluorescent tubes, street-lighting, and power lines, radiation from timebase circuits, smoothing irons, the majority of interference relates to television.

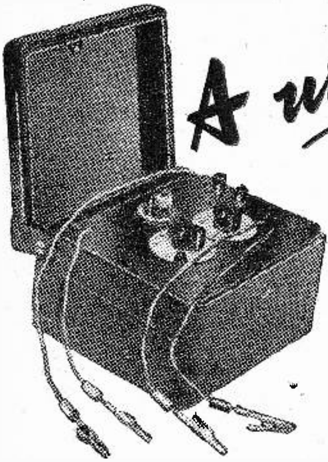
The number of complaints arising from defective conditions at the receiving site amounted to 10,335 (sound) and 2,456 (television) respectively under the heading of inefficient aerial or earth installations : 5,290 (sound) and 5,375 (television) due to faulty receivers, 227 (sound) and 666 (television) due to maladjustment of receivers, and 3,168 (sound) and 2,998 (television) due to other conditions.

These figures show the enormity and the complexity of the interference problem, which was recently discussed in Parliament, when the Assistant Postmaster-General was asked what steps he is taking to ensure that television sets are adequately suppressed or screened to prevent their causing interference with sound radio reception.

The reply was that where a television set causes interference with sound receivers, which are themselves in proper order and condition, the owner of the television set is liable to have his licence withdrawn.

TV AND EDUCATION

MORE than 30 educational television stations with a covering of 40 million Americans will be operating this year in the United States of America. Commercial stations are co-operating with local schools, and indeed at present 800 Philadelphia schools receive TV instruction from three commercial stations. In New York crippled children are able to complete their high-school education by TV, and results of TV education are promising. One university reported a 30 per cent. higher performance by students taught by TV than by those who received standard class-room instruction. Educational television in the U.S.A. is about to expand considerably, and is far ahead of any similar effort in this country.—F. J. C.



A useful TEST UNIT

A SIMPLE INSTRUMENT FOR TESTING CONDENSERS, INCLUDING ELECTROLYTICS, MEASURING E.H.T. AND SUPPLYING AN AUDIO OUTPUT

By F. W. Austin

THIS simple piece of test gear was designed to make as much use as possible of a small neon tube having a minimum of switching arrangements. The results have been, for the small outlay involved, pleasing enough to merit further investigation.

Functions

The apparatus will measure E.H.T. voltage, give a reasonable indication of leakage in paper condensers, give indication of capacity of electrolytic smoothing condensers and supply a signal for injection into both the audio and video detector stages.

Power Requirements

The only power required is obtained by making use of the high tension supply of the receiver under test. When measuring E.H.T. a switched potentiometer isolates the normal H.T. lead and prevents shock to the user from this source, as can be seen from the circuit diagram.

Basic Unit

The basic unit consists of a 1 megohm potentiometer having a 150-volt neon (surplus CV71) shunted between the slider and "earthy" end. This is shown in the circuit as a *chassis* connection.

E.H.T. Voltage

This is developed across a chain of 32 megohms consisting of 14 resistors (2.2 MΩ-1 watt each) and 1 resistor (200 k-1 watt) with the remainder across the 1 megohm potentiometer. This limits the current at 16 kV. to 500 microamps., and gives 500 volts across the potentiometer at that reading.

Calibration

As few readers are likely to have a 500 volts D.C. supply readily available other means must be found for marking the scale. We can, therefore, connect the top end of potentiometer to a 250 volts source and mark the position at which the neon "strikes." This will then be the position for 8 kV. reading.

The resistance of the potentiometer arm across the neon should then be measured. Assuming it is 500 kΩ a mark can then be made against 250 kΩ on the scale. This becomes the 16 kV. reading. All other scale markings can be made by multiplication or division, thus:

16 kV. × 250 kΩ = 4,000, also 8 kV. × 500 kΩ = 4,000 ∴ 10 kV. = 4,000 ÷ 10 = 400 kΩ, also 6 kV. = 4,000 ÷ 6 = 666 kΩ, etc.

These figures are arbitrary, depending on the

PARTS LIST

RESISTORS	CONDENSERS
14 × 2.2 MΩ (1 watt)	1 × .05 μF paper (350 v.w.)
1 × 200 kΩ (1 watt)	1 × .02 μF paper (350 v.w.)
1 × 47 kΩ (1 watt)	
1 × 1 MΩ potentiometer (less switch).	**SUNDRIES**
1 × ½ MΩ potentiometer (s/p. switch)	1 neon (surplus CV71)
	2 Insulated terminals
	1 neon holder
	4 wander plugs
	4 crocodile clips
	Box, panels, etc.

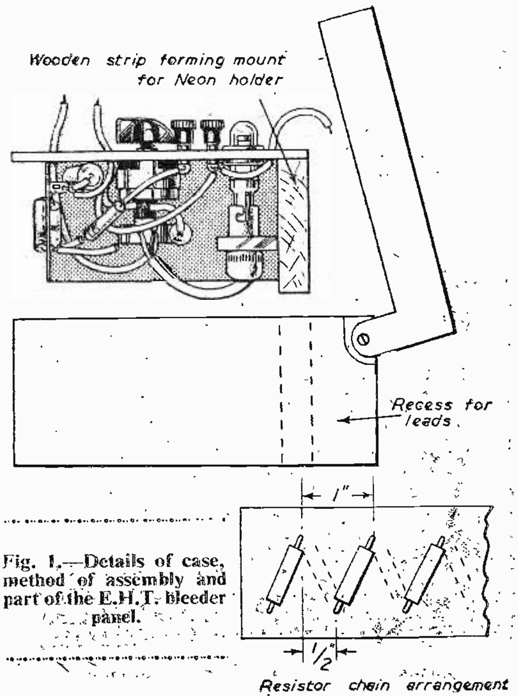


Fig. 1.—Details of case, method of assembly and part of the E.H.T. bleeder panel.

neon. In my own case the neon struck at 150 volts and the following resistances applied for the various settings :

5 kV. = 960 kΩ	6 kV. = 800 kΩ	7 kV. = 686 kΩ
8 kV. = 600 kΩ	9 kV. = 533 kΩ	10 kV. = 480 kΩ
12 kV. = 400 kΩ	14 kV. = 343 kΩ	16 kV. = 300 kΩ

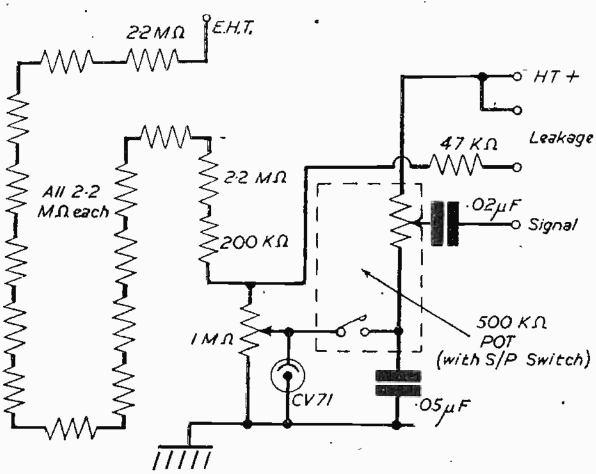
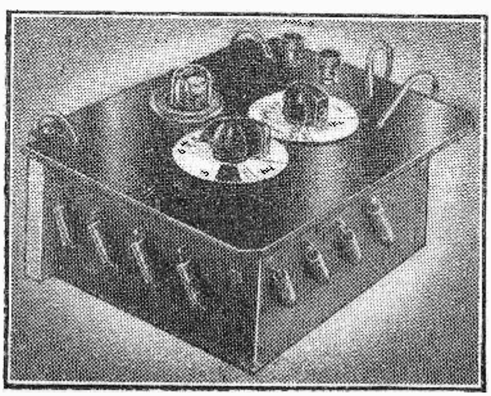


Fig. 2.—Theoretical circuit of the unit.

Construction

A study of the circuit diagram and layout of components should give a good idea of the methods to adopt. The only critical arrangement is the setting out of the resistor chain, which was made up on two thin paxolin panels and mounted on the left-hand side and along the bottom of the layout diagram. All other components should be kept well clear. These resistors were of the type having wires coming directly out of the body and their use is strongly advised. My own unit, as may be seen from the illustration, was enclosed in a plastic box complete with lid, bought cheaply as surplus, but as they are not generally available a wooden box will suffice. The panel holding the controls should be rather shorter than the box to give space at the back for packing away leads when not in use. A strip of wood is fixed at right-angles at the rear of the panel, and besides forming the recess for leads it also supports a bracket on which the neon holder is mounted. See Fig. 1.



Another view of the finished instrument.

E.H.T. Operation

When measuring E.H.T., the signal control should be turned off (*switched* off). With the negative lead connected to the chassis the striking point of the neon then indicates potential.

Signal Operation

With H.T. leads connected between H.T.+ and chassis the signal amplitude control is turned to maximum, and the kV pointer reduced slowly from maximum kV setting towards minimum (it will be noted that this control is connected in "reverse sense" to give maximum kV reading in a clockwise direction). The signal will not be variable and can be set as desired.

Paper Condensers

These are tested by having the kV control set to CAP and the signal control switched off. The capacitor is then applied to leakage terminals and quickly reversed. A short, sharp flash should be the reward. A constant glow shows either bad insulation or a short-circuit.

Testing Electrolytics

For fairly full information about these a potential of 250 volts is desirable, although similar results are obtainable at 230 volts. This is, of course, limited by

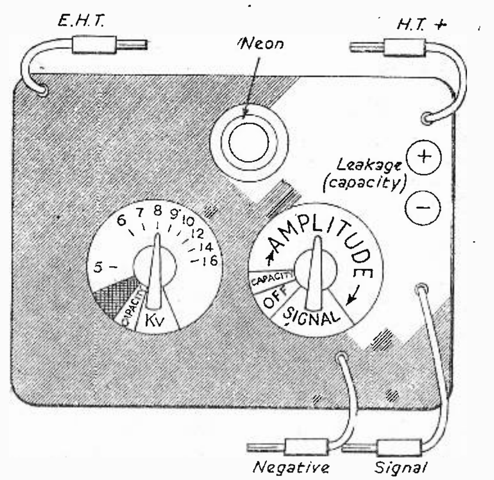


Fig. 3.—Details of panel, controls and connections.

the striking voltage of the neon and the various high resistances in the circuit. The kV control should be set to CAP and the signal amp. control switched off. The condenser is connected to plus and minus leakage terminals, when the neon should glow for a time before going out. The signal control is then switched on and left at the CAP setting. After a short period the neon will commence to flash at regular intervals, the capacity being ascertained by the *interval* between flashes. With 250 volts applied to the H.T. terminals, times should be roughly as follows:

$8\mu F = \frac{1}{2}$ second off; $16\mu F = 1$ second off; $32\mu F =$ 2 seconds off.

Larger condensers than these should not be attempted, although they may be measurable with a lower applied potential. In any case, their normal leakage current grows greater and modification of the unit to suit would result in spoiling the other amenities of the apparatus.

If the leakage is excessive, the neon will remain alight. If condenser is open-circuited, neon will oscillate.

Important Note

The particular neon used (CV71) has a tendency to oscillate better one way round than the other in the holder. This position will be found by observing when a glow surrounds the ring in the lamp and extends right down the supporting wires. Three different neons of the same type have been tried with similar results.

BBC Television Transcription Service

WAR IN THE AIR, the series of BBC films recently seen by millions of viewers throughout Britain, will soon be shown on Canadian television screens. The Canadian Broadcasting Corporation have taken the whole series of 15, which trace the development of air power in our lifetime, and, by using film from official sources, present a graphic picture of the struggle for air mastery in the second World War. The films have been described as one of the achievements of BBC television.

Their sale in Canada also underlines one of the achievements of the BBC's Television Transcription Service, which is responsible for sending such films and telerecordings to other countries. This three-man unit (which, like the long-established transcription service for sound radio, is part of the BBC External Services) has just completed its second year of operations, and in that time it has given an international flavour to BBC Television. Films or telerecordings have been sent from the BBC to appear on television screens in Canada, the U.S.A., Holland, France, Germany, Belgium, Switzerland, Italy, Denmark and Japan.

Two Years Old

This two-year-old service grew out of the demand from other countries for telerecordings of the Coronation. It was clear that these countries were interested in what the BBC was doing; and none more than Canada, who is to-day the Transcription Unit's best customer. In 1953, nine films and 41 telerecordings were dispatched to Canada; and before the end of 1954 six films and 41 telerecordings had been sent.

What kind of BBC programmes have the Canadian viewers been seeing this year? They have seen Emlyn Williams and Lord Beaverbrook in the Speaking Personally series, and the archæological stories of the Buried Treasure programmes. They have watched the animal and bird features by George Cansdale and Peter Scott; and have seen something of Britain's stately homes. And the Canadians, like viewers in other countries, have taken many telerecordings of outside events, among them the Queen's return from her tour, Trooping the Colour, Sir Winston Churchill's speech at the Lord Mayor's Banquet, and on his 80th birthday. The round of British sport was covered in telerecordings of Rugby Union at Twickenham, the Boat Race, the F.A. Cup Final, racing at Ascot, Chataway's victory in the 5,000 metres, and the table tennis championships.

The U.S.A. took a number of telerecordings. Both N.B.C. and C.B.S. networks showed the Mansion House lunch while N.B.C. has given its viewers Sir Anthony Eden's party political broadcast and racing at Ascot.

Europe has shown an interest not only in films specially made for BBC television, such as that about the artist Graham Sutherland, but in telerecordings of national and sporting events. Germany, for instance, showed viewers the Trooping the Colour, a full version of Sir Winston Churchill's 80th birthday presentation, and the England v. Germany soccer match. In Holland the Queen's return was among the programmes seen during the year. Switzerland, France, Holland, Belgium and Italy all took the Trooping ceremony; and Belgium particularly asked for library material about Christmas in England. And a telerecording of the table tennis championships, in which some of their expert players took part, was requested by Japan.

Speed Essential

In sending telerecordings of outside events to overseas television stations speed is essential. Some idea of the way the transcription unit works can be gauged from the fact that the telerecording of the Prime Minister's birthday presentation was received in Hamburg shortly after noon the next day. An edited version reached Canada within two days.

The European television networks are making an increasing demand for telerecordings of international football matches, particularly where their own national teams are concerned. In some studio programmes the language is a barrier. But this obstacle has been overcome with the Art Films made by the documentary department of the Television Service in association with the Educational Television and Radio Centre of the United States and the Arts Council of Great Britain. A separate music and effects track is provided, but no English commentary. The European television stations can then add their own commentary in the native language. This commentary is a translation of the English script.

Not only does the transcription unit send to countries with television but to those without a service. Films have gone to Malaya, Australia and Norway, for non-theatrical distribution. They are issued to film societies, Government film libraries and so on; but not to cinemas.

Telerecordings and films are sold to overseas television networks at prices which make the transcription unit fully self-supporting. In two years of work the unit has laid the foundation of a service which not only gives viewers in other countries a picture of British life, but which enables millions of people abroad to share with the viewer at home some of the pleasures and excitements of BBC television programmes.

NEW SERIES

Servicing Television Receivers

No. 9.—EKCO EK10, TS105 AND SERIES

By L. Lawry-Johns

THESE notes may be used in conjunction with many Ekco receivers which employed a basically similar chassis. Models may be found with or without radio, 9in. or 12in., table or console. Some employed SP41 valves instead of the more usual SP61 as used in the receiver about to be described. As is well known, the service equivalent of the SP61 is the VR65 and of the SP41 the VR65A. The receiver is of the TRF type and the circuit is quite straightforward. The radio unit is of the superhet type with four preset stations, and consists of a three-valve unit which will be described in detail later. The audio circuit of this receiver is different in many respects from other models in the series which are not fitted with radio. A point to bear in mind is that although a transformer is fitted and the receiver therefore is for A.C. mains only the chassis is connected to the mains, and caution is to be used as in the case of an A.C./D.C. receiver.

The aerial input is by 75 ohm coaxial cable through isolating condensers to the coils L3 and L4, a separate feed being taken to the radio section from the outer contact of the aerial socket via L1 which is the coil mounted at the rear of the socket. From L3-L4 the signal is taken to the grid of the first R.F. amplifier V1, which, with V2, is common to both sound and vision. The contrast control is fitted in the cathode circuit of V1. V3 is the vision only R.F., the sound signal being tapped off of the anode coil of V2. The coil L19 is the sound rejector, and is fitted in the grid circuit of V10, the first sound R.F. amplifier.

From the anode of V3 the signal is coupled by L9, L10 to the video detector V4, which is a double diode, the second section being used as the vision interference limiter. The video signal is taken from the cathode of the detector diode via a system of peaking chokes and a resistor to the grid of the video amplifier V5. The anode of V5 is D.C., coupled to the C.R.T. cathode via a choke resistor combination. The interference limiter is also fed from this point. A lead is taken from here to the cathode of the V4B diode. The anode of this section is connected to the cathode through a resistor; a second resistor is wired across this, but can be disconnected by operation of the screw marked interference limiter at the rear of the chassis. A .1μF condenser is taken from the diode anode to chassis. Operation of the screw changes the time constant of the circuit and thus V4B conducts just before peak white. This increases the effectiveness of the limiter, but affects the picture content.

Sound Channel

The sound signal is amplified with the vision by V1 and V2 and then passed to the grid of V10. A preset gain control is fitted in the cathode circuit of this valve to enable an approximate level to be obtained between TV sound and radio as the volume control is common to both. V11 is used as the second R.F. sound amplifier and also as the audio amplifier.

The TV sound signal is taken via a set of coils from the anode of V10 to the grid of V11. The anode of this valve is coupled through a further set of band-pass coils to one section of V12 which is a double diode. The rectified signal is then coupled to the cathode of the second section which is used as a series noise limiter. From the anode of this diode the signal is then taken back to the grid of V11 for A.F. amplification. The cathode of V11 is decoupled by two condensers, one, a .001μF, is for R.F. and the other, a 20μF 12 volt electrolytic, for A.F. bypass. The amplified A.F. signal is taken from the screen of V11 to one contact of the four-pin radio chassis plug. It is then passed to the radio-TV selector switch, and then to the volume control. Both the TV and radio signals are then passed back to the main chassis to the grid of the sound output valve, V13. A negative feed-back circuit is fitted from the anode of this valve through a .001μF condenser and resistor to the control grid. This point should be borne in mind when severe distortion of sound is experienced.

The video signal at the anode of the video amplifier V5 is passed by a condenser and resistor to the grid of V14. This acts as the usual grid current type of sync separator. The sync pulses drive the valve into grid current which produces a steady negative bias across its grid leak resistor. Thus the negative video signals are placed beyond cut off and are not passed. The sync pulses alone are present at the anode of V14, which has two resistors and a choke in its anode circuit. The first resistor is decoupled to chassis by a 4μF electrolytic. This is another point to remember when unsteady synchronism is experienced.

Line Time Base

The frame pulses are taken from the junction of the second resistor and the choke. The line pulses are taken from the junction of the choke and the anode of V14, and are fed by a condenser to the suppressor grid of the line oscillator V15. This valve is used as a combined miller and transition oscillator and no blocking oscillator transformer is therefore used. The scan voltage is developed across the cathode load resistor and is fed via a resistance-capacitor network to the control grid of the line output beam-tetrode V16. Line hold is by a variable control feeding H.T. to the grid of V15 through a 2.2 MΩ resistor. Should the control be at the end of its travel and still not locking this resistor should be suspect. V18 is the efficiency diode and is connected with its cathode to chassis. The anode is connected through the secondary of the line output transformer to the cathode and grid of the line output V16. The E.H.T. rectifier V17 is fed from the overwind on the line output transformer.

Frame Timebase

The frame oscillator is a thyratron marked V7 in Fig. 1, and is a 6K25. A fault very often met with is a "jittery" raster. That is, the picture rapidly vibrates up and down although the synchronism is still held. Almost invariably a replacement 6K25 will provide a cure. The valve base is sunk below chassis level and the valve is often difficult to remove. It is often necessary to help matters by pushing up the centre spigot of the valve from beneath. The blunt end of a pencil is often a help as a screwdriver may damage the surrounding components. The Frame Hold control is in the cathode circuit of V7 and operates purely by altering the cathode bias. The charging components are a 100Ω resistor and a .5μF condenser from the anode to cathode. The load resistor is a 100 KΩ and the scan waveform is taken from the junction of the 100Ω resistor and the .5μF. It is fed through a .1μF condenser to the top of the height control, the centre slider of which feeds the grid of the frame output valve V8.

The cathode resistor of V8 is not taken directly to chassis. The secondary of the output transformer and the frame scan coils both have one side directly returned to chassis. The cathode resistor is connected to junction of the other two sides. As secondary winding has a low resistance of only 1Ω as opposed to the scan coils' 14Ω the cathode may be thought of as being in series with the secondary winding of the frame output transformer.

H.T. Supplies

H.T. is supplied by two half-wave rectifiers, the main television PZ30 and the UY41 in the radio unit. On television both are used, but on radio the PZ30 is switched out of the circuit and the UY41 carries the smaller load alone. Although both these rectifiers have a common cathode output to the smoothing circuit, they are supplied independently from the primary of the mains transformer. The surge limiting resistors to the anodes of the PZ30 often go open circuit, and their location and replacement is very simple. They are wired to a tag strip at the base of the mains transformer. They are 50Ω 5-watt of the coated type, and lower wattage should not be used. If one should go open circuit it would leave one half of the PZ30 to take the increased load, the current drain would be excessive and one anode of the PZ30 and that of the UY41 would be seen to be red hot. In addition, the remaining resistor would be passing the excess current, and this would very soon cause it to become defective. This, of course, leaves the UY41 totally inadequate to cope with the situation. Under these circumstances the UY41 may flash over and blow the fuses. If, therefore, the fuses are found to be blown it is very necessary to check the UY41 for internal shorts, also the PZ30, which can well be responsible for the whole trouble, and ensure that the surge limiting resistors are in order.

Another common cause of trouble from an H.T. and blown fuse point of view is the power plug connecting the radio and TV chassis. This may well be found to have a leak between pins and should be given priority attention should trouble of this nature persist after the PZ30 and UY41 have been checked. Note that the video amplifier V5 has its H.T. supply to its anode maintained when the receiver is switched to radio. This is to keep the C.R.T. cathode biased so as to prevent the tube from being burned by a spot when switching from TV to radio. Therefore, the anode of V5 is supplied direct from the smoothing circuit and not via the connecting plug and TV radio switch, as is the remainder of the TV section. Of course, this also applies to the sound output valve V13, which is common to both TV and radio. The heaters of the TV valves are fed from

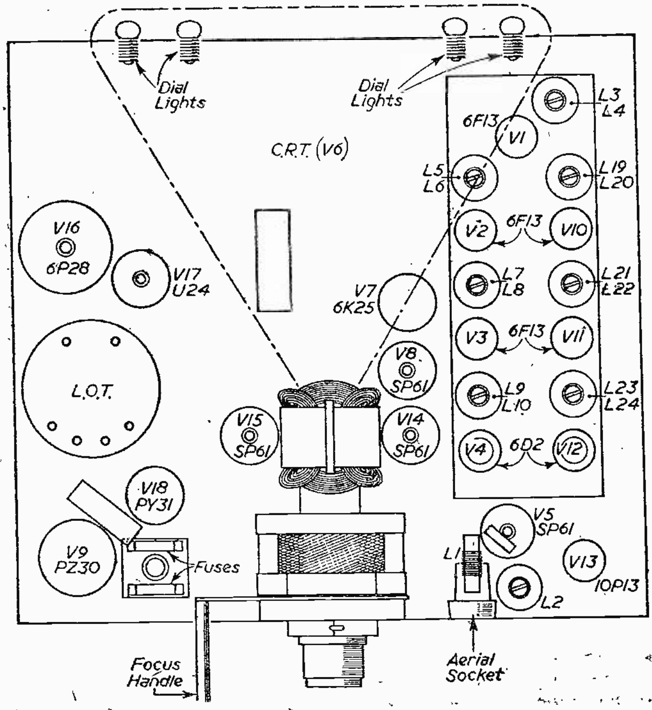


Fig. 1.—Top view of chassis.

various secondary windings on the mains transformer, again with the exception of V13, which is in series with the A.C./D.C. chain of the radio valves. The fuses should be rated at 1.5 amp.

Radio Section

The radio receiver consists of a triode-hexode frequency changer, UCH42. The I.F. amplifier is a UAF42 with its diode section used for detection. The output valve is, as stated, common to TV and radio and is a 10P13. The outer screening of the coaxial TV aerial cable is used as the radio aerial, as stated earlier. The I.F. is 455 kc/s and A.V.C. is fed from the detector circuit to the grids of the UCH42 and the UAF42. The station indicator lamps are switched by the selector switch, and the bulb in use is put in series with the heater chain and is shunted by a 100Ω 2-watt resistor wired from the radio selector switch to chassis.

Picture Troubles

Faults likely to be encountered are fading, weak reception, unsteady picture, weak or no synchronisation, partly collapsed raster, weak and poorly defined picture coupled with poor or no sync, and no raster at all.

Fading of vision only is often due to a poor contact on the valve bases of the vision valves. A varying emission video amplifier may be responsible, and it may be changed with another SP61, the sync-separator, for instance, to prove the point.

Weak reception may be caused by a large number of factors. Assuming the sound to be unaffected, however, the valves should be changed with reference to the diagram indicating their positions and purpose. If no improvement is effected a voltage check on the valve bases should be made, and the decoupling capacitors bridged in turn by a known good component. The decoupling condensers are of the .001μF tubular ceramic type, and can quite easily go open circuited with consequent loss of gain. V4 (the vision double diode) should be checked, and if no vision signals are being received do not forget to ensure that *both* sections are lighting up. A glow from inside the valve does not indicate that the detector section is being heated, and both heaters should be observed.

Open-circuited anode and screen decoupling resistors are a common cause of "no signals." These are of the 4.7 KΩ ¼-watt type, and a voltage check on the valve bases will soon locate the faulty component.

Weak synchronism, assuming the contrast to be well up, usually points to the SP61 sync separator, V14, being low on emission. If this valve is changed with V5, that is, the video amplifier, and it is in fact low, the picture will now be darker, necessitating increased brilliance and contrast adjustment, depending upon just how low the emission has fallen. If the valve is not at fault attention should be directed to the 4μF 275-volt anode and screen decoupling condenser. This is one section of a double unit can, located under the chassis near the vision limiter plug. The other half of the unit is the 8μF anode and screen decoupler of V11 (sound R.F. and A.F. amplifier).

If the poor sync is accompanied by a smeared picture, poorly defined and inclined to tear, a cathode to heater leak in the C.R.T. should be suspected. If this is the case a heater isolating transformer may be fitted and should be of the 2-volt secondary type.

If one of these transformers is fitted the cathode should be joined to one of the heater leads so as to prevent variations if the defect is of an intermittent nature.

As described previously, a jittery raster is nearly always due to a defective 6K25 (V7 frame oscillator). Also a partly collapsed raster can often be caused by this valve. Usually, if this is the case, the bottom half of the raster will be almost normal, but the top half will be compressed to the middle, leaving a large blank area at the top of the tube.

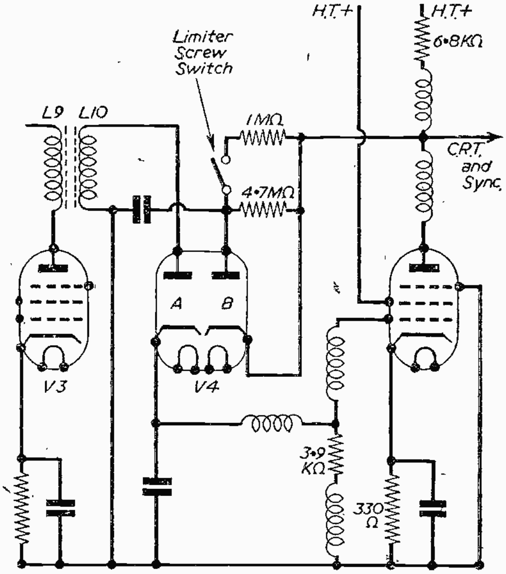


Fig. 2.—Vision limiter, detector and video circuit. Anode and screen separate the supply source.

The frame output valve (V8, SP61) may also be the cause of a small or reduced frame scan and can easily be checked by substitution.

If no raster can be resolved and the line time base whistle is absent the line oscillator (V15, SP61) should be suspected and changed as described previously. If a change of valve does not start the time base working normally the series resistor associated with the line hold control should be investigated. It is a 2.2 MΩ ¼-watt (red, red, green) and can go open circuited or high. This resistor should be suspected also when the picture cannot be locked in a horizontal direction and the control is fully over. The line output valve (V16, 6P28) could, of course, also be responsible for the non-operation of line transformer, E.H.T., etc. This is not so often the case, however, and the SP61 should be suspected first. If the time base is working, but there is no E.H.T., the U24 (V17) rectifier will often be found to be glowing blue inside. This indicates that it is soft and should be replaced. On later Ekco models, such as the 162 series, such a blue glow often indicates a defective line output transformer; the valve in this case is a wire-ended U25. However, in the receiver being dealt with, the line transformer is rarely the cause of the trouble and another U24 is usually all that is required.

By way of explanation, a blue glow in a valve indicates excess current; this does not apply to the line output valve, which normally operates in this way. An excess current may be caused by a heavy load, as in the case of a leak in the line output transformer, or by the presence of gas (air) in the valve as in the set being described.

Sound Defects

Weak volume which is not distorted can usually be traced to a low emission V10 or V11, or these valves may be improperly seated. The electrolytic decoupling condensers used to by-pass the cathodes of V11 and V13 may be open circuited. These are separate condensers mounted near the respective valve bases and are rated at 20μF 12-volt for V11 and 50 μF 12-volt for V13. These condensers, however, even if one is completely open circuited, do not cause a drastic drop in volume. Low volume on TV sound with marked distortion is often the result of the load resistor of the sound noise limiter going high or open circuited. This is rated at 2.2 MΩ on this model, but may be found to be 4.7 MΩ on some models which are "near relatives."

It will be found near the valve base of V12. It is hoped that the voltage table given will enable fault location to be speeded up and doubts as to whether this or that voltage is correct to be overcome.

A few final notes which may be of help :

The dial lamps are rated at 6 volts, .06 amp. The E.H.T. should be approx. 7 kV. The tube in this particular model is a Mazda CRM92 or CRM121 for the 12in. model. The cathode voltage should read 185 volts. The sound output valve used on models without radio is a 6P25 in the same position as the 10P13.

TV VOLTAGE CHART

Valve	Anode	Screen	Cathode
1—6F13	195	195	1.9
2—6F13	195	195	1.9
3—6F13	195	195	1.9
4—6D2	—	—	—
5—SP61	185	242	2.4
6—Tube	7 kV	—	185
7—6K25	Pulsating		
8—SP61	235	242	3.0
9—PZ30	225	—	—
10—6F13	195	195	1.8
11—6F13	185	185	1.8
12—6D2	—	—	—
13—10P13	225	242	13
14—SP61	Pulsating		
15—SP61	190	142	30
16—6P28	—	210	.27
17—U24	7 kV	—	7 kV
18—PY31	—	—	—

RADIO VOLTAGE CHART

Valve	Anode	Screen	Cathode
UCH42	223	87	—
OSC	123	—	—
UAF42	150	87	—
UY41	—	—	226
V1310P13	210	223	11.5

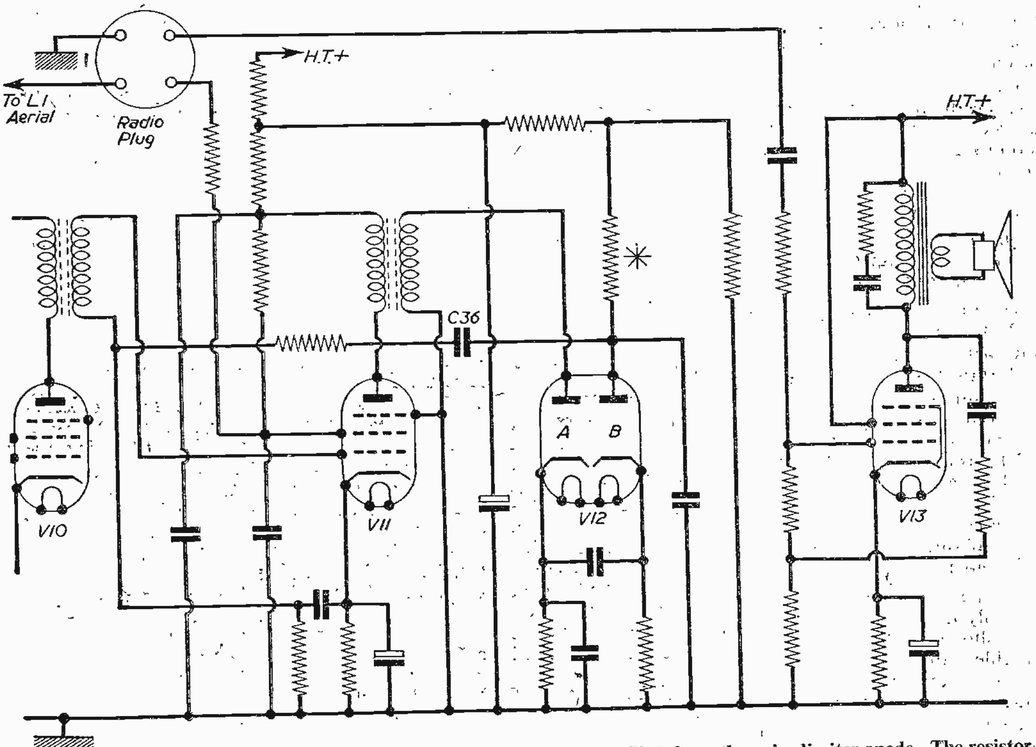


Fig. 3.—Television sound amplifier. C36 feeds back A.F. to the grid of V11 from the noise limiter anode. The resistor marked * is the limiter anode load and is rated at 2.2 MΩ in this model.

The Radio Components Show

DETAILS OF SOME OF THE EXHIBITS AT THE R.E.C.M.F. EXHIBITION IN LONDON

ONCE again the component manufacturers have been able to show, under one roof, the vast collection of special items which they have produced for radio and television, and this year's exhibition, held as usual at Grosvenor House on April 19th to 21st, was even more interesting than previous shows. Naturally, with the advent of transmissions on Band III by the ITA there was a very wide selection of tuners and adaptors, but these were almost entirely of types designed for commercial receivers. They all appeared to consist of an R.F. stage, utilising a double-triode connected as an earthed-grid cascode amplifier followed by a triode-pentode as frequency changer. The output was generally at 34 Mc/s and intended for connection to the I.F. stages, and some had a special heater connection to provide the necessary 15 or 17 volts, whilst others were complete with power unit. Details of these will be given in a later issue. A general impression of the remaining exhibits would be that there is otherwise very little actually new, most of the items being improved versions of existing components, but one outstanding new development is the printed circuit technique which is being produced by the T.C.C. and other firms. One interesting component incorporating this principle is illustrated below and is a Belling-Lee circuit connector. These are designed for easy installation, and can be mounted side-by-side in multiples of four connector strips to produce a practically unlimited number of contacts. They can be "stacked" with spacers between for component mounting. They can be mounted direct to plates, printed or otherwise, and are suitable for mounting on ceramic and laminated plastic printed circuits.

T.C.C. Printed Circuits

On the T.C.C. stand was a vast range of samples of the types of apparatus which are available in this new technique. These included:

Several high quality amplifiers.
Radio receivers of the A.C./D.C. and battery types.
Portables with contained battery.
TV tuners for Band I and Band III.
Aerial filters for TV receivers.
Cross-over networks.
I.F. transformers for TV.
I.F. transformers and amplifiers for TV.
Transistor computor panels.
Telephone distribution panels.
Flexible circuits, etc., etc.

In addition, various types of electrolytic and paper condensers were shown which were particularly suitable for assembly in printed circuit panels. There were, of course, also the many electrolytic, ceramic and plastic film condensers already well-known under such names as "Metalmite," "Micropack," etc.

Potted Chokes

Another type of component which is coming into increasing use is the "C" core potted transformer and choke. Illustrative of these is the W/B component shown on page 540. This has a "C" core moulded in Aroldite, and is fitted with waterproof plugs and sockets. Other W/B exhibits included the complete range of Stentorian high fidelity loudspeakers, now incorporating the patented Cambric cone from 2½in. to 18in. in diameter, including 8in., 9in. and 10in. models fitted with universal impedance speech coils, providing instant matching at 3, 7.5 and 15 ohms.

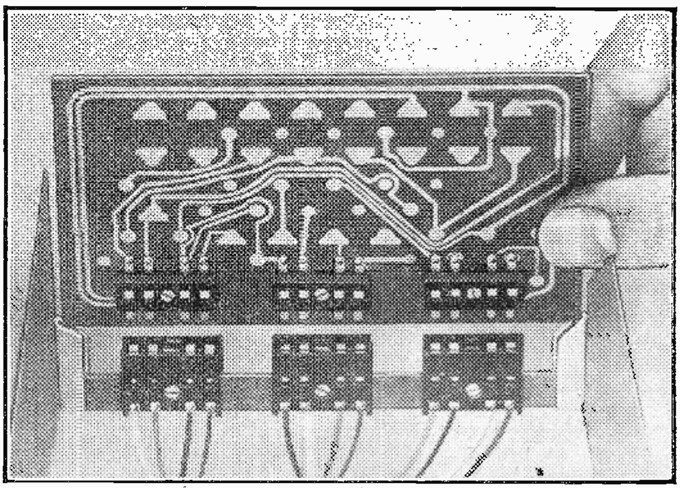
The television components series shown included numerous items suitable for wide angle C.R.T.

The radio sonde transmitter as supplied to the British Meteorological Office and several foreign governments will also be seen at this company's stand.

Ion Traps

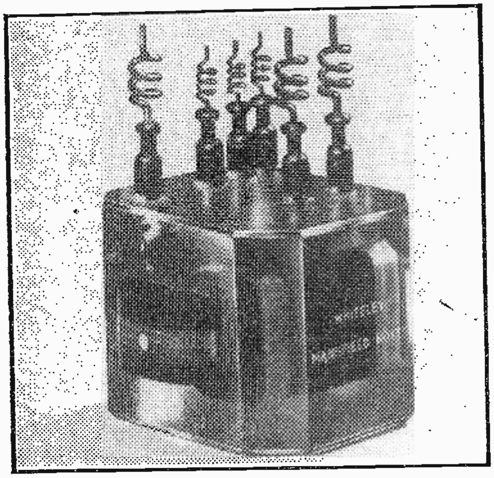
As one of the largest manufacturers to the trade, the Plessey exhibit was particularly interesting. Many set makers use ready-made Plessey parts and among the new television items which Plessey had on view was a new ion-trap magnet specially designed to reduce astigmatism in picture tubes. This ion trap gives an approximately linear field distribution and a small decrease in field strength along the axis. This is achieved by means of new style pole pieces in which the usual half-circle pole pieces have been replaced by soft-iron strips bent twice along their lengths.

Standard focus units on display consisted of two Ferrite magnet rings exactly aligned, the rear magnet being capable of axial positional adjustment with respect to the front magnet, which is fixed to the main assembly. Varying sizes of magnet are made, with or without a shift ring clamp.



A Belling-Lee printed circuit component.

A combined focus and scan unit was shown, consisting of a mounting which has a scanning coil in a screening cover on the front portion, and a double-ring focus unit on the rear part. Adequate mechanical shift is provided by a steel ring fitted in front of the forward magnet ; its position is such that it introduces the minimum of spot distortion. The screening coil can be moved axially over ½in. total within its screen. An important feaure of this unit is that the picture tube is supported by resilient means within the neck of the assembly. A number of different handles for the focus unit are available and the shift ring is provided with a clamp at the top of the unit. The leads from the scanning coils are brought out from a slot provided at the front end of the cylinder.



A potted "C" core transformer by Whitely Electrical.

Aerials

Several firms had television aerials on show and although generally these are unchanged (that is, they still consist of single, "H" and "X" units) some of the models shown had the new Band III units added. These Band III aerials were seen in various types, from single to folded units, and with and without directors and reflectors. The illustration on the right shows a folded dipole and director adaptor, intended for assembly on a standard Band I dipole, in which case it offers a substantially correct impedance match to the feeder, and the Band I dipole acts as a partial reflector on Band III, giving an overall gain of about 4 db. This kit is intended to sell at £1 16s. The "Addex" is an antiference Band III aerial, also arranged to assemble on a standard Band I "X" type aerial. This may be added in different ways to provide the equivalent of a Band III "H" aerial and give equal reception from stations in opposite directions—a most important point, as some receiving sites may be in a position mid-way between two transmitters.

Valves and Tubes

Several new picture tubes were to be seen, amongst them being a new Mullard 21in. tube for 90 degree scanning, the MW53-80. This is of particular interest in that it is about 3in. shorter than 70 degree tubes with the same screen diagonal. This enables the front-to-back cabinet measurement of a television receiver to be kept reasonably small (21in.), a factor of special importance in table models.

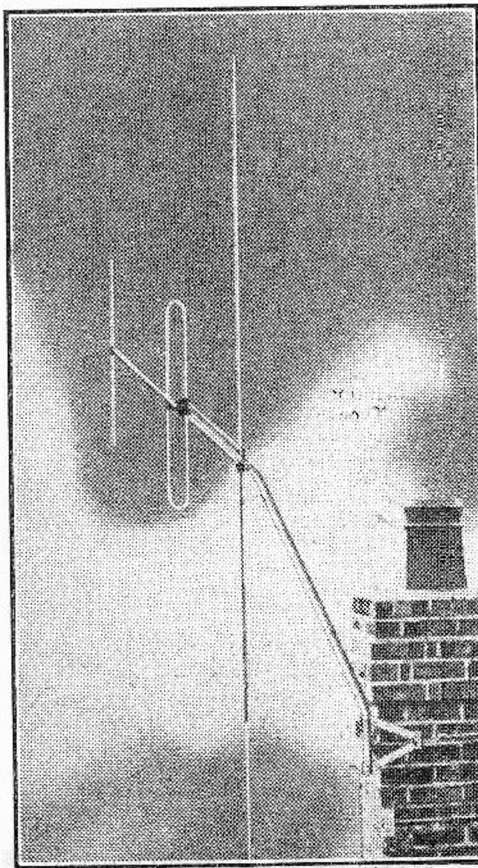
A new range of Mullard cores has been developed for line output transformers and scanning coils for use with the 90 degree tubes.

For line output transformers, the new cores give closer coupling between coils and core, leading to higher inductance for a given number of turns and lower leakage inductance. The resulting circuits have less tendency to "ring."

The cores for scanning coils have been produced in the form of 16-slot castellated yokes, specially shaped to allow them to be fitted close to the flare of a tube, thus avoiding corner cutting. An advantage of the use of 16 slots is a more uniform magnetic field, and therefore a reasonably undistorted raster.

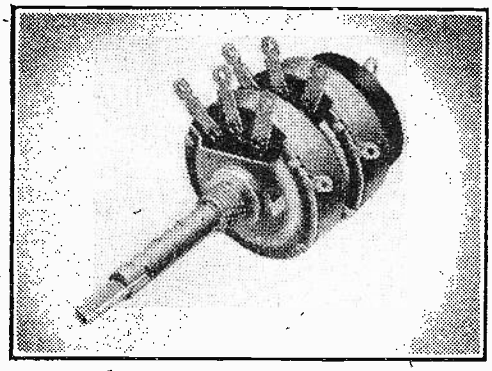
Solders

The well-known Ersin Multicore Solder, containing five cores of extra fast non-corrosive type 362 flux specially formulated for extreme soldering speed, was an important feature of the Multicore stand. A new type of Ersin Multicore Solder which was shown, also containing five cores of the extra fast non-corrosive



A Band III aerial mounted on a standard Band I dipole. This is a Belling-Lee kit assembly.

type 362 flux, is known as Savbit alloy and contains approximately 2 per cent. copper and is claimed to increase the useful life of a soldering bit by 10 times. This special alloy which is made under sole British Licence of Patent No. 721,881 is already in production and can be supplied in nominal tin content alloys of 60 per cent., 50 per cent. and 40 per cent. There is no appreciable difference in melting points between Savbit alloys and conventional tin/lead alloys.



One of the new dual controls with concentric spindles, by Egen Electric.

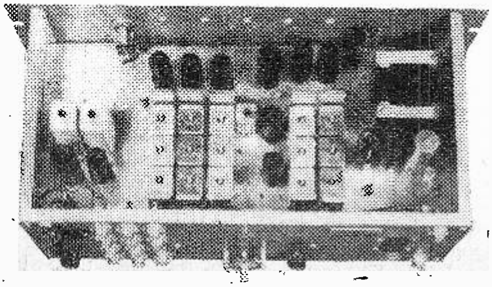
Steps are being taken to obtain A.I.D. approval for Savbit alloy and for any new edition of B.S.S. 219 to be amended for such copper-loaded alloys.

Among the other special solder products exhibited was solder tape, solder rings and washers, preforms and a complete soldering and fluxing process for printed circuits. (The attention of component manufacturers is drawn to Multicore Activated Surface Preservative, P.C.10. This material, which is already being used by manufacturers of printed circuits, ensures that wires and tags will not become oxidised during storage.)

Among the many other items seen were a wide range of components displayed by Egen Electric, Ltd.

Designed for application in the television and electronic engineering fields, the new range of Egen dual potentiometers with concentric operating spindles (Types 136, 137 and 138) incorporate all the features which have contributed to the success of the Egen potentiometers, including multiple contact rotors, smooth, easy movement and freedom from wear and noise. The component is designed to ensure thorough screening between sections, and spindles can be machined to customers' particular requirements.

Type 138 has a double-pole, single-throw mains switch ; Type 137 is of similar design but incorporates a single-pole, single-throw switch ; and Type 136 is exactly similar but has no mains switch.



The new Egen concentric switch potentiometer range (Types 154 and 155) offers the outstanding advantage of an independently operated switch, and this component when applied to a typical modern television receiver reduces day-to-day operation to simply switching on and off, while the potentiometer can remain pre-set in its optimum position.

Type 154 is fitted with a single-pole, single-throw mains switch, while Type 155 is an identical component, but with a double-pole, single-throw switch.

On both types the switch is operated by the inner spindle and the potentiometer by the outer spindle.

The Egen Types 126 and 127 pre-set potentiometers are widely specified by television and electronic equipment manufacturers. Type 126 incorporates an efficient wire-wound element, while Type 127, of identical external appearance and dimensions, has a carbon element.

Also shown were the Types 105 and 115 miniature carbon potentiometers, co-axial plug and socket, Type 104 special wire-wound pre-set resistor, Types 123 and 125 sub-miniature carbon pre-set resistors, a number of interesting special inductance mechanism assemblies, a sub-miniature volume control, and several components designed for incorporation into printed circuits.

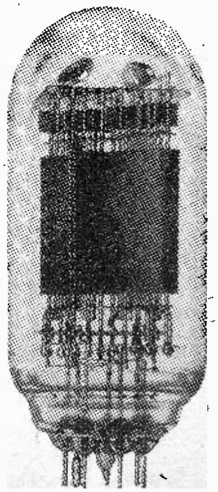
Messrs. James Neil & Co. (Sheffield) showed a wide range of magnets for loudspeakers and for ion traps, focusing and picture shifting in television.

At the 1954 Radio Components Show this company exhibited prototypes of the remarkable new Radial Focalizer, then emerging from experimental stages. The Radial Focalizer is now in bulk production. It is highly efficient magnetically, it is non-astigmatic, and it has no significant external field.

Rectifiers

A comprehensive display of Westalite rectifier units included a number of new miniature assemblies in various types of sealed housings. All of the new miniature rectifiers contain either double or quadruple voltage elements capable of withstanding peak inverse voltages of 42 and 85 volts respectively. Although many of these midget rectifiers were developed primarily for Service and Ministry requirements, they have also found a ready commercial market.

Westalite rectifiers for radio and television anode supplies include both the usual spindle types and the newly developed contact cooled rectifiers for chassis mounting. The latter rectifiers dissipate their losses through the chassis and therefore effect a considerable saving in space, and increased efficiency.



Left : A 5-channel pre-selector, by Plessey. Right : a new Mazda Beam Tetrode D.C. control valve, type 13E1, suitable for use in stabilised power supplies.

CORONA DISCHARGE

THE CAUSES AND CURE OF A COMMON FAULT

By W. J. Delaney

A VERY common defect in many home-constructed and serviced commercial receivers often causes difficulty due to its similarity to other faults. We refer to that trouble known as "corona discharge." It is a form of arcing which occurs in the E.H.T. circuits and which, in an extreme case, is apparent on visual inspection of the chassis and also by the peculiar smell which arises shortly after the discharge commences. Before going into this fault further it would be as well to try and explain how the trouble arises. To put it non-technically it may be stated that E.H.T. may be considered as travelling at high speed (pressure), and is thus comparable with a car or train travelling at high speed. Any change in direction of the latter must be carried out over a curve, the higher the speed (pressure) the more gradual the curve. If a railway track has a curve designed for slow speeds, and is accordingly fairly sharp, a train arriving at the bend at high speed will shoot off the rails in the direction it was already travelling, and the E.H.T. current does exactly the same thing. If there is, for instance, a terminal on the E.H.T. transformer and a lead has to go from this to the anode cap on the C.R.T., the lead from the terminal should come away in a gradual curve to the anode cap, and if it is soldered and taken at right angles a corona discharge is almost certain to take place at the angle. Similarly, the solder surrounding the point should also be put on in such a manner that it has no points.

Corona Points

One of the main effects of a corona discharge is to generate ozone, a smell peculiar to the seaside, and which can readily be identified when once it has been noticed. Therefore, if corona is suspected it would be quite a good way of confirming it to *switch off*, and then smell inside the set. The smell will hang about for some while before dispersing. Similarly, if the chassis is inspected in a darkened room, the source of the discharge will be located as a faint blue—either halo or thin pencil beam. The extent of the corona depends upon the value of the E.H.T., the sharpness of the bend, or the acuteness of the point from which it takes place. The sharper the point, or the higher the E.H.T., the greater the corona. Accordingly, by flattening the point the discharge will be reduced, and if the point is finally removed or rounded off the discharge will cease. Similarly, if the E.H.T. is reduced so will the discharge, until at a certain value it will cease.

It might be thought that the trouble will not matter, but the reason for this article is that many occasions have been investigated where a constructor or viewer thought he was suffering from some other trouble when the real trouble was simply corona discharge. The most obvious effect of the arcing which takes place under this condition is the production of white spots on the raster. These are very similar to those experienced in fringe areas from radiated interference, but can be identified in that they usually cover the entire raster evenly. Car interference or interference from other types of electric motor usually take the form of lines of dots, generally dividing the screen into three equal parts, and sometimes these lines travel up and down the screen. Local interference from, say, a hair dryer or vacuum cleaner, will again be in more or less band form, although if very close to the receiver these may cover the entire raster. It will be found, however, that there is a distinct regularity in the formation of the spots. Atmospheric disturbances in fringe areas, or noise from over-driven valves on the R.F. side, will be of haphazard formation and cover the screen, but the spots will generally be more widely spaced and more erratic than those produced by corona. Service men who are not familiar with the trouble can easily create it by drawing off some solder to a point on the E.H.T. feed and making this very prominent so that corona takes place and then noting the effect on the screen. Unfortunately the point at which the discharge takes place may be under the chassis or otherwise obscured, so that it is not readily visible. It may be of such a character that it produces no spots on the screen, and the viewer may thus be unaware of the fact that it is taking place, other than that the E.H.T. will be reduced. If the receiver has a separate volume control this may be turned right off, and if the set is reasonably quiet it should then be possible to hear the discharge in the form of a sizzling or frying noise, fairly high in pitch, and regular, as distinct from that produced by noisy, resistors, etc. Again, if the point is below the chassis the noise may be masked. Removing the aerial lead is not a definite test, as noise caused in the early stages may give rise to a trouble which may not readily be distinguished from corona by the inexperienced, and it may not be possible to remove valves as a check if the heaters are wired in series.

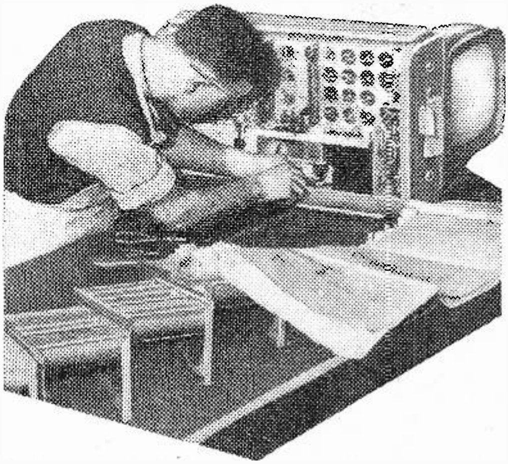
If the frying noise can be heard, and it is doubtful whether it is corona or a noisy component, one test is to reduce brilliancy, or otherwise adjust the tube controls so as to vary the beam current and thereby modify the E.H.T. flow. Alternatively, in the case of flyback E.H.T. the drive may be reduced to lower the E.H.T., and if the noise ceases with lowered E.H.T. then it is fairly certain that it is corona.

Soldered Connections

It is a good plan, to make sure that corona will not occur in a home-made receiver, to solder all connections which are in any way connected with the E.H.T. supply with round beads of solder and to run all leads in curves rather than direct from point to point. For instance, in the case of a flyback E.H.T. arrangement, similar to that used in the Super-Visor, from the anode of the line output stage every lead should be regarded as critical. This includes the leads to the recovery diode, the E.H.T. transformer, the heater leads for the E.H.T rectifier and the smoothing capacitor. In addition, the actual connections to the anode of the tube must also be kept free from points and sharp angles. It will be remembered, for instance, that in the Super-Visor the E.H.T. connections were made by means of metal clips mounted on the tops of smoothing condensers, and the front edge of the metal tube rests in the clips.

(*Continued on page 571.*)

PAGES FROM A TELEVISION ENGINEER'S NOTEBOOK



THE CATHODE FOLLOWER CIRCUIT

THE cathode follower is often found in the home-constructed televisor where it is nearly always used as an impedance matching device for feeding into a capacitive load such as a picture tube.

Basically, the cathode follower is a negative-feedback type of valve circuit with the output taken from across an unby-passed cathode load ; or, as it is sometimes looked on, an amplifier circuit in which the load is common to both anode and grid circuits.

It is characterised by a very high input impedance and a low output impedance, so that a direct output coupling can be taken into a low-impedance cable or highly capacitive load. Since the output of an ordinary amplifier with the load in the anode circuit is high impedance, such a system cannot be used for direct coupling in this way unless some impedance matching device such as the transformer is interposed. This is all right at audio and low frequencies, but at television video frequencies extending to some 4 Mc/s or so a transformer is not a practicable solution. The cathode follower, on the other hand, can readily be adapted as such a device for its high input impedance permits feeding from the output of a preceding amplifier of normal design, and the frequency response is not limited over the range mentioned above.

Basic Circuit

A basic cathode follower is shown in Fig. 1, where the cathode load is Rk, and the input signal is applied between grid and earth. The presence of a signal causes an A.C. component of voltage to be developed between cathode and earth, and so Rk may be considered as an A.C. generator as far as its feedback function is concerned. A change in the potential at the cathode will cause changes in the anode voltage Va and the grid voltage Vg equal to the change in voltage across Rk, say, Vk. Va is diminished and the grid is effectively more negative than it was before with respect to the cathode.

It is not very difficult to see that the gain will always be less than unity because any change in the input voltage must appear, in part, as a change in bias in order to produce a change in the valve current. Only the balance of the input voltage appears as output. It is simple to show that the gain of the circuit is given by

$$\frac{\mu Rk}{Ra+Rk(1+\mu)}$$

where Ra is the valve impedance and μ the amplification factor. For the gain to be as near to unity as possible, μ must be much greater than 1, and Rk must be much greater than Ra. There is no difficulty about the first of these conditions, but the second is often impracticable.

Unlike the anode loaded amplifier, a positive input to the cathode follower produces a positive output, and a negative input produces a negative output, that is, there is no reversal of phase.

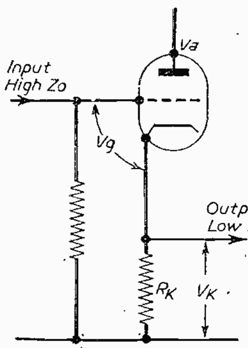
In the true cathode follower there is no anode load, but in practical circuits one is often included. The circuit is then basically a phase-splitter, but the theory of the cathode-follower still stands. The outputs are both less than unity in gain, and the output at the anode is of reversed polarity to the input.

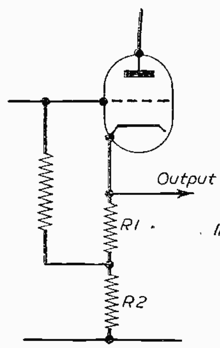
Input and Output Impedances

It can be shown that the input impedance of a cathode follower is very high due to its very low input capacity ; in fact for a triode the input capacity is given by

$$Cin=Cag+Cgc/\mu$$

where Cag and Cgc are the anode-grid and grid-cathode capacities respectively.





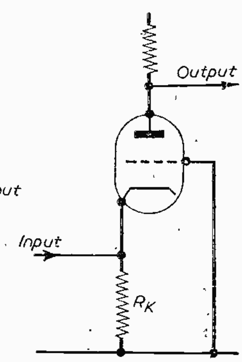


Fig. 1 (left).—A basic cathode follower circuit. Fig. 2 (centre).—Modified circuit Fig. 3 (right). — Cathode input stage.

The valve works with its grid always negative with respect to cathode, and a high amplitude positive input is, therefore, permissible without the danger of grid current flow. This is due to the degenerative effect of the cathode load, the high impedance being maintained essentially constant throughout the input cycle.

The cathode impedance of the stage can be shown to be equal to $Ra/(\mu+1)$; as μ is always very large compared with 1, this reduces to Ra/μ which is, of course, effectively 1/gm. The output impedance of the cathode follower is, therefore, this cathode impedance in parallel with Rk, which is $Rk/(1+Rk.gm)$. The output impedance is consequently very low and can be matched quite easily into 70 ohms type cable by the use of a high slope valve and the proper value of Rk.

It should be noted that whereas the output impedance of an anode loaded amplifier is constant, the output impedance of a cathode follower may not remain so. The mutual conductance gm varies with anode current and is subject to variation with changes in the instantaneous input voltage amplitude. For example, if the input swing is sufficiently negative to cut the valve off, gm becomes zero and the output impedance is then simply Rk.

The output from a cathode follower is distortionless if it is operated within its normal range, but it will distort in the same way as any other type of amplifier if the input swing is excessive. When very large negative inputs have to be handled, the circuit may be modified as shown in Fig. 2. Rk is now split into two parts and the grid is returned to the centre point of them. The valve bias is consequently reduced to the voltage present across R1, and a greater negative swing can be handled as input.

The Cathode Input Stage

A modification of the basic follower circuit is shown in Fig. 3, where the input is applied to the cathode and the output is taken from the anode, the grid being earthed. The input impedance of this arrangement is low, but the output polarity is in phase with that of the input as it is in the cathode follower. The gain this time is not less than unity, but is, in fact, rather greater than the gain of an ordinary anode-loaded amplifier using similar components.

The application of such a system as this is restricted because of the low input impedance, but it can be used to match a low impedance line into a high impedance circuit. It is, in fact, the opposite number of the cathode follower in that it represents a step-up transformer as compared to the step-down effect of the latter system.

Its main application in modern television is found in the R.F. side of the set as the earthed grid input amplifier for V.H.F. working.

New Mullard Cathode Ray Tube Tester

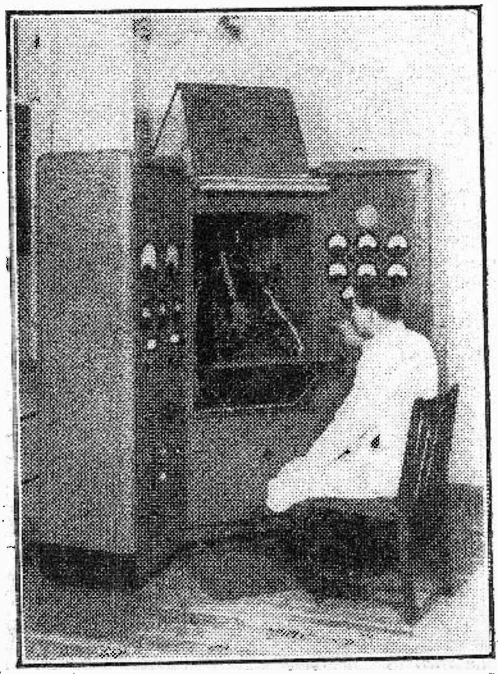
AT Mullard Valve Service Depot, Glasgow, a new equipment designed to test television picture tubes to laboratory standards has been brought into operation.

The equipment is capable of testing to the laboratory test specification all direct-viewing tubes whether fitted with straight or ion trap guns and the design is based on tube testing equipment used in the Mullard tube factories. The design of the tester makes for ease of handling by the operator. For example, the tube can be turned from the vertical to the horizontal position for screen inspection by means of a low geared motor on pressing a button. Faults can be quickly located, however obscure, and an accurate technical assessment of the trouble can be easily obtained which is invaluable to the central service organisation for statistical records and quality control.

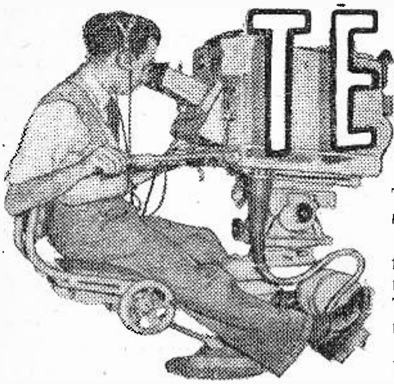
The test procedure begins with a check on the insulation between electrodes, including a measurement of heater-cathode insulation, the voltages applied being in excess of those which occur under normal operating conditions in a television set. Next, operating voltages are applied, and a raster is put on the screen. Adjustments are made to focus controls and, if necessary, to the ion trap magnet, and under normal brightness conditions the tube face is examined for screen uniformity and brightness under focused and de-focused conditions.

Characteristics of the tube, including emission, cut-off, stray emission, and gas current are now measured, and the tube is subjected to overload conditions to investigate arcing, brushing and insulation breakdown. Readings are taken on 16 voltage current meters of the wide scale type.

Elaborate safety precautions include the fitting of armour plate glass to the front of the tube screen, and automatic disconnection and short circuiting of the E.H.T. voltage when the tube is in a position to be handled by the operator. Safety switches automatically disconnect the mains when the rear doors of the tester are opened for servicing.



The new television picture tube tester at the Mullard Valve Service Depot, Glasgow.



TELENEWS

Televising the Olympic Games

SIR GEORGE BARNES, director of television to the BBC, told the Radio Industries Club of the Midlands recently that it may be possible for the Olympic Games to be televised to Europe from Melbourne, Australia, next year.

This could be done, he said, by passing the TV link on from country to country just as programmes are sent to this country from Europe. He added that there was no technical reason why this could not be done.

I.T.A.'s Croydon Station

WORK on the I.T.A.'s temporary transmitter is now well in progress.

The contract for the station, complete with 200ft. tower and a special high gain aerial, has been awarded to Marconi's Wireless Telegraph Co. Ltd., who are also supplying the vision and sound transmitters.

The Cup Final

IT is almost certain that the Cup Final on May 7th will be televised to large screens in several cinemas throughout the country.

TV Network by July

THE Austrian postal authorities have been told to have ready by July 24th a complete television network with stations at Linz, Salzburg, Vienna and Graz.

This order comes from Herr Waldbrunner, Austrian Minister of Communications.

Wrong Ratio

THE extra width of films made in CinemaScope makes it almost impossible for them to be shown to best advantage on the narrower television screen. This is one form of spectacle that can be seen only in the cinema.

Television Licences

THE following statement shows the approximate number of television licences issued during the year ended February, 1955. The grand total of sound and television licences was 13,916,246.

Region	*Number*
London Postal ...	1,108,493
Home Counties ...	475,796
Midland	811,781
North Eastern ...	636,365
North Western ...	638,867
South Western ...	236,505
Wales and Border Counties	239,379
Total England and Wales	4,147,186
Scotland	237,512
Northern Ireland ...	22,695
Grand total	4,407,393

Commercial Appointment

IT is announced that Mr. R. H. Hammans has left the BBC to take up duties as chief engineer with Granada Television. He will supervise the building of Granada's TV centre in Manchester.

Staff Shortage

SIR IAN JACOB, BBC Director-General, has stated that the shortage of qualified television engineers in this country will soon become acute.

"The new era of competition means a problem of staff to be faced," he forecasts. "Top-grade TV producers are at a premium and it will be a pretty good fight as to who gets them."

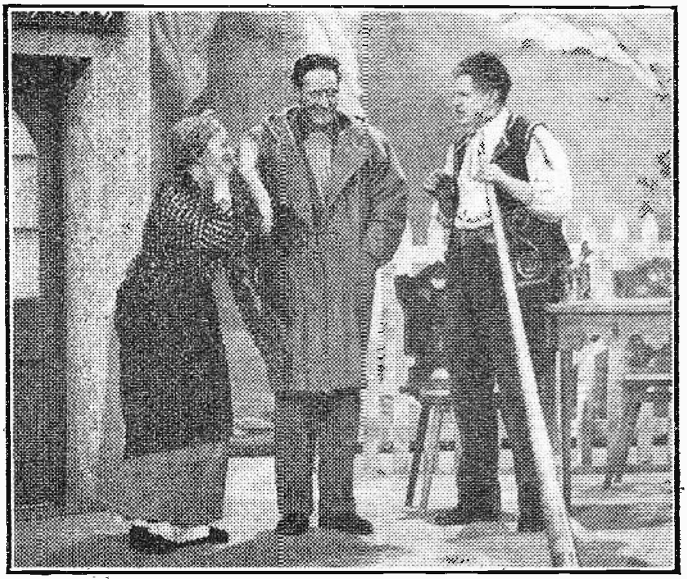
Scottish Stations

THE Independent Television Authority hope that one or possibly two commercial television stations will commence operation in Scotland next year.

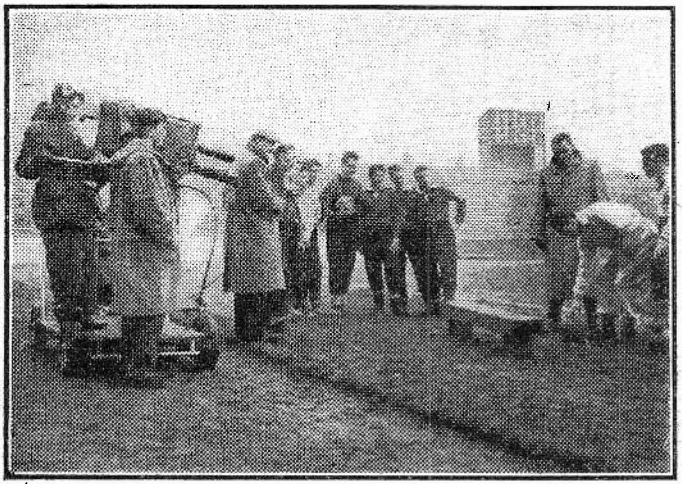
Suppressors for Fire Brigade

VIEWERS in Worcestershire will not be bothered by television interference when fire engines rush past their houses on alarm calls.

All fire brigade vehicles in that county have now been fitted with suppressors.



Left to right : Beryl Reid, Jeremy Hawke and Benny Hill in a recent edition of the popular "Benny Hill Show."



The camera spotlights Roy Paul, Manchester City captain, as he rehearses schoolboy footballers for a Children's Television broadcast at Maine Road, Manchester.

No *H* Aerials at Tower

FOLLOWING a Ministry of Works decision that they were not in keeping with the character and dignity of the building, the individual TV aerials on the living quarters of the Tower of London have been removed and replaced by one central aerial.

The new installation is invisible from the ground and has been carried out by E.M.I. Sales and Service, Ltd.

Cameras For Tests

BRITISH aeroplane manufacturers are using special television cameras for testing new aircraft engines.

The cameras give the designers close-ups of the power units in operation and any fault in performance or behaviour is instantly noticed.

Play Telerecording

WHEN a telerecording of the play "For Dear Life" was shown to viewers on April 7th it was the first to be seen under the recent agreement between the BBC and Equity.

Light Entertainment

THE pattern of light entertainment during the coming months is now taking shape. On Sundays the panel show "Guess My Story" will be augmented with a fortnightly half-hour show televised from Blackpool, starting in May or June. Mondays will carry Henry Hall's "Face the Music," "Café Continental" and "Show Case" with Dave King.

"Find the Link," "Top Town" and "Garrison Theatre" shows will be placed on Tuesdays, and Wednesdays will bring two new shows to the screen—"Off the Record," a disc programme starting on May 11th and "The Lyon Family" on June 15th.

Where Honesty Pays

A RENO, Nevada, club manager has installed a television camera above his gambling tables, with a cable connection to a receiving screen in his office.

The camera is constantly trained on the players trying their luck; any signs of cheating are easily observed from the manager's office and the appropriate steps taken.

Ocean Cable

A HIGH power telephone cable will be laid across the Atlantic next year.

3-D TV

TELEVISION in three dimensions is being employed by the United States Argonne National Laboratory of the Atomic Energy Commission to control at a distance the operation of radio-active materials.

A twin lens is used on the camera and a normal set has been modified to receive pictures in 3-D.

Miss Jean Metcalfe

MISS JEAN METCALFE, who is now a member of the Outside Broadcasts Department (Sound), Entertainment Division, will take part in "Special Inquiry Into Cosmetics" on television on May 16th.

Norwich Transmitting Station

THE BBC has placed a contract with J. L. Eve Construction Co. Ltd., 17, Hillside, London, S.W.19, for the design, supply and and erection of the 560 ft. stayed mast for the Norwich television station.

Design work has started and it is hoped that the mast, with its aerials, will be completed so that the station can be ready for service about the middle of 1956.

£1,500,000 a year

FOR the use of the three commercial TV stations which will operate from London, Birmingham and Manchester the ITA is charging its four programme contractors £1,500,000 a year.

The Treasury loan to the ITA of £2 million has to be repaid within ten years.

The Long Wait

MR. P. H. SPAGNOLETTI, of Kolster-Brandes, has forecast that colour TV will not be seen in Scotland until about 1959-60. He told this recently to members of the Radio Industries Club of Scotland at a meeting in Edinburgh.

ALPHA FOR VALVES

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EB41	11/-
EBC33	7/6
EBC41	11/-
EBF80	11/6
EC52	6/3
EC91	9/-
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ECH42	10/6
ECL80	14/6
EF8	6/6
EF36	6/-
EF39	6/6
EF41	10/-
EF50Syl	8/-
EF50	6/-
EF80	11/6
EK32	8/-
EL2	12/6
EL33	13/-
EL41	11/6
EL42	13/6
EL84	12/3
EM31	9/-
EY51	14/6
EZ40	10/-
EZ41	11/-
E1148	2/-
H30	5/-
H63	7/9
HL1320	5/6
HL23DD	7/6
HP211C	7/6
KT2	5/-
KT32	10/-
KT33C	11/6
KT66	11/6
KT74	8/-
KTW61	7/9
KTW63	7/9
KTZ41	6/9
LD210	6/9
LP220	6/9
MS/PEN	5/-
P61	3/9
PA20	14/-
PCC84	12/6
PCF80	12/6
PCF82	12/6
PEN25	8/-
PEN44	12/6
PEN46	8/6
PL81	14/6
PL82	11/6
PL83	13/-
PM12M	10/-
PM2B	5/6
PM22B	5/6

PY30	8/-
PY80	11/-
PY81	11/6
PX25	15/-
S130	8/6
SP220	6/9
SP61	3/9
SP41	3/6
TP26	9/-
U10	9/-
U16	12/6
U22	8/-
U25	14/6
U35	15/-
U281	10/6
U404	10/-
UAF42	12/-
UB41	9/-
UBC41	11/-
UCH42	13/6
UF41	11/-
UL41	11/6
UY41	10/6
VP23	8/-
VR105/30	5/6
VR116	4/-
VR150/309	9/-
VT52 (EL32)	8/-
VT75 (KT44)	7/6
VT501 (TT11)	6/-
VU39 (MU12/14)	8/6
VU111	3/6
VU120A	3/-
W61	9/-
W77	8/6
W81	10/-
OZ4	6/-
1A3	9/-
1A5GT	6/6
1A7	11/6
1C5GT	8/-
1L4	7/6
1LD5	6/9
1R5	7/6
1S4	7/6
1S5	7/6
1T4	7/6
1U5	8/-
220VSG	6/9
2A3	6/9
2X2	5/-
3A4	8/-
3D6	5/-
3Q4	9/-
3Q5	10/-
3S4	8/6
3V4	8/-
4D1	3/-
42	8/-
5U4 (U52)	8/6
5Y3GT	8/6
5Z3	8/6

5Z4G	8/6
6A7	10/6
6A8G	10/6
6AC7	6/6
6AG5	7/6
6AJ5	9/-
6AK5	9/-
6AL5	7/-
6AM5	7/6
6AM6	7/6
6AQ5	8/6
6AT6	8/-
6B4	6/-
6B8G	4/-
6BA6	8/-
6BE6	8/-
6BR7	9/6
6BW6	8/6
6BX6	14/6
6C4	8/-
6C5GT	7/6
6C6	6/6
6C9	8/-
6CD6G	13/6
6D3	7/6
6D6	7/3
6F6G	7/6
6F6M	8/6
6F8G	7/-
6F13	13/6
6F14	12/6
6F15	11/6
6G6G	6/6
6H6	3/6
6J5G	5/-
6J6GT	5/6
6J5M	6/6
6J6	8/-
6J7G	6/6
6K6GT	6/6
6K7G	6/-
6K7GT	6/6
6K7M	6/9
6K8G	8/-
6K8GT	9/6
6L1	11/6
6L19	12/6
6L6G	9/-
6L7M	7/6
6N7	7/6
6Q7G	9/-
6Q7GT	9/-
6R7G	8/-
6SA7GT	8/-
6SG7	7/6
6SH7	6/-
6SJ7GT	8/-
6SK7	6/3
6SL7	8/-
6SN7GT	9/-
6SQ7	9/-
6SS7	8/-
6ST7	7/6
6U5G	8/6
6V6G	7/6
6V6GT	7/6

6W2	15/-
6X4	8/-
6X5GT	7/9
7B6	9/6
7B7	8/6
7C6	8/6
7H7	8/-
7Q7	8/-
7R7	8/6
7S7	8/6
7Y4	8/6
75	10/-
77	8/-
80	8/6
84	8/6
807	7/6
8D2	2/9
9001	5/6
9002	5/6
9003	5/6
9004	5/6
9006	6/-
954	2/-
955	4/9
956	3/6
10C2	13/6
10F1	10/-
10F9	13/-
10LD11	11/-
10P13	11/6
10P14	11/6
12A6	6/9
12AH8	11/6
12AT7	9/-
12AU7	9/-
12AX7	10/-
12C8	8/-
12H6	5/-
12J5	6/-
12J7GT	9/6
12K7	9/-
12K8GT	9/-
12Q7GT	9/-
12SC7	7/6
12SH7	5/6
12SJ7	8/6
12SK7	6/6
12SL7	9/-
12SQ7	8/6
12SR7	7/6
20D1	10/6
20F2	12/6
20L1	10/-
20P1	15/-
20P3	11/-
20P4	11/-
25A6G	9/-
25L6GT	8/6
25U4GT	12/-
25Z4G	9/-
35L6GT	8/9
35W4	10/-
35Z4GT	8/6
50L6GT	8/6
117Z6GT	8/-
215SG	7/-

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16in.×9in.×2½in. .... 12/- ea.

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Both with tap on Primary for 2.5 v. Pilot light.

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50 kΩ, ½ MegΩ, 1 MegΩ, 2 MegΩ. 1/9 ea.

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2.2 kΩ, 470 Ω, 7.5 kΩ, 22 Ω 150 Ω, 5.6 kΩ, 390 Ω, 150 kΩ ½ meg. Ω, 39 Ω, 1.5 meg., 56 kΩ. All 4d. ea.

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Prices ¼/½ watt 3d. ea. 1 watt 6d. ea.

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22 Ω	270 Ω	3.3 kΩ	39 kΩ
27 Ω	330 Ω	3.9 kΩ	47 kΩ
33 Ω	390 Ω	4.7 kΩ	56 kΩ
39 Ω	470 Ω	5.6 kΩ	68 k
47 Ω	560 Ω	6.8 kΩ	82 kΩ
56 Ω	680 Ω	8.2 kΩ	100 kΩ
68 Ω	820 Ω	10 kΩ	120 kΩ
82 Ω	1 kΩ	12 kΩ	150 kΩ
100 Ω	1.2 kΩ	15 kΩ	180 kΩ

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Solon type 964 fitted oval bit .... 19/11 ea.
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S.W.G.	Price	S.W.G.	Price
16	1/11	30	3/1
18	2/1	32	3/3
20	2/3	34	3/5
22	2/5	36	3/7
24	2/7	38	3/11
26	2/9	40	4/2
28	2/11		

TERMS: Cash with order or C.O.D. Postage and Packing charges extra, as follows: Orders value 10/- add 9d.; 20/- add 1/-; 40/- add 1/6; £5 add 2/- unless otherwise stated. Minimum C.O.D. fee and postage 2/3.

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5/6 VINCES CHAMBERS, VICTORIA SQUARE, LEEDS 1.

More About the RF26 Unit

SOME FURTHER DETAILS OF THIS USEFUL R.F. UNIT

By B. L. Morley

A LOT of interest has been aroused on this class of unit since my article in the February issue of PRACTICAL TELEVISION and in response to requests it is hoped that some further details may be of interest to constructors.

The circuit of the unit was given in the March issue of PRACTICAL TELEVISION. It comprises an R.F. amplifier using an EF54, a mixer also using an EF54 and an oscillator using an EC52. The service equivalents are VR136 for the EF54 and VR137 for the EC52.

The unit is in a self-contained chassis which is silver-plated, and is an excellent buy at the modest price of 35s. A power supply of 6.3 v. at 1 amp and 250 v. at 30 mA is needed additional to the unit itself.

Tuning is effected by a dial on the front of the chassis and the range covered is 65—50 Mc/s. The unit will tune Kirk o' Shotts and Sutton Coldfield (Channels 3 and 4) direct ; Holme Moss and London (Channels 1 and 2) by the insertion of iron-dust cores in the tuning coils ; Wenvoe (Channel 5) by the insertion of brass cores in the coils.

The output is delivered at about 7.5 Mc/s.

It was intended originally to feed into an I.F. strip—the well-known R1355, which has I.F.s tuned to 7.5 Mc/s, but it is possible to use it with other I.F. strips provided that the oscillator frequency is altered.

Another feature is its possible use on Band III, and the writer will be giving data for this when it is available, should it prove practicable.

Tuning-in the Vision Signal

One important point with this unit which some constructors seem to miss is that when tuning the unit for single sideband reception (i.e., all transmitters except London) special precautions must be taken.

When used with an I.F. strip the following procedure should be adopted to ensure accurate tuning.

First tune the dial for maximum vision, adjusting the trimmers above the chassis, fitted across the tuning condensers, for absolute maximum. The trimmer on the front panel should be adjusted for maximum response.

Now adjust the small oscillator trimmer so that the "volume" of the vision signal is reduced by half. This is a small postage stamp trimmer fitted under the chassis, directly underneath the oscillator section. It will be found to be very sensitive and requires careful adjustment.

The adjustment should be made by turning the trimmer towards the sound channel. If it is not clear in which direction this lies so far as the trimmer is concerned, then note the dial reading giving maximum vision and then turn the dial to reduce the vision a little by increasing the capacity. For example, supposing the vision comes in at dial reading 100, then turn the dial to 110.

At this point you may get the sound coming in. Note the position of the marker on the oscillator trimmer and adjust it so that sound is at maximum. This will show the direction in which the oscillator must be trimmed for optimum vision.

Now restore the trimming as it was originally for maximum vision and carry out the process given above.

The "volume" of the vision signal will be reduced by half and must be compensated for by operation of the contrast control. It will be noted that the picture quality is greatly improved.

When cores are being used in the coils for obtaining the requisite channel, then the cores should be set level with the tops of the coil forms and the separate ganging trimmers adjusted as given.

If brass cores are difficult to obtain then one turn can be taken from each tuning coil so as to get Channel 5.

It is also possible to avoid the use of cores for Channels 1 and 2 by adding one turn to each tuning coil.

The final adjustment for picture quality should be to adjust the small trimmer on the front panel.

Fitting a Wavetrap

One snag with the unit is that it is liable to let signals through at intermediate frequency. As the 7.5 Mc/s band is well occupied with high-powered transmitters, it is possible to get severe interference from this source.

To avoid break-through a simple wavetrap can be fitted directly in the aerial system.

Using a ⅜in. diameter coil former wind on 26 turns of about 34 s.w.g. enamelled wire, close-wound. Connect a 10 pF condenser across the ends and insert an iron-dust core. Break the wire from the aerial socket to the first coil and insert the rejector coil. The coil former can be mounted on the inside of the front panel. (Fig. 1.)

To trim it, connect an ordinary aerial to the aerial socket and adjust the coil for minimum sound. If this is done at night-time there are plenty of signals in the band which will break through.

It is possible to get sharper tuning if the 10 pF condenser is replaced by one at 0—30 pF.

Using a Pre-amplifier

The unit is extremely stable and a one-, two- or even three-valve pre-amplifier can be fitted. It has been the writer's experience that little is gained beyond a two-valve pre-amplifier.

When a pre-amplifier is fitted it will be found that there is no need for a wavetrap at intermediate frequency.

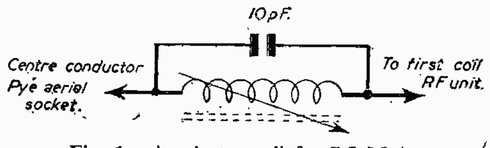


Fig. 1.—A rejector coil for 7.5 Mc/s.

Range of Unit

When used with the R1355 unit the RF26, with the aid of a two-valve pre-amplifier, can bring in the signals at what may be considered impossible ranges. I have received signals at over 180 miles which would provide a reasonable picture, and if the path of the signal is over water there is no reason why the range cannot be extended.

Of course, local conditions come into operation at these extreme distances and reception could not be guaranteed.

Here is a thought for those who live near the south coast. Why not try the transmissions from Paris using a really good directional aerial of high gain? If any reader has tried this the results would be interesting to hear.

Altering the I.F.

The intermediate frequency given by the unit can be altered by modifying the oscillator section.

Before we deal with the actual method, however, it would be as well to review the underlying principles as otherwise the phenomenon produced may be confusing to the novice, especially when trying to use the unit for producing sound and vision simultaneously.

The intermediate frequency is produced by beating a locally generated frequency against the incoming frequency. The R.F. valve picks up and amplifies the incoming signal at its transmitted frequency. The local oscillator generates a separate frequency and the two are introduced to the mixer valve, which by a process of detection (it is known as the first detector) produces the signal at a frequency which is the difference between the two.

The setting of the oscillator frequency can provide two intermediate frequencies. Further, two separate oscillator frequencies can produce a single intermediate frequency.

Let us choose some easy figures for the purpose of comparison.

Supposing the signal is coming in at 50 Mc/s and our oscillator is working at 40 Mc/s; then we shall have two intermediate frequencies from which to choose. The first is the oscillator frequency plus the signal frequency (40+50=90 Mc/s) and the second is the difference between the oscillator frequency and the signal frequency (50−40=10 Mc/s). Thus we have two possible frequencies available at the output of the mixer, and we choose which one we desire simply by arranging a tuned circuit at the output of the oscillator to resonate to the desired frequency.

Supposing that we decide to have an I.F. of 10 Mc/s, then we can see that our oscillator can be tuned to 40 Mc/s as 50−40=10. But note that the signal frequency is 50 Mc/s and we could use an oscillator at 60 Mc/s as 60−50 also=10.

Generally, it is desirable to have the oscillator frequency above the signal frequency, but the production of harmonics and possible interference decides the final arrangement.

So far so good. The snag arises when we are tuning an oscillator if we are not quite certain of its actual frequency and we wish to produce sound and vision.

In order to study the problem let us use some simple arithmetic.

Channel 1 transmits vision on 45 Mc/s and sound on 41.5 Mc/s. Supposing we are receiving these signals and have arranged for the vision intermediate frequency to be 13 Mc/s; then we could use a frequency of 45−13=32 Mc/s for our oscillator as 45−32=13.

Now, if the oscillator is working at 32 Mc/s, then the sound signal coming in at 41.5 Mc/s will be converted to a frequency of 41.5−32=9.5 Mc/s.

Again so far so good. Our vision is at 13 Mc/s and sound 9.5 Mc/s which is quite common in commercial practice. Supposing we are dealing with an oscillator whose exact frequency is not known and that it will oscillate not only at 32 Mc/s but also at 58 Mc/s and all points in between. One setting of the oscillator will produce 13 Mc/s when the oscillator is working at 32 Mc/s, and the same signal will be produced at another setting of the oscillator when it is working at 58 Mc/s. We shall thus receive the vision signal at two settings of the oscillator.

It does not matter which setting is used for the vision, but if we are receiving sound as well at 9.5 Mc/s we shall not receive sound at the second setting of the oscillator. This is because the oscillator working at 58 Mc/s will produce the sound signal at 58−41.5=16.5 Mc/s, which is a long way from our intermediate frequency of 9.5 Mc/s.

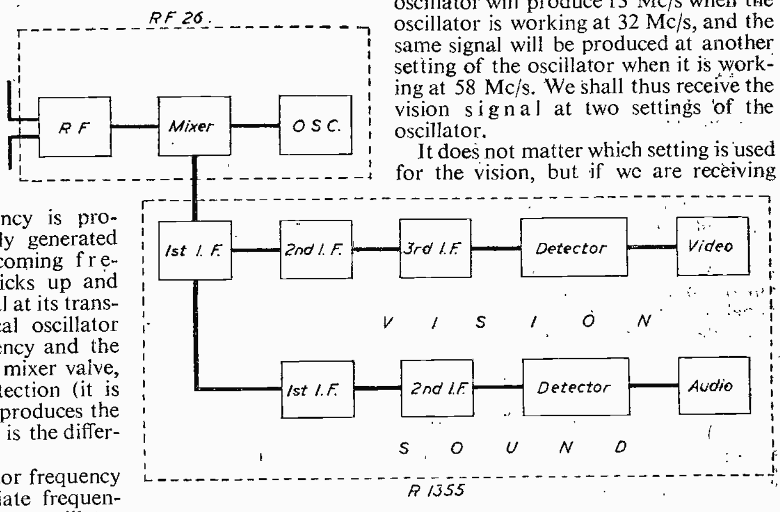


Fig. 2.—Block schematic of the R1355.

The principle holds good for the sound, and it is possible for the corresponding conditions to arise: (a) First position of oscillator sound but no vision; (b) Second position of oscillator sound and vision; (c) Third position of oscillator vision no sound. All this without touching the I.F. coils!

The golden rule when altering the oscillator frequency and endeavouring to receive sound and vision is to tune in the vision first and adjust the oscillator to see if the sound is nearby. If this is not the case find the second position of the oscillator and try again.

Sound and Vision on R1355

The I.F. strip of the R1355 contains five stages. It is an easy matter to divide these stages, using two for sound and three for vision in areas of average

AN RF24 SOUND UNIT

USING AN EX-GOVERNMENT UNIT FOR A SOUND ONLY RECEIVER

By J. Stebbings

MUCH has been written in the past on the conversion of the R.F. units of the 1355 receiver, and the subject was clearly summarised by B. L. Morley in the February issue. Almost all conversion instructions presuppose that the R.F. units will be used as a superheterodyne either with a 1355 or other I.F. unit working at 7 Mc/s.

The R.F.24 and R.F.25 units can, however, be quite simply converted into straight sound units in far less time than it would take to make up a receiver from a design. There have been a number of straight television receivers described in the past and these usually employ an R.F. stage common to both sound and vision. The sound is taken off by a pick-up loop on the anode coil of the first valve and the sound section consists of two R.F. stages followed by detector and output stages. The R.F.24 may be converted into such a complete sound section with comparatively little alteration. The shallow chassis and the neat and accessible wiring of these units make the conversion particularly easy.

The following instructions relate to the R.F.24, but readers will have little difficulty in applying them to the R.F.25, which differs only in minor details.

Fig. 1 shows the original circuit using three SP61 (VR65) valves. The first is a radio-frequency amplifier, the second a frequency changer, and the third is the local oscillator. It is convenient for the conversion that the three valves are the same type. Fig. 2 shows the final circuit in which V1 remains an R.F. stage with only minor alterations. V2 is converted into a second R.F. stage again with few circuit changes. The oscillator stage, however, is completely scrapped and in its place is wired a germanium detector and the output valve V3.

The output stage V3 uses the original SP61 valve, and some readers may be surprised at this. However, provided a high-ratio output transformer is employed, sufficient volume with reasonable quality can be obtained, particularly if a 15-ohm loudspeaker is used. This arrangement is satisfactory with VCR97 and other small-screen receivers. The writer uses this sound section, in place of the one specified, in his Argus receiver. If greater sound output is desired, then a normal short grid-base L.F. pentode could be substituted after suitable adjustment of the bias resistor.

The First Stage

The first stage of the conversion is to remove from the top of the chassis the five-way switch, and all coils and trimmers. Having cleared the top of all wiring, remove the steel end panels and the longitudinal screen. This will leave only an H-shaped screen across the middle of the chassis. The coil formers, valve top-cap connectors, and three of the 30 pF trimmers should be saved for re-use.

The next stage is to re-wind the coils, leaving plenty of spare wire at the ends. The original unit was used on channel 2 with coils having the number of turns shown below. Figures are given, however, for other channels, and these should be used as a guide in arriving at the required inductance. The ceramic former is used for L1 and the two ebonite formers for L2 and L3.

L1 and T1 are mounted vertically close to V1. It will be found impossible to drill a hole in the required position for fixing L1, so it should be mounted on a piece of strip steel which is secured at a convenient bolt hole. L2 and T2 are mounted horizontally on the centre part of the H-screen on the opposite side to the valve. L3 and T3 are mounted vertically next to V3, but before doing this it will be necessary to remove the tag strip underneath. This strip will not be required in any case.

That completes the mechanical work on top of the chassis. Unwanted components should now be removed from the three compartments underneath. In the middle V2 compartment remove the coil in the anode circuit, C4, and the screened output lead. In V3 compartment remove all components except the heater by-pass capacitor.

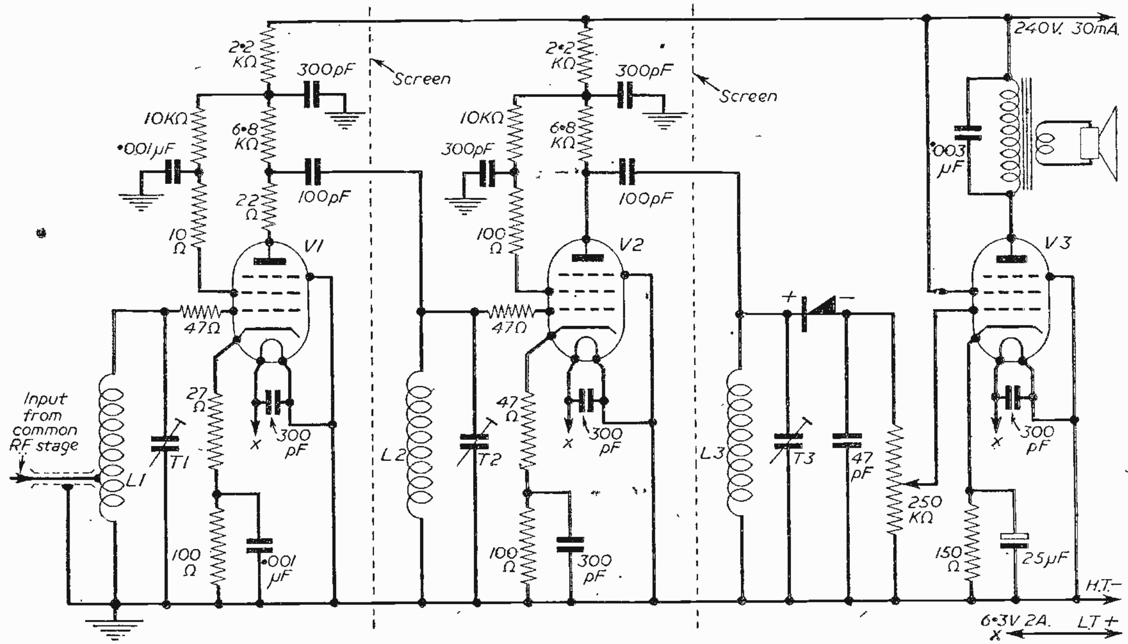


Fig. 2.—The sound unit modification.

Re-wiring

Re-wiring may now be started with V1 stage. L1, T1, and the valve-top connector are all dealt with above the chassis and, below, the anode load resistor R3 should be changed to 6,800 ohms. L2 and T2 may now be wired connecting up with C3 below the chassis. The bias resistor (R11) of V2 should be changed to 100 ohms, a 10,000-ohm resistor connected in parallel with the screen feed R7, and a 6,800-ohm resistor wired as a new anode load. A 100 pF capacitor should be connected to the anode of V2 and a lead taken into the third compartment. L3 and T3 are wired above the chassis and a lead through to the underside will be necessary. It remains only to complete the detector and output wiring in the third compartment as shown in Fig. 2. In the original model the volume-control was mounted externally and connected by two screen leads. The loudspeaker was likewise external, and the primary of the output transformer was connected with twisted flex.

The power required is 240 v. at 30 mA and 6.3 v. at 2A. when the SP61 output valve is employed.

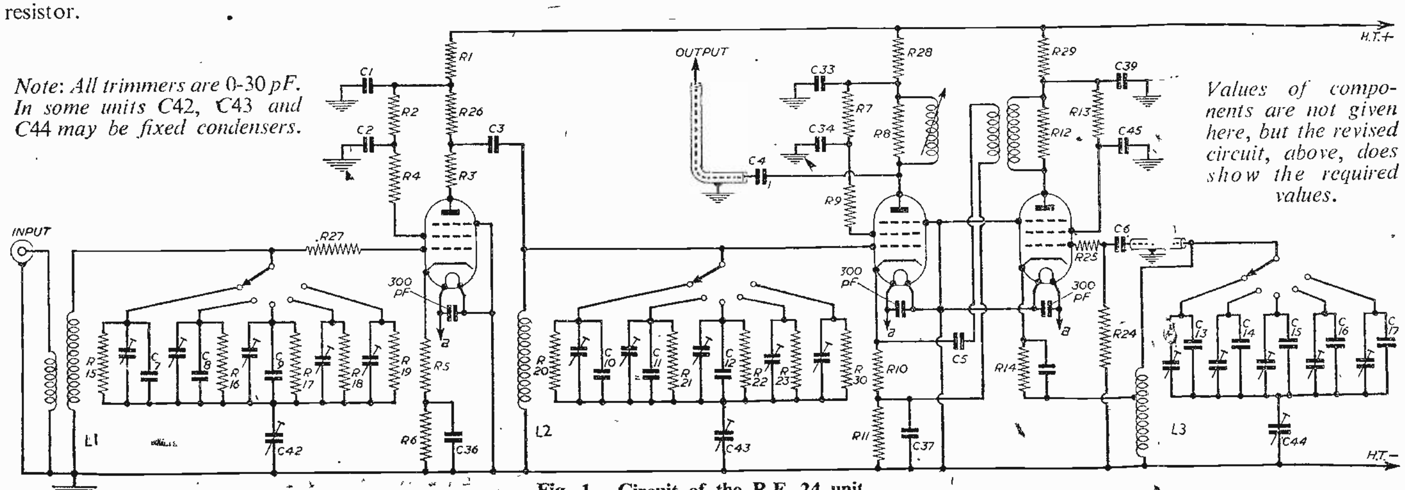
Results

The original is giving excellent results in an Argus receiver fed from a dipole at 25 miles from Holme Moss.

COIL TURNS

Channel	L1	L1 tap	L2	L3
1	4½	1	4½	5½
2	4	1	4	5
3	3½	1	3½	4
4	3	¾	3	3½
5	3	¾	3	3

Note: All trimmers are 0-30 pF. In some units C42, C43 and C44 may be fixed condensers.



Values of components are not given here, but the revised circuit, above, does show the required values.

Fig. 1.—Circuit of the R.F. 24 unit.

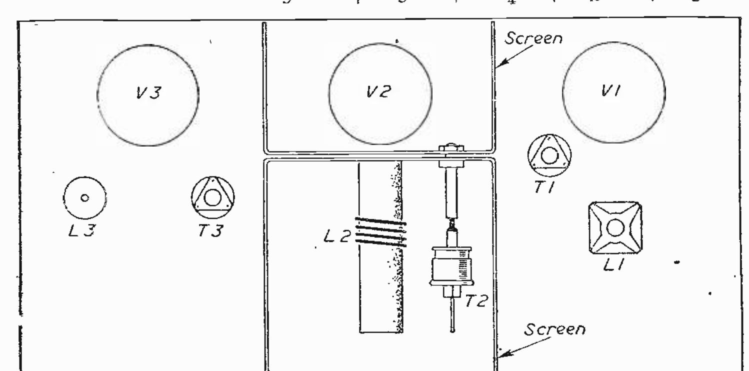


Fig. 3.—Layout showing coil positions.

The Miller Timebase

BASIC THEORY AND PRACTICAL OPERATION

By "Engineer"

THE Miller Timebase is, perhaps, the type which is most widely used in home-constructed receivers—particularly those employing electrostatic tubes. There is no doubt that it is capable of a fine performance with practically perfect linearity and these features, coupled with its simplicity and cheapness, have given it a deserved popularity.

Unfortunately not all constructors are getting the best out of this class of circuit and this is probably due to a lack of a full understanding of the basic principles, and of the effects of varying the values of the components, not only in the timebase itself, but also in the associated coupling networks. It is possible, for example, to have a Miller timebase which is itself performing perfectly yet which is producing a non-linear scan by reason of faulty choice of coupling components.

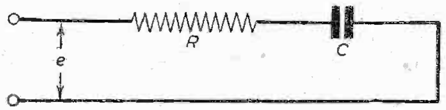


Fig. 1.—A charging condenser.

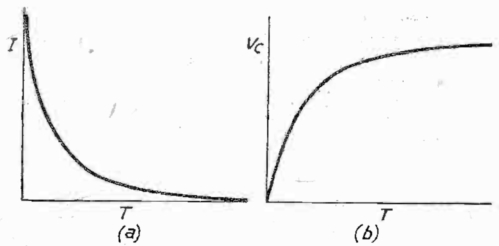


Fig. 2.—Current and voltage curves.

Time Constants

Most television timebases rely for their operation upon a condenser which is charging or discharging via a resistance. The object of the valve in the circuit in most cases is merely to trigger the circuit so that it operates at the correct time.

When a condenser is connected in series with a resistor across a voltage source, then the condenser will commence to charge up (Fig. 1). It will be appreciated that when the circuit is first connected, the full voltage "e" from the supply is directly across the condenser and a heavy current will flow from the supply to charge up the condenser.

However, as soon as the current starts to flow through the resistance "R" it will cause a potential difference across the resistance, the value of the P.D. depending upon the value of the resistance. The resistance therefore acts as a sort of limiter to the current, and instead of a sudden surge of current flowing to charge up the condenser, the current will flow in a more or less steady manner.

At the commencement of the charging period the current will be fairly heavy, but as the condenser becomes charged the voltage across it becomes higher, and gradually becomes more equal to the voltage of the supply. The current flow will gradually tail off; the voltage drop across R decreases, the voltage across C becomes more nearly that of the supply, the current reduces and thereby reduces the voltage drop across R, and so on.

If the current through the resistance is plotted against time, it will be found to appear something like that shown in Fig. 2a. Similarly, the voltage built up across C will be as given in the curve in Fig. 2b.

In each case it will be seen that the curve has an almost straight portion and then dwindles off into a very shallow bend in a non-linear fashion.

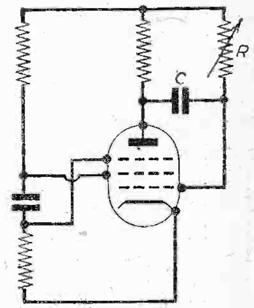


Fig. 3.—The basic Miller circuit.

This type of curve is called an exponential curve.

Consider Fig. 2b. It will be noted that after the initial drive the curvature becomes less and less, the condenser voltage rising more and more slowly. In fact, it would take an infinite time for the condenser to become exactly the same as the potential of the supply. Most of the work of charging is done within the first few microseconds.

For practical purposes the circuit loses its usefulness when the voltage across the condenser reaches 0.632 of that of the supply.

The actual time taken for this to occur is termed the *Time Constant* of the network. Its value is given in seconds when the capacity of the condenser in Farads is multiplied by the resistance in ohms (this is also when microfarads are multiplied by megohms).

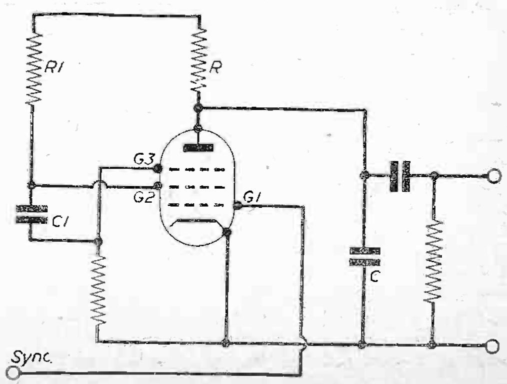


Fig. 4.—The basic transitron circuit.

signal strength. It is not proposed to give the details here as that has been given elsewhere, but what we are concerned with is the tuning.

Two methods can be employed. First, the vision can be arranged to be at 7.5 Mc/s and the sound at 11 Mc/s, or the vision at 11 Mc/s and the sound at 7.5 Mc/s, according to whether the oscillator frequency is above or below the signal frequency.

(Proof is: Oscillator at 52.5 Mc/s produces vision at 52.5−45=7.5. Sound at 52.5−41.5=11, or oscillator at 34 Mc/s gives vision at 45−34=11 and sound at 41.5−34=7.5.)

Whichever is used is mostly one of personal choice. All that is required to alter the existing 7.5 coils to 11 Mc/s is to insert brass cores in place of the iron-dust cores.

Tuning

Whichever is chosen, the difficulty remains of arriving at the correct oscillator frequency, as it is possible to make the oscillator tune to both 52.5 and 34 Mc/s.

Supposing vision is chosen to be 7.5 Mc/s and sound at 11 Mc/s, then the tuning should proceed in the following manner.

Tune in the RF26 for maximum vision "volume" and adjust all the ganging trimmers for maximum. Now adjust the small oscillator trimmer underneath the oscillator section until the vision strength is reduced by half. Note the dial readings and also the position of the oscillator. Tune in the sound on the dial. It doesn't matter what the dial position is, but make a note of it and go back to the vision. Once again off-tune the dial from the vision towards the channel used for sound (about 10 degrees) and turn the oscillator until sound is heard in the sound section.

This should be somewhere near the optimum oscillator position for the vision. All that is necessary now is to turn the trimmer towards the optimum vision position retuning the sound I.F. stages as the trimmer is altered until eventually maximum sound is obtained with the oscillator set at optimum vision position and the vision is received as well.

A slight adjustment of the tuning dial may be necessary, and the trimmer on the front panel should be set at maximum quality of picture.

Where the optimum oscillator position and maximum sound oscillator position do not come fairly close (as given in the paragraph before the last), then it is possible that the oscillator is working at the incorrect frequency and a second position where vision can be received should be found.

I.F.s Other Than 7.5 Mc/s

A popular I.F. for vision is 13 Mc/s with 9.5 for sound, and it should be possible to tune this in simply by altering the oscillator trimmer or adding an iron-dust core.

The unit should be trimmed, adopting the method given in the previous paragraph.

There are quite a few I.F. strips which operate at 12 Mc/s, and the RF26 can be used with these by modifying as for a 13 Mc/s strip.

It seems that with the advent of Band III an intermediate frequency in the region of 35 Mc/s will be used and to cater for this the oscillator can be tuned to 80 Mc/s.

To do this take one turn from the oscillator coil and, if this is found insufficient, then a brass core can be added, though this was not found necessary in the prototype.

At an oscillator frequency of 80 Mc/s the vision is 35 Mc/s and the sound is 38.8 Mc/s.

Band III Test Transmissions

THE call sign allocated to the Band III experimental transmitter operated by "Belling-Lee" at Beulah Hill is G9AED. Through the helpful co-operation of the Independent Television Authority the transmitter and mast is located on the same piece of ground as their temporary mast and transmitter.

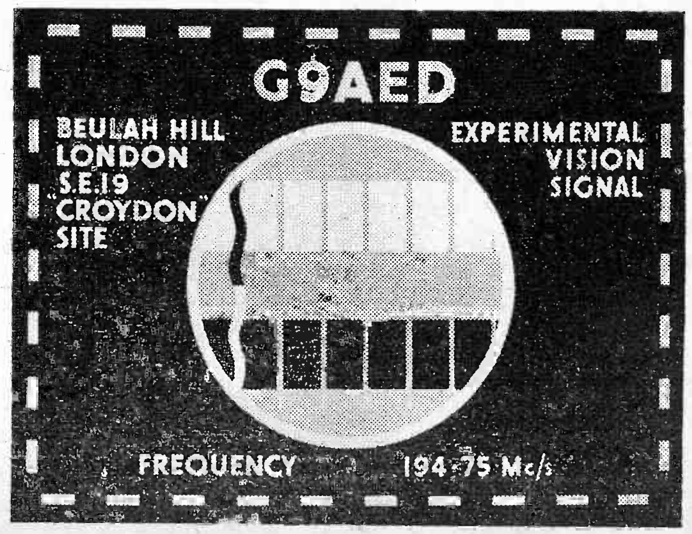
The test card is primarily intended for the investigation of ghost images and provides the following features.

(a) A wavy line in black and white, followed by white, grey and black. This line is wavy to differentiate from the vertical range marks. With ghost signals the wavy line predominates, and positive or negative ghosts can be identified.

(b) Vertical lines numbered 1, 2, 3 and 4 indicating the additional path in miles that the ghost has travelled, i.e., if the reflecting object is situated directly behind the receiving aerial, in line with the transmitter, the distance of the reflecting object is exactly half the extra distance travelled by the delayed image.

(c) A circle to enable approximate linearity adjustments to be made to the receiver.

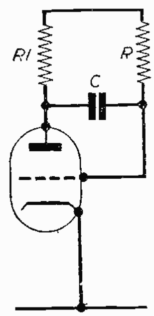
(d) The black and white border to the card corresponds to the similar design on test card C and indicates the edge of the picture.



The Band III Test Card.

In TV work we are more concerned with very short periods of time of the order of millionths of a second (microseconds), and to simplify calculations we find the time constant in microseconds by multiplying capacity in picofarads (pF) by resistance in megohms.

The same sort of process takes place when a condenser is discharged through a resistance; there is, at first, a rapid fall in voltage which then gradually fades out more and more slowly.



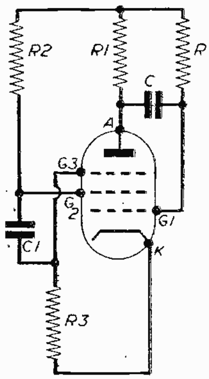


Fig. 5 (left).—The basic Miller integrator circuit. Fig. 6 (right).—The Miller integrator and transition circuit.

Some television timebases use a charging condenser while others (like the Miller) use a discharging condenser. In the first case a condenser is steadily charged to a certain point and then rapidly discharged, while in the second case the fully charged condenser is discharged to a certain point and then rapidly recharged. The result is the production of the well-known saw-tooth waveform necessary in the scanning process.

The Miller Circuit

Fig. 3 shows the basic Miller circuit and the condenser C with its resistance R is used in a discharging circuit brought about by operation of the valve.

The Miller circuit is actually a combination of two circuits—the transitron and the integrator. Its full title is the Miller Integrator and Transitron Circuit.

In Fig. 4 will be found the basic transitron circuit; its operation follows.

Assume that C is charged and the suppressor grid G3 is sufficiently negative to cut off the anode current: the screened grid G2 is drawing full current and is, therefore, at its most negative.

When a positive sync pulse is applied to the grid anode current will commence to flow and the anode will draw current away from G2. G2 will, therefore, start to move in the positive direction, and the positive movement is communicated to G3 via C1, and still more anode current flows. The increased current causes an increase in the voltage drop across R and the anode will move in a negative direction; C will therfore commence to discharge.

A point is soon reached where the anode potential is too low to maintain anode current, and the current from the cathode will therefore start to move more and more to the screen. There will, therefore, be an increasing voltage drop across R1 and the screen will move in the negative direction. The negative movement is communicated to the suppressor which therefore cuts off more anode current. The effect is cumulative and anode current is rapidly cut off. Lack of anode current via R causes the potential drop across this resistor to decrease and hence C will charge from the increasing positive potential appearing at the anode. C is therefore rapidly charged up and the process recommenced.

The grid of the valve is used only for the application of the sync pulse.

The output of the circuit is not strictly linear and can be vastly improved by inclusion of the Miller integrator.

The Miller Integrator

The basic circuit is shown in Fig. 5. Assume that C is fully charged and the valve is drawing current. Because of the voltage drop across R1 the anode is negative with respect to HT+. This negative voltage is communicated to the grid via C.

C discharges via R1 and R and, hence, as its voltage falls the grid becomes less negative and the anode draws more current. The falling voltage across C1 is almost equalled by the steadily increasing potential difference across R1. The change of voltage at the anode is much greater than that across the grid due to the voltage magnification of the valve. In fact the voltage change at the anode is the integral of the change of grid voltage and the miller effect between grid and anode gives rise to the term miller integrator for this class of circuit.

The interaction between anode and grid means that the discharge of C is very linear.

The Complete Circuit

The complete circuit is shown in Fig. 6.

Starting with C fully charged, G3 is at zero potential and G2 at its most positive. R1 and R2 are about the same value but the voltage drop across R1 is greater than that across R2 as the anode current is greater than the screen current.

C commences to discharge and the voltage across it

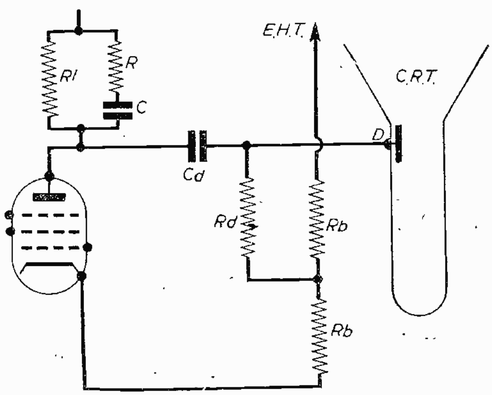


Fig. 7.—The coupling circuit.

will fall until a point is reached where the anode voltage is too low to hold the main stream of electrons from the cathode. They are therefore diverted to the screen and the consequent increase of current through R2 causes G2 to move in the negative direction; the negative movement is communicated to the suppressor grid G3 via C1 which reduces the current flow to the anode still further and the anode is rapidly cut off. At this point C is almost fully discharged.

As no current is being drawn via R1 the potential at the anode will rise and the rise in the positive direction is communicated to the grid. Another way of looking at it is that as the anode moves more positive, the negative on the grid communicated via the condenser is reduced and the grid becomes very positive (it is connected to the positive line via R). The result is that C is very rapidly charged up and the current is thereby drawn from the cathode and diverted away from the screen; G2 will therefore move in the positive direction and the movement communicated to G2 via C1 returns G3 to zero.

When C is fully charged the grid becomes negative, anode current commences to flow, and the process is repeated.

There are two important points to note. First, although the grid is returned to H.T. positive, grid current does not flow continually because of the charge on C. If C were removed the grid would draw a heavy current. The second point is that the discharge of C takes place via R and R1. The time taken for the discharge to take place depends upon the value of the condenser C and the value of R and R1 which form the discharge path. R is usually made variable so that the timing of the circuit can be accurately adjusted.

The synchronising pulses are usually applied to the suppressor grid so that the anode is cut off and the charging of C initiated. C is charged, of course, during the flyback period.

The negative charge accumulated on the suppressor grid via C1 must be rapidly extinguished during the flyback period or the flyback will be delayed. The charge on C1 leaks away via R2 and R3; the amount of the charge will depend upon the capacity of the condenser, and the discharge period will depend upon the total capacity of C1 plus the resistance of the discharge path.

The run-down of C takes place in an extremely linear manner due to the inherent properties of the circuit. The majority of the causes for non-linearity lie in the associated coupling networks; in this particular circuit about the only real causes of non-linearity are a faulty valve, leaky condensers (a common cause in ex-Government equipment and particularly noticeable in the frame circuit), or bad choice of components in the screen circuit.

In order to obtain the very best out of the circuit R3 and R2 can be made variable. R will, of course, consist of a fixed resistor plus variable resistor to enable the range of the sweep to be varied, the fixed resistor limiting the range of the variation and thereby avoiding making the grid a direct connection to H.T.+.

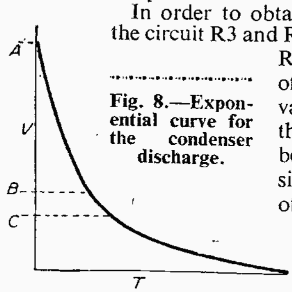


Fig. 8.—Exponential curve for the condenser discharge.

Causes of Non-linearity

The most likely cause of non-linearity is in the coupling network, provided the values of the Miller circuit itself are as specified.

A typical example of the coupling network is shown in Fig. 7. The output from the oscillator is taken via Cd to the deflector plate "D." The latter is biased from the E.H.T. network and the associated resistor arrangement is shown as Rd (the decoupler) and Rb the bleeder.

It will be seen that Cd plus Rd, Rb form a condenser and resistance network and will, therefore, have a certain time-constant. The time-constant of this section must be rather larger than that of the valve circuit. If the condenser Cd is too small, for example, then the resultant waveform at the deflector plate will be distorted.

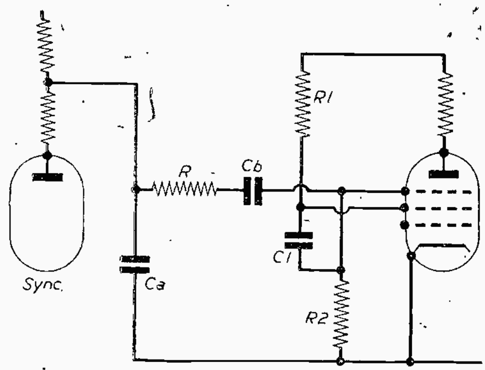


Fig. 9.—The sync coupling circuit.

In Fig. 8 we show the exponential curve for the condenser discharge. It will be observed that from A to B the discharge is linear, but from B to C the discharge becomes non-linear the degree of non-linearity rapidly increasing.

Supposing C in Fig. 7 is too small, then the condenser will barely hold the charge, and the discharging of it will take place right through to the curved portion. On one side we could have a linear waveform but on the other the waveform would be non-linear.

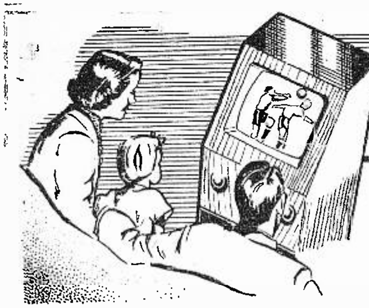
For optimum results the time constant of Cd, Rd, Rb should be 50 times that of the duration of the saw-tooth. This figure is generally the case in line circuits but often is not attained in the frame circuit. For the frame typical values are 0.5μF and 2 MΩ.

Another possible cause of non-linearity closely associated with the above is the method of feeding the output of the oscillator into a low-impedance circuit. Ideally, the output should be fed into a circuit of infinite impedance. If the circuit is of low impedance, a load will be placed upon the oscillator which will materially affect the linearity of the scan. When the oscillator output is fed directly to the C.R.T. network, high-impedance circuits are usually attained, but when fed into an amplifier it is possible, by error, to have the input circuit at a rather lower impedance than is desirable.

A point which is quite often overlooked is the imput from the sync separator. The usual method is to integrate the pulses in a standard integrating network, and to inject the integrated wave-form into the suppressor circuit. The circuit must be carefully designed or the R2, R3, C1 characteristics may be modified, with consequent non-linearity.

When investigating the cause of non-linearity the coupling circuit from the sync must not be forgotten. Fig. 9 shows a typical coupling network for a frame oscillator, R, Ca and Cb forming part of the differentiator. It will be seen that these components are practically in parallel with R2, which is in the flyback circuit. Incorrect values, leaky condensers or high value resistances will obviously modify the operation of the oscillator.

(To be continued.)



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

PUBLIC DEMAND

NEWSPAPER critics are not easy to please, whether they specialise in plays, films, books or television, and the growing importance of television can be measured by the steady increase of space allocated to TV critics.

Some newspapers now devote even more columns to television critiques, news and gossip than they do for films; in fact, a Sunday newspaper recently gave 28in. of space to TV matters and only 10in. to films. This indicates current public demand. There is, of course, the support of the publicity world which must also be taken into account—large amounts of advertising space are taken in newspapers by radio, television and film products. However, this commercial consideration in no way affects the opinions of the professional critics concerned. It merely ensures that there is adequate space for their writings.

BLASÉ CRITICS

IT is only natural that the TV critics tend to become a trifle blasé. They, like their colleagues in the other fields of entertainment and art, are apt to become a little satiated with their own particular medium. It must be somewhat discouraging for the hard-worked BBC producers to read a succession of "panning" notices about their efforts—but, all the same, they do read them avidly and with benefit. I have noted lately that the critics are realising more fully the magnitude of the task of the BBC play-producers whose greatest handicap is the shortage of suitable material and the time to put it into the best possible shape.

SCRIPT PREPARATION

CONSIDER what happens before a stage play or a film is put into production. The subject is selected from large numbers of so-called original scripts, from books that have already been published or seen in an alternative medium. Quite a few good films and plays have been adapted from material first seen on TV, "Ten Minute Alibi" being an excellent example. Public appeal, suitability of the material for contract stars, topicality, breadth (or lack of breadth) of background, all influence the decision of the producer as to whether he should venture to the next step—the preparation of a treatment or master-scene script which sets out the main highlights of the story and characterisation in the manner required. For a stage play, the story must fall naturally into the theatrical convention of time and place which limits the number of sets, for obvious reasons. For a film, the canvas is much broader and the emphasis is on various settings, including exteriors, together with plenty of movement rather than on dialogue. A television play comes somewhere in between these two extremes.

From the first "treatment" or master scene scenario, there is progress through various draft scripts until the stage or shooting script has been finalised. This takes time. Amendments are made for various reasons, principally to mould the characters in the story to fit specific actors or actresses. Then, at last, the preparations of set design, wardrobe, special effects, music and casting are put in hand. This complex procedure sometimes takes weeks or months in the case of plays and films but has to be compressed into the shortest possible time for TV plays. All the time the preparations are going on, the production cost is mounting and the BBC is strictly limited in its budgets. The theatrical repertory companies' ideal of a single stage setting and five or six characters would be convenient and inexpensive but would be very dreary as a staple diet on TV. Altogether, considering these factors, I think that the boys at Lime Grove are doing a first-class job. Their chief difficulty lies in the availability of suitable material in large enough quantities.

"FANTASTIC SUMMER"

HAVING thus praised the backroom drama boys of Lime Grove as a whole, I will now refer to one of them, Barry Learoyd, in particular.

Mr. Learoyd has given us many smooth and gripping TV plays in his capacity of producer, but for "Fantastic Summer" he was also the TV playwright, founding his script upon the novel of that name by Dorothy Macardle. It was the story of a widow who had strange glimpses of the future and, forewarned of disaster, tried to prevent the betrothal of her daughter to a man she imagines will be her daughter's murderer. Fay Compton gave a beautifully sensitive performance and made the most of dialogue and material which was very ordinary indeed. Nan Wilde was attractive and convincing in the equally gloomy part of the daughter, while that fine old actor, Ian Fleming, brought a little brightness and authority to the play as Dr. Franks, the psychiatrist.

Maybe I am prejudiced against plays which feature psychiatrists, but their professional jargon which figures in so many modern plays has now become cliché. It seems to me that very brilliant dialogue is now required to put this kind of story over and Mr. Learoyd is less good as a dialogue writer than he is as producer.

THE COMEDIANS

IT is the comedians who have been registering the best with viewers lately. "Before Your Very Eyes" has become very popular with the masses and once more demonstrates the complete mastery that fine little comedian Arthur Askey has over the technique of television. The dumb blonde of the show, Sabrina, was an attractive gimmick and stooge, in spite of her extraordinary Robey-ish eyebrow make-up, and the sketches were amusing and well-written. Another comedian who has scored with viewers is Jimmy James, and the Benny Hill shows—a little uneven at first—have become some of the slickest and most hilarious productions on the air. Peter Ustinov and Peter Jones, whose specialised type of humour has scored heavily with some, but not all, sections of the sound radio listeners, make a much broader appeal on TV.

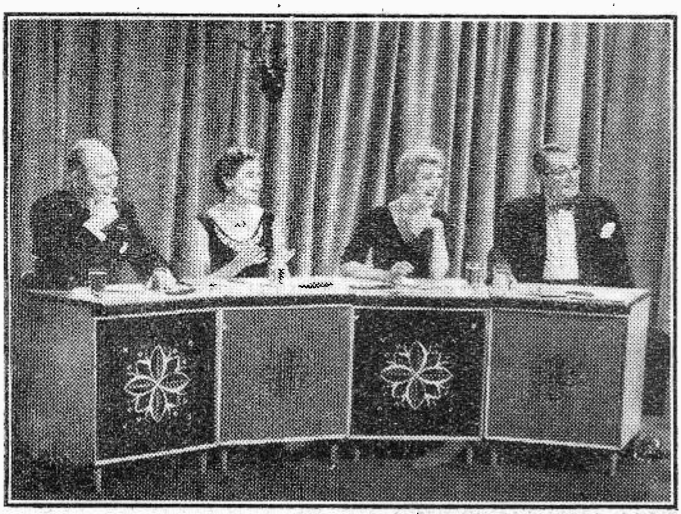
BRITISH KINEMATOGRAPH SOCIETY'S RECOMMENDATIONS

THE B.K.S. has once more been doing good work in the television field, especially since the special Television Division has been established under the chairmanship of Mr. L. C. Jesty.

A special Television Standards Committee has been considering recommendations for producers making films for television, with particular references to standards for the use of magnetic sound and the density and contrast factor of prints of the picture side: 35 mm. film is still favoured on this side of the Atlantic. In the U.S.A. 16 mm. film is widely used, but not exclusively. A lecture on making films for television was given by Harold Huth, producer at the Douglas Fairbanks Studio at Elstree, where upwards of two hundred features for American TV have been made. Apart from explaining various technical problems, Mr. Huth outlined the many restrictions on types of material acceptable to the American viewer which also conformed to the code laid down by the authorities. Unlike the British viewers, the Americans, especially those living in the mid-West, were allergic to dialects and strong accents, especially to Cockney, "Kensington" or "Oxford" English and to certain Scottish accents. Strangely enough, Lancashire, Yorkshire, Irish or Somerset accents, if moderate, were accepted. The English drawing-room type comedy did not appeal at all, but stories set in familiar London tourist spots, such as Trafalgar Square, the Tower of London or Limehouse, and those about Scotland Yard, scored heavily. As for characters—the London "Bobby" is extremely popular via TV in all parts of the States.

"WHAT'S MY LINE?"

"WHAT'S MY LINE?" has had a long run, but the fact that it is being "rested" for a few months before its reappearance in commercial TV, will not be regretted. "Find The Link" is an entertaining parlour game which has now settled into fine shape, though it suffered a severe loss in the death of the brilliant young chairman, Peter Martyn. That veteran young man of TV interviewers, Leslie Mitchell, has taken over the chair with great tact and skill, and it bids fair to eclipse the success of "What's My Line?"



Viewers recently said goodbye to "What's My Line?" for a while. The show is planned to return when the commercial programmes begin. Left to right: David Nixon, Lady Barnett, Barbara Kelly and Gilbert Harding.

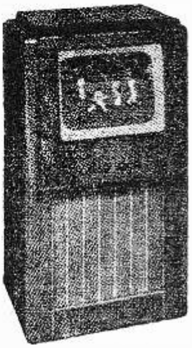
FOR BALLETOMANES

DANCING figures increasingly in BBC programmes. The standard of dancing has always been high, but it is not easy to put over in an entertaining manner. The comedy shows now regularly feature ballet scenes as well as the tap and soft-shoe routines, and the dance arrangements are more akin to the choreography of American ballet as seen in American musical films. "Dancers of Tomorrow" was a charming feature about the training of young dancers at the Sadler's Wells School and the Spanish Ballet programme presented by Antonio and soloists from his Palace Theatre Company was excellent. In the latter case, the entire company were not seen on TV and only about eight were seen on the screen at the same time, and then only for the finale. This is a sensible way of putting ballet over on television. Massed lines of dancers are rather wasted, except when filling the ultra-wide screen of a CinemaScope picture. The Antonio presentation was extremely well done from the technical point of view, with novel camera angles and lively cutting from shot to shot which made the most of the gifted dancers.

CONJURORS

RALPH READER has a good reputation as a dance arranger and producer of musical shows, but I found him less good as a compere and comedian's stooge in "It's A Great Life." The highlight of this show was the smooth performance of David Berglas, whose conjuring on a "drink" theme was highly entertaining. A magician has to be good to get by the very close close-ups captured by TV cameras with long-focus lenses. Berglas did it all right—better than some of the magicians who competed in the programme visit to the Magic Circle. Of course, though the tricks are important, it is the patter that goes with them which sells the act.

A FEW REMAIN



This cabinet is offered below cost. It is suitable for a televisor using tube sizes varying from 12in. to 17in., its overall dimensions being 3ft. 5in. high, 1ft. 4in. deep, 1ft. 10in. wide. It is complete with plywood back and "Bowler Hat." Originally made for a very expensive televisor and really good quality. Unrepeatable. Offered at **£6.19.6** carriage, packing, etc., 12/6.

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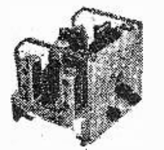

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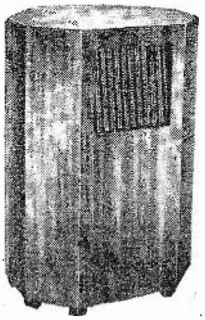

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The information fed into the ratio arms can be derived from the operator's own pet methods, or alternatively the data freely available in newspapers and popular magazines can be used. The circuit is quite an interesting one but it is not difficult to operate. When complete the unit is entirely self-contained and mains operated. The price of all components needed, excluding metal front plate and chassis, is **£3/10/-**. Our Publication "A New Approach" is provided free with orders, alternatively will be supplied separately at **2/6**, post free.

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Band 1	.15	to	.315 mc/s	i.e., 20 to 200 metres
Band 2	.315	to	.680 mc/s	
Band 3	.680	to	1.5 mc/s	
Band 4	1.8	to	3.7 mc/s	
Band 5	3.7	to	7.5 mc/s	
Band 6	7.5	to	15.0 mc/s	

The Sensitivity is 4 micro valves for full output. It uses 8 valves and operates from batteries (12 or 24 volt) or from the mains through a power pack. It has built-in output stage with a jack socket for Controls, all of which are brought to the front panel, include aerial switch comparative condenser, main tuning condenser, band selector, C.W. switch, power on/off switch, and volume control.
Very compactly built in crackle finished case, these sets are brand new, having never been used and guaranteed in perfect working order—special price this month is **£14/10/-** each, or 45/- deposit, balance by 12 monthly payments of **£1/3/6**, carriage and insurance 10/-. Order now to avoid disappointment. Circuit diagram and component data given free with sets, or available separately price **2/6**, post free.

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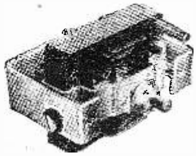

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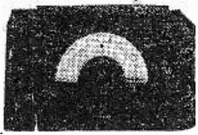

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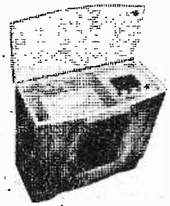

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Frame Flyback Suppression—2

SOME CIRCUITS FOR THE EXPERIMENTER

By "Erg"

(*Continued from page 488, April issue*)

A TYPICAL method of applying the principles in a practical way is shown in Fig. 4. This shows the scheme applied to the Electronic Engineering televisor which employs grid modulation of the tube.

V16 is the thyratron frame oscillator and provides an output which is positive-going on scan. The output of the frame output valve is therefore positive

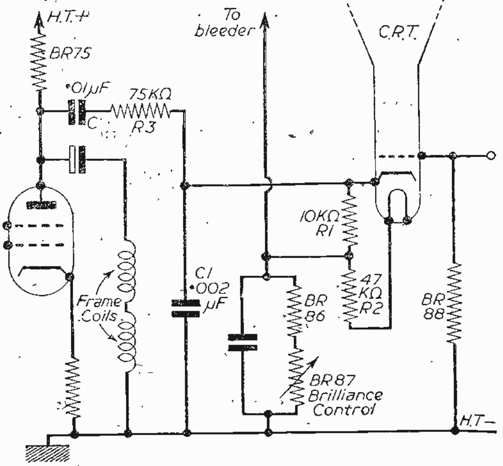

Fig. 4.—E.E. circuit modified. Here R1, R2, R3, C and C1 should be inserted.

on the flyback, and this can be applied directly to the cathode of the C.R.T.

The first step is to modify the existing cathode circuit by the insertion of the resistor R1 as shown in the diagram; the cathode is then connected to the anode of the output valve via the resistor R3 and the condenser C.

It should be noted that the performance of the circuit depends upon the time constants of the coupling components, and if difficulty with linearity is experienced, then some variation of the condenser C may be called for. This applies to all the circuits mentioned.

The Simplex Magnetic Televisor

Another example of a grid modulated televisor is the Simplex. The position here is further complicated by the fact that the input to the frame output valve is negative-going on scan, which means that the output has a negative flyback and obviously cannot be applied to the cathode circuit.

The problem can be overcome by tapping the pulse from the frame coils themselves, the correct polarity being obtained by earthing one or other side of the coil, the tap being taken from the other side. Fig. 5 shows the scheme.

The cathode circuit of the C.R.T. must be modified in the manner given previously.

The "Practical Television" Televisor

This televisor uses cathode modulation of the C.R.T. and the output of the frame amplifier is positive-going on scan. The flyback is therefore negative and a suggested circuit for flyback suppression applied to the grid of the tube is given in Fig. 6.

The Lynx

Like the previous model, this televisor also uses cathode modulation of the C.R.T. The flyback at the frame output valve is negative-going and a method of adapting the circuit is given in Fig. 7.

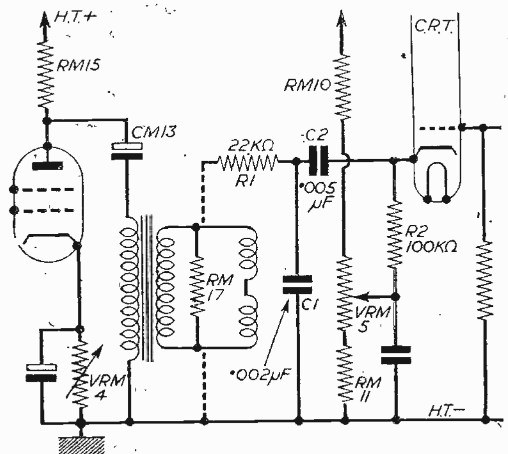

Fig. 5.—"Simplex" M circuit modified. R1, R2, C1 and C2 should be inserted.

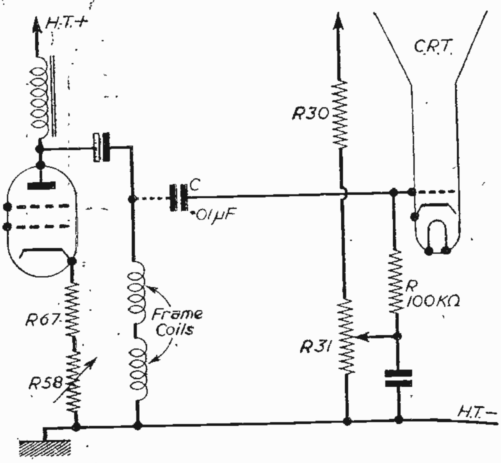

Fig. 6.—The "Practical Television" receiver modified. C and R are inserted in the existing circuit.

The Viewmaster

The Viewmaster is another circuit which uses cathode modulation. A suggested circuit for modifying the flyback is given in Fig. 8. In this case the flyback is obtained from the frame coils themselves ; one side of the coils must be connected to chassis and the other taken to the cathode of the C.R.T. If correct polarity for suppression is not obtained, simply change the earth and the 27K. connections round on the frame coil.

Other Models

It has not been possible to mention the variations required for all the television receivers designed for the home constructor in a short article of this nature, but the principles given should enable the constructor to adapt the designs to his own particular needs.

Miller Timebases

There are very many receivers built by the amateur which employ the Miller transitron and integrator type of timebase. It has not been favoured a great deal by the manufacturer because, in spite of its excellent properties in providing a linear scan, its output is the reverse to the usual timebase oscillator—i.e., it is negative-going on scan.

The modern type of timebase amplifier precludes the use of a negative input for the line circuit, not only because of the difficult biasing arrangements for the output valve, but also because of the extremely high voltages produced during the flyback. If the amplifier input is negative, then the flyback at the anode is negative, and when it is realised that a peak voltage in excess of 2,000 volts can be reached by the flyback it is plain to see that severe damage may be done to the output valve.

It is possible to employ the Miller circuit in a magnetic televisor, but steps must be taken to reverse the polarity of the output. This is not difficult and circuits employing this principle have been published in this journal.

The suppression of the flyback can be accomplished in this class of circuit quite easily, provided the fact that the output is negative-going on scan and positive-going on flyback is kept in mind. We have already dealt with one case of this kind—the Simplex

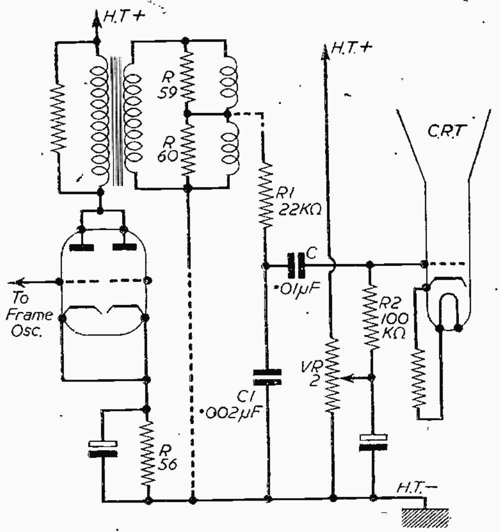

Fig. 7.—The "Lynx" modification. R1, R2, C and C1 should be inserted.

magnetic model which uses a Miller oscillator followed by a phase reversal stage before the line amplifier proper.

Simplex Electromagnetic Model

This televisor is a recent example of a circuit employing the Miller oscillator for the frame circuit, and the method of adapting it for suppression of flyback is quite simple. Fig. 9 shows the adapted circuit.

A resistance of 100 kΩ is inserted between the

(*Continued on page 567*)

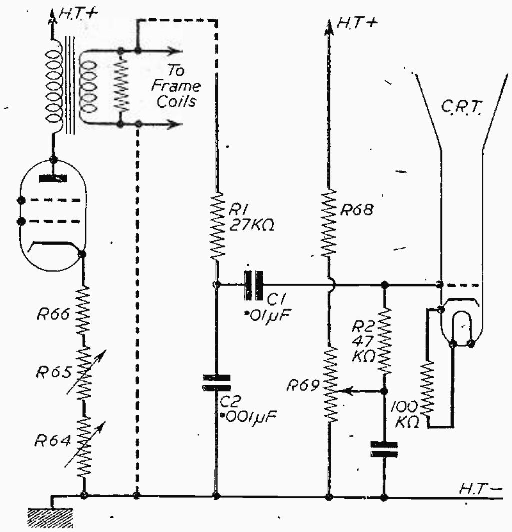

Fig. 8.—The "Viewmaster" modification. R1, R2, C1 and C2 should be inserted.

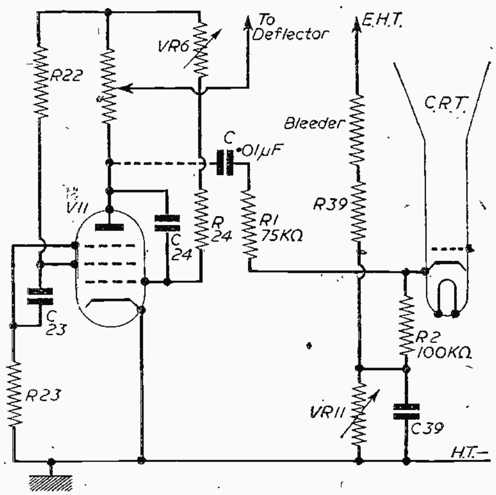

Fig. 9.—The "Simplex Electromagnetic" modification. C, R1 and R2 should be inserted.

cathode and the brilliance control network, and the cathode is fed from the frame oscillator anode.

The frame oscillator is negative-going on scan, and hence positive-going on flyback, and the positive pulse is applied to the cathode during the flyback period.

The condenser C can be adjusted in value so as to give efficient suppression without upsetting the linearity of the scan.

The Argus

This televisor, which has been built by many constructors, can also be adapted in a similar manner. The circuit is given in Fig. 10.

The Argus employs a negative E.H.T. system and, therefore, certain precautions must be employed. The cathode and grid of the C.R.T. are at E.H.T. potential so far as the chassis is concerned. The coupling condenser C must, therefore, be rated at full E.H.T. voltage—i.e., 2.5 kV.

Other than this the circuit is quite standard and it should be possible to apply it to other circuits equally successfully.

Adding a Refinement

The discerning constructor will doubtless by now have realised one snag in the simple arrangements described.

Let us consider for a moment the case of a cathode-modulated tube to which the suppression scheme has been added. The flyback pulse is applied to the cathode in a positive form as the normal content of the picture signal and, by the modification, we have applied it to the grid in negative form, so that the beam is thoroughly blanked out by the additive bias.

What has not been mentioned is that if the frame sawtooth waveform is applied to the grid of the tube it is positive on the forward scan. Therefore, the normal bias of the tube will be reduced on the forward scan, and as the picture is displayed during this period the picture will appear brighter.

So far so good; we seem to have gained something, as now, not only is the general brightness of our picture increased, but we have also reduced the possibility of the flyback lines appearing. In fact, this is not the case, nor is it desirable to make it so, as increasing the brightness generally does not increase the contrast, but tends to reduce it. While the original object was to increase the general brightness level we wish to have the amount of increase entirely under control.

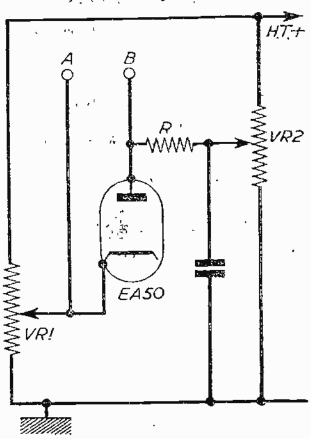

Fig. 11.—Basic diode gate circuit.

Further, if the whole of the frame oscillator waveform were applied to the grid or cathode circuit the components in that circuit would form part of the oscillator circuit, and the waveform applied to the deflector coils would be modified. In other words the scan is likely to become non-linear.

For this reason the components of the circuit have been chosen so that the time constants are correct for the flyback, but rather inadequate for the forward scan, so that the scan does not have a great deal of effect.

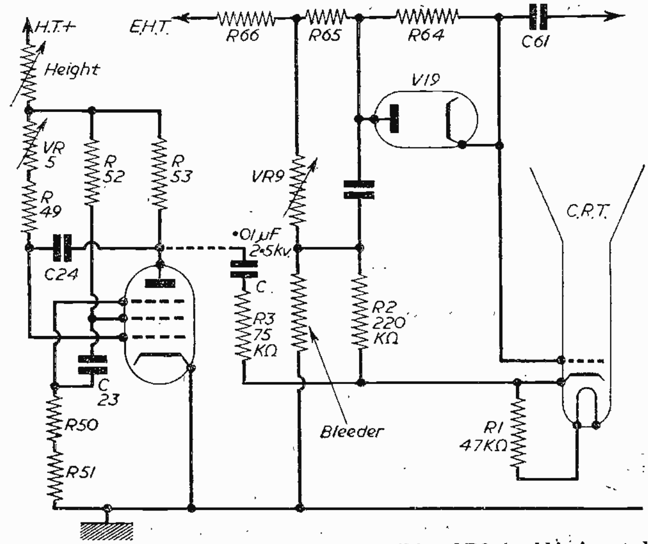

Fig. 10.—The "Argus" modification. C, R1, R2 and R3 should be inserted.

Although the circuits we have given are quite practicable, they can be improved by the use of a diode gate which will allow the flyback pulse to pass through to the C.R.T., but would prevent the forward scan affecting the tube brightness.

A Diode Gate

In Fig. 11 is shown a typical diode gate type of circuit. The diode is fed from potentiometer networks with H.T. at both anode and cathode. If VR1 and VR2 are adjusted so that the voltage appearing at the anode is exactly the same as that appearing at the cathode no current will flow between the two.

Imagine such a circuit set up and balanced. Now if the potentiometer VR1 is adjusted so that the potential of the cathode is lower than that of the anode, then current will flow through the valve. If VR1 is adjusted so that the potential of the cathode is higher than that of the anode no current will flow through the valve.

(To be continued.)

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).

ADJACENT CHANNEL INTERFERENCE

SIR,—*Re* your answer to W. A. Henderson (Whitehaven), "Your Problems Answered," "Adjacent Channel Interference," January, 1955.

The "venetian blind" effect mentioned is not only suffered by Mr. Henderson, but is received on all makes of receivers not only in this area but also by residents of the Isle of Man.

This seems to point to the interference being transmitted from the Isle of Man.

It might be noted that on the original opening of the Isle of Man station this interference was not present.

It is possible that adjacent channel interference may be in the radio link to the Isle of Man.

We of one of the forgotten TV areas would much appreciate any reliable information about the permanent high-power transmitter which is *supposed* to be installed on the Isle of Man.—J. COLEBROOK (Whitehaven, Cumb).

THE P.T. "SUPERVISOR"

SIR,—I have yet seen no correspondence concerning the above receiver and it was the February issue with modifications article which has prompted me to write this.

When I completed this receiver some four months ago I encountered trouble with the vertical hold. In fact it was through your query department I learned about the error re R37. Although I changed this to a 100K with some improvement the picture still rolled. After much "tearing of hair" I decided to try a different value for the frame hold control VR6. This was increased to 1 meg. and now the picture locks solid even with the contrast a quarter of the way up.

A few further points which may be of interest. In order to cut costs I took the risks of using all "surplus market" valves except the 6CD6 and I used an RM4 and a GEX35 in place of the Westinghouse types.

The C.R.T. is a T901A with heater coupled to an isolating transformer as suggested.

The set is used with a home-made "H" aerial receiving Sutton Coldfield some 70 to 80 miles away.

I found it quite simple to align and the advantages of refinements such as A.P.C. have gone towards giving reception superior to a T.R.F. receiver which I had previously. Wishing your journal continued success.—E. ANDREWS (Oxford).

FADING OUT PROGRAMMES

SIR,—I really cannot agree with the remarks made by "Iconos" about the fading-out of some television programmes as an indignity. The fact is that both cases he mentions were followed during the evening by a Continental exchange and we cannot expect these other countries concerned to alter the whole of their time-tables just because British TV producers and comics cannot work to an allotted time. They were over-running their time and there's an end of the matter. Why should the pianist or the author sacrifice their programmes because of the long-winded efforts of some comics who don't know when to stop? Let those who like their comedy (and I am one of them) have it by all means but don't drop down like a sack of bricks on the "cultural" items which happen to follow.

"Iconos" needn't appeal to Sir George Barnes for examples of "culture" giving way to comedy or other programmes of similar vein—I can recall dozens of occasions when this has happened, usually during symphony concerts and classical recitals on the Home Services, though I agree that the tendency is much less on television. — S. A. KNIGHT (Chelmsford).

BIG SCREEN CINEMA TV

SIR,—I was interested to read in the February issue of PRACTICAL TELEVISION Iconos's note of the London Coliseum and Television.

Actually it was in 1929 that the Coliseum first was associated with television in conjunction with the late J. L. Baird. In that year a large screen was placed on the Coliseum stage and the picture of the late Sir George Robey live, also from a film, was transmitted from the Baird studios in Long Acre. The presentation of the act was when Sir George Robey first appeared on the Coliseum stage in person, then while he travelled up to Long Acre, a distance of some 300 yards, a film of him was projected on to the screen from Long Acre and then arriving in the studio he did the same act again by live television. I forget exactly for how long this was done—it was certainly a week and may have been a fortnight.

It might interest a younger generation to know that the screen used 2,100 bulbs of the "torch" variety, the scanning being arranged by rotary commutator of the same number of segments, and the actual screen was (if my memory is correct) some 30in. x 70in., the exact definition being 30-line.—D. R. CAMPBELL (Weybridge).

SOUND QUALITY

SIR,—In last August's issue you published a letter of mine in which I criticised the quality of film sound tracks when shown on television.

Now, having seen the "Fabian of the Yard" series, I take back what I said. The quality that the recording engineers have obtained for this series of films is excellent, almost like "live" broadcasts.—J. BARWELL (Haywards Heath).

TELEVISION HEARING AID

SIR,—I read with interest your note in the March edition of PRACTICAL TELEVISION under the heading "News from the Trade."

I would like to point out that such an attachment has been on the market to my knowledge for a considerable time, and during the course of my business I have run across dozens of them. I refer to the product known as the "Adaphone," measuring only 2in. by 1¼in., and manufactured by a firm well known for its work in hearing aids and the needs of the deaf.

The Adaphone is marketed in three distinct forms, each fitted with a miniature earpiece, and, indeed, includes a standard mould which fits into the ear.

For those desiring a tailored mould, one is supplied at a slight extra cost, moulded to suit the individual

(*Continued on page 571.*)

requirements. It is fitted with weighted straps for holding the instrument securely to the arms of a chair, and it is finished in an attractive grey colour.

One model I have seen, used by a friend of mine, even incorporates A.V.C., and my friend has been using it for some years.

So you see, sir, the article you mentioned in the April edition is not a new item, for I saw them at least two years ago. — C. R. JONES (Barry).

SIR,—We were very interested to read in your April issue an article on the radio and television attachment for use by the hard of hearing. We would like to say how, as manufacturers of hearing aids and attachments for the deaf for over 20 years, we entirely agree with the opinions expressed in this article, and we thought that it might be of interest to your readers, or to yourself, to know that we have been marketing a special device for television and radio listening, since May, 1953, and that the attachment in question, the Adaphone, was a modernised version of an attachment, bearing the same name, which we introduced in 1936. This was written-up in *Practical Wireless* on October 3rd, 1936, some of these attachments still being in use.

I thought this bit of history might amuse you. You will see, however, from our leaflet that the modern version which still incorporates automatic volume control is very similar and neater than the original.—B. MONTAGU (Hearing Aid Department, Multitone Electric Co., Ltd.).

PICTURE TUBE FAULT

SIR,—With reference to the problem published in the April issue of PRACTICAL TELEVISION of Mr. M. Gibson, of London.

It may be of considerable interest to him and perhaps others to learn of my experience with a picture tube fault which was almost identical with the failure he experienced. Like him, I had a C.R.T. in my set which developed an inter-electrode short, which on first sight appeared to be a cathode-heater short. As in his case, I fitted an isolating transformer with no improvement. The emission of the tube was quite good, however, and in order to reduce to some extent the strain between electrodes I tried reducing the heater voltage on the tube. This did the trick, although the focus was slightly impaired. It was necessary to move the focus magnets forward. There still remained, however, a severe disturbance in the background on dark scenes. This I eventually cured by decoupling the accelerating anode to earth via a 0.1 μF condenser.

The tube in my set is a Mullard MW31-16, and I reduced the heaters to about 5 volts.

Trusting this will be of some value and interest.—R. G. JAMES (Stoneycroft).

PRICE OF HOME-CONSTRUCTED TELEVISION SETS

SIR,—I should like the opportunity of answering the points raised by Mr. Simpkins and Mr. Sanders in their letters to you which appeared in the March issue of PRACTICAL TELEVISION.

We have, in fact, taken much care to produce a 15in. high-quality television kit, specially for the television student and constructor, which we feel is offered at a reasonable price. All the parts are of brand new manufacture and, to assist in one of the main difficulties, we can supply the R.F. unit ready assembled and aligned. The total price, without tube, of approximately £40 represents the one-third decrease on the equivalent retail figure, as mentioned by Mr. Simpkins.

We also sell this kit on the instalment system which should make it fully comparable to the purchase methods employed by the retail trade.

Students who have constructed this receiver, under our guidance, have all commented on its excellence and suitability for home construction.—P. T. V. PAGE (Director of Studies, E.M.I. Institutes, Ltd.).

BAND III RECEPTION

SIR,—In your comments in the March issue you state that the second aerial will cost £15 to £20. Pye are supplying their agents with aerials that cost £2. Also you state that you can only convert 25 sets a week. I have fitted tuners to Pam sets 954, 952, 953 and Invicta 118, 120. These have been 13 channel units and I have not hurried over them and they took on average two hours, so on the assumption that I worked on convertors all day the number will be far above the one that you state.—DAVID D. MALYON (Branch Manager, Arion Television).

CORONA DISCHARGE

(*Continued from page 542*)

These may be cut from 1in.-wide strips of brass, but the edges should be rounded and the ends also should be clipped and rounded. Similarly, if a glass tube is used, and the lead is soldered on to a top-cap connector, the lead should not be soldered flat to the side of the connector but placed end on and surrounded by a large round blob of solder. For a similar reason the valveholder used for the line output valve and the recovery diode should also be chosen with care, as the discharge may take place between adjacent pins, and cases have been known where the actual material between certain pins has been charred, giving rise to a conducting surface (carbon) which has eventually resulted in ordinary electrical flash-over and the ruin of a valve. It should be emphasised that all the above precautions are not essential, but to avoid any possibility of later trouble it is worthwhile taking every precaution to prevent corona in every part of the E.H.T. circuit.

A case of corona recently investigated arose from a projecting ceramic pillar terminal on a commercial transformer. This was situated near the line output valve, and the lead had fractured just beyond the connecting point. The corona discharge in this case was in the form of a thin pencil about ⅜in. long aiming at the line output valve. A sheet of glass was placed between the terminal and the valve, and the pencil pierced the glass as though it were not there. A sheet of a plastic material was then placed in the way, and this melted after some time in the shape of a jagged hole. A special wax material was then placed round the joint and effectively stopped the discharge. This material is commercially available, but should not normally be necessary if the precautions mentioned above are taken. Ordinary petroleum jelly will stop the discharge, but unfortunately will melt and run from the point due to the normal temperature rise inside the average set. Hard wax removed from an ex-Government transformer, for instance, will also keep it down, but in some cases it may not prevent it entirely.

Your PROBLEMS Solved

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 575 must be attached to all Queries, and if a postal reply is required a stamped and addressed **envelope** *must be enclosed.*

MURPHY V200

My Murphy V200 TV has developed a fault in vision. Sound is in order, and tube heater is lighting up as normal. E.H.T. whistle is normal, too.

The fault was preceded by black lines flashing across the screen, and a crackle on sound that was similar to interference from an electric motor. Then it got very intense, and the screen went black. I can't get the screen to light up at all, by means of the brightness, contrast or sensitivity controls. Could the fault be in the vision interference limiter circuit ? This has not seemed too good for a while, the adjustment being at position giving maximum interference. This had to be adjusted like this or flattening of the highlights was present. Even on this position the contrast couldn't be turned up too much or the highlights would become flattened.—A. Gwilym Davies (Flintshire).

The effects which preceded the final black-out are symptomatic of a collapse of insulation in the picture-tube. A fault of this nature would cause the tube beam current to rise considerably and show as intense illumination on the screen. Moreover, the final fade out may have been caused by failure of a weak component in the E.H.T. circuit, which could not stand up to the strain of the heavy beam current.

We would, therefore, advise that you first of all ensure that the picture-tube is up to standard, and then go on to investigate the E.H.T. section.

We would point out that the progressive alteration in the characteristics of the vision interference limiter might well have been aggravated by a gradual reduction in tube emission.

MARCONI VT53A

I have a Marconi Model VT53A, London only, T.R.F I would like to use a converter or modify to receive Channel 3, i.e., Norwich transmitter.

Would the Cyldon 5 Channel tuner suit ? If not, do you know of any that would, or details to modify ? — C. R. Woodard (Norwich).

The Cyldon 5 Channel tuner is totally unsuitable for the modification you have in mind. Channel converter units for this purpose can be obtained from Spencer West, of Quay Works, Great Yarmouth, Norfolk.

BUSH 24A

My Bush receiver has developed the following faults, which no doubt can all be attributable to one cause.

(a) Kinks in the lines and fly-back lines on the left of the picture.

(b) White vertical bars about half an inch wide, pronounced in the top left-hand corner, gradually decreasing in intensity towards the middle of the picture.

(c) A kind of halo effect on the right-hand side of the picture subject, giving letters and figures the appearance of depth.—E. E. Butcher (Leigh-on-Sea).

These symptoms are probably caused by a fault in the damping diode circuit PY81 (V10 Trader Service-sheet). You should have the condition of this valve checked, and replace it if necessary. You should also check the condition of the associated 0.1 μF reservoir capacitor in the anode circuit of the PY81. Also ascertain that the line amplifier valve PL81 (V8) is well up to standard.

PYE FV1

I shall be most grateful if you will advise me on a fault with my Pye FV1. E.H.T. at the tube anode is non-existent. I have had EY51 tested also PL38 (line output) and proved O.K. I have also discovered that V14 (line oscillator) is overheating and also that a blue glow is present on the PL38.

I suspect the line output transformer as being the cause of the E.H.T. fault and, if this is so, could you inform me as to where I can obtain a replacement.— J. Ward (Rotherham).

The symptoms mentioned are consistent with line output transformer trouble. It will be necessary to install a correct replacement component, which can be obtained only through a Pye agent.

ULTRA T22

When I switch on all I get is a bright spot about 3in. in diameter.

I do not know a great deal about them but I am willing to learn. I would also like to know if it is possible to change it to a larger tube. It now has a CRM92 9in.—T. Dodkin (Edgware).

Your trouble is almost certainly due to the absence of H.T. on the timebase H.T. rail (terminal N8). You should check along this line from the H.T. point in an endeavour to discover where the fault lies. Check C6 for insulation.

You could use a CRM121 12in. tube in the receiver, but this would probably give a slightly less brilliant picture than a new CRM92.

BUSH TV22

My picture has developed a distinct slant from the horizontal. Whilst the screen can be filled by stretching the picture, any writing on the screen has a definite slope down to the left of the screen. Can you please tell me how to correct this fault ?—A. Cudmore (Colchester).

The alignment of the picture on the screen is controlled by the position of the scanning coils. These are situated on the neck of the picture-tube, behind the focus unit. The coils should be very carefully twisted to correspond to alignment of the picture.

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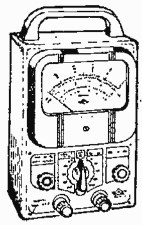

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It is best to perform this adjustment directly after the receiver is switched off, while the inside is still warm.

PYE VT4

I have a Pye VT4 and have noticed the following faults.

(1) When the vernier fine tuner is adjusted to give maximum definition it introduces severe ringing and sound on vision. Is this due to misalignment of the tuned circuits, or is this an inherent fault with this receiver ?

(2) After being in operation for approximately 30 minutes a convex gap is noticeable at bottom of frame.

Your help and advice in these matters will be greatly appreciated.—N. D. Healey (Bristol).

(1) This is quite a normal occurrence; the fine tuning should be adjusted for maximum sound, consistent with minimum sound interference on vision and optimum definition. A compromise between definition and "ringing" is generally necessary. If this condition cannot be achieved the vision I.F. stages may be in need of re-alignment.

(2) This effect is probably caused by an alteration in the characteristics of the frame timebase valve as it increases in temperature. It is sometimes aggravated by the receiver's mains adjustment not corresponding closely to the local mains voltage. You should check these points.

G.E.C. BT4542

Could you please help me with a fault which has developed in my G.E.C. BT4542 television receiver, Holme Moss frequency?

The set was switched off after working normally, and on switching on the following evening there was a complete loss of picture.

The raster is quite normal and I have had all the valves in the video strip tested, and they are O.K. The vision detector and noise-limiter in the above section are crystal diodes. What effect would either of these diodes have if faulty ? And is there any test which I could apply to them ? At times it is possible to see a very faint picture on the raster.—F. Bowman (Knutsford).

We presume that the sound channel is unaffected by the fault on vision. If this is the case then the trouble lies somewhere in the vision I.F. detector stages. It is unlikely that the video amplifier is at fault, as you are able to obtain a raster. Your best plan of action would be first to check the potential on the electrodes of the vision I.F. valves, making sure that the voltages are more or less normal. Assuming that they are, and that the valves are up to standard, the vision detector stage should come under suspicion.

The crystal diode becoming defective would give rise to the symptom, and this does sometimes happen on your receiver. There is no really satisfactory test for this component; by far the best is by substituting with a component of known goodness.

SIMPLE TV 'SCOPE

I am starting to build the 'scope shown in the August, 1954, issue of "Practical Television" (page 119), but using a different C.R.T.—a VCR517B (10E/818). I have completed the E.H.T. exactly as shown in Fig. 1, except that I have reversed the polarity of MR4 and MR5, which surely are drawn wrongly.

I could not get the tube to emit, although I used the brilliance and focus controls throughout their range, so I replaced R7, R17 and R16 with variables of 1 m., ½ m. and 2 m. respectively. The tube did then emit, but only when R17 was zero (then R7 had no control). I obtained better results when I interchanged pin 1 and pin 2 connections on the tube, but even then the best "picture" I got was about ⅛in. diameter. Can you please give me the C.R.T. circuit for my tube, and can I expect to get a pin-point ?—E. Jones (Gosport).

You should be able to get a pin-sharp trace with the VCR517. It is possible that you have a fault in the E.H.T. network, or a resistor has changed its value in this network. Try varying the values and check very carefully for possible leakage, especially via spindles of the shift controls.

FERGUSON 983T

Could you please tell me how to reduce picture width on my Ferguson Model 983T ?

I have the plug in minimum position, but the picture overfills the screen—by how much I cannot say—and this has only been so since a service engineer replaced the line-output transformer with a new one which, incidentally, was obtained from Ferguson, and to outward appearances at least looks to be the same as the old one.—E. Walker (York).

This symptom almost certainly means that the replacement transformer's tolerance is outside that stipulated by the manufacturers for optimum performance. If you are certain that the E.H.T. rectifier valve is up to standard and that the width adjustment is correctly positioned, then we feel that it would be to your advantage to have your dealer rectify the trouble for you.

A "K" AERIAL

I wish to construct a type of aerial which I have sometimes seen made in the form of a capital K. Can you please tell me whether the reflector should be insulated from the mounting bracket, or is it permissible for the lower arm of reflector to be longer than the upper and be made part of the mounting bracket? Can you also suggest the best angle between dipole and reflector arms and suitable lengths of both for Channel 5.—W. Prewett (Salisbury).

Theoretically, it is desirable to insulate the reflector from the chimney bracket. In practice this is not very often done, however, and the performance would appear to be little affected.

There is no critical angle between dipole and reflector, though a satisfactory figure is something like 45 deg.

The dipole should have an overall length of 7ft. 1in. and the reflector 7ft. 7in.

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PRACTICAL TELEVISION, MAY, 1955.

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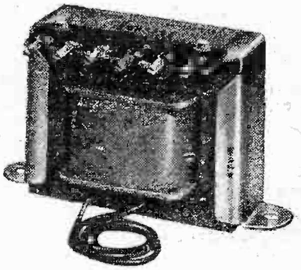

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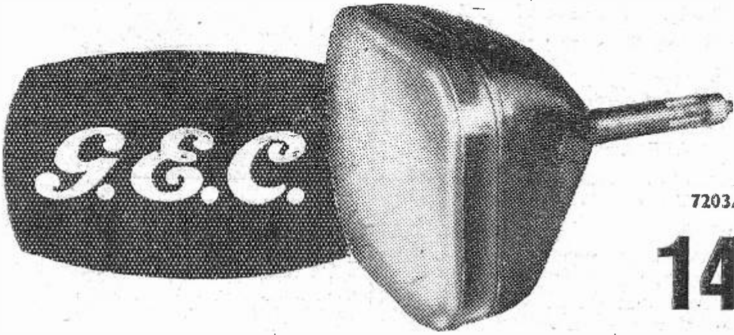

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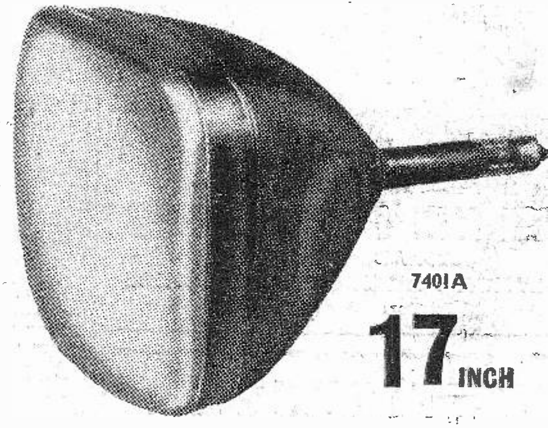

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