SERVICING—NEW SHORT SERIES

PRACTICAL TELEVISION

AND TELEVISION TIMES

1/-

EDITOR
F. J. CAMM

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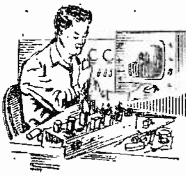
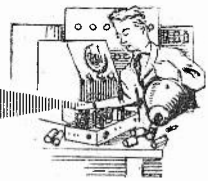


Practical Television



& TELEVISION TIMES

Editor : F. J. CAMM

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Televiews

THE ADVANCE OF VIEWING

ACCORDING to statistics compiled by the BBC Audience Research for the quarter April to June, 1954, in comparison with the same period for 1953, the average level of evening viewing among the whole adult population of the United Kingdom (approximately 37,600,000 persons) has risen from 8.1 per cent. to 10.4 per cent. It is not surprising, therefore, that the average of evening listening for these two comparable periods has fallen from 17.1 per cent. to 14.4 per cent. The average level of evening viewing among what the BBC terms "the television public" is, however, only 38.8 per cent. for this year as compared with 37 per cent. last year, and for sound the comparable figures are 18.2 per cent. for this year and 20.3 per cent. for last year. It is estimated that the average size of the adult TV public in the April-June quarter of this year was approximately 9,000,000 and in the same quarter of 1953 7,000,000; whilst the average size of the adult sound public for the same period was 26,000,000 and 28,000,000 respectively. The average levels of listening and viewing among the whole adult population during those evening hours when all BBC services are on the air is 13.2 per cent. for sound, and 10.4 per cent. for television (total 23.6 per cent.) for the 1954 quarter compared with 15.6 per cent. for sound and 8.1 per cent. for television (total 23.7 per cent.) for the 1953 period. Thus, whilst the total listening and viewing time shows practically no change, being slightly greater in 1953, it will be observed that television is on the increase at the expense of sound broadcasting.

It is interesting to note that the proportion of the population which tuned in to a BBC programme during the hours when all services (Home, Light, Third and TV) were on the air was about the same in April-June, 1954, as in the same period 1953, but whereas in 1953 sound's share of this total was 66 per cent. and television's 34 per cent., in 1954 sound broadcasting's share had fallen to 56 per cent. and television's had risen to 44 per cent. The figures show that in both quarters the average adult viewer watched just under two out of every five evening broadcasts. The tendency, therefore, is towards more viewing and less listening, and a simple graph would show that TV will overtake sound in approximately 18 months' time.

TV IN INNS

THE President of the Board of Trade was recently asked whether he would take steps to amend the Copyright Act so as to prevent authors or composers, or the Performing Rights Society acting on their behalf, from obtaining fees from innkeepers or hotel-keepers who permit their guests to listen to radio or television programmes.

We gather, however, that publicans have found their takings diminish when they install TV in the saloon bar, and rather than pay a copyright fee they would refrain from showing TV programmes. The case for alteration in the Act would vanish if evidence showed that this form of entertainment inflated the innkeepers' profits. All the evidence is to the contrary.

FOREIGN VALVES IN TV SETS

IT is reported that a large proportion of British TV sets will contain foreign valves and cathode ray tubes, whereas previously the Home Industry provided nearly all the country's requirements. The greatly increased demand for TV receivers has proved to be outside present manufacturing facilities in this country. An almost three-fold increase in imports of valves and tubes has taken place. The increased demand is undoubtedly due to the imminence of the alternative commercial TV programme. Special valves are required for such sets. The valves are available for home constructors who wish to build adaptors permitting existing Band 1 to receive the new transmission. They are imported mainly from Holland and Germany.—F.J.C.

A SIMPLE T-V "Scope"

DETAILS FOR THE CONSTRUCTION OF AN INEXPENSIVE OSCILLOSCOPE FOR TV

By B. L. Morley

(*Continued from page 122, August issue*)

THE layout arrangements should be adhered to, the components being positioned as given in Fig. 2. This is important to avoid cross-talk. Of particular importance is the mains transformer. The best position is behind the C.R.T., but this makes the chassis unduly long and a compromise has been effected by fitting it at the side of the C.R.T. In order to reduce any ripple effects on the trace, a mu-metal screen was made and erected as shown.

For those who are making their own chassis the overall dimensions given in the figure can be used. The width given on the front panel is a little greater than that of the Indicator Type 6 so as to allow the controls to be fitted at the side of the C.R.T. In the Indicator these controls are set back a little and long spindles are used.

The front panel should be made strong enough to secure the C.R.T. and brackets should be fitted to keep it rigid. A cover should be made to cover the whole unit and ventilation holes provided.

Modifying the Indicator 6

The focus and brilliance controls remain as they are and the frequency coarse control is also left *in situ*. (It is labelled "Fine" in the unit.)

A small hole is drilled next to the brilliance control and the width control is fitted. One of the midget types of volume controls should be fitted here.

At the bottom left-hand side of the unit is a control attached to a 25 K potentiometer; this is used for the sync control.

Above this potentiometer are three Pye sockets. The centre one is left and the other two are removed and replaced with two toggle switches, one for mains on/off and the other for the blanking control (S2).

By the side of the Pye sockets are two pre-set controls, access to which is obtained through a small hole in the front panel. The potentiometers should be removed and replaced by the fine frequency control and the amplitude control, the spindles being extended so that knobs can be fitted.

The tube face is fitted with a green mask which should be removed, but if a horizontal graded scale is also fitted, then it can be retained so as to form a useful reference line.

All pre-set controls are removed from the panel on the right of the chassis and the two shift controls are mounted in their place. The condensers for E.H.T. smoothing are fitted by the side of the panel and the coupling condenser C3 is fitted under the shift controls. It is important that this condenser is well insulated from the chassis. If a metal-can type is used, then the can should be connected to the anode of V1 and the central terminal to the other side (the C.R.T.).

The mains input lead is taken through a hole drilled in the six-pin socket at the top of the front panel.

C16 is mounted underneath the rear end of the C.R.T. on top of the chassis.

V1 and V2 are fitted in the first two B9G valveholders from the front panel. All other valveholders are removed.

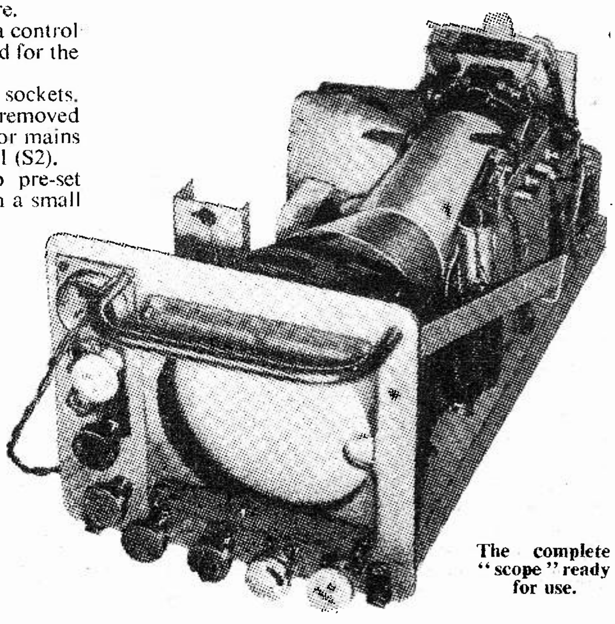
It will be found that the existing layout underneath the chassis will lend itself readily for mounting the components. All components should first be removed.

The only items which should be left *in situ* are the focus and brilliance controls, the coarse frequency control, and the sync control.

Note that a list of items additional to the Indicator is not given; there are various models and modifications and it was considered that if the constructor prefers the use of the Indicator, then he could purchase the extra components required after the unit has been stripped.

A complete shopping list has been given and it should be an easy matter to decide which items are required.

Those who would like to add an extra touch will find the provision of a pilot light a useful feature.



The complete "scope" ready for use.

It can be mounted on the front panel in any convenient position. The lamp should be red or green and can be run from the common heater line. A suitable circuit is given in Fig. 3.

Wiring Diagrams

In order to make this instrument available to as many as possible, wiring diagrams have been prepared

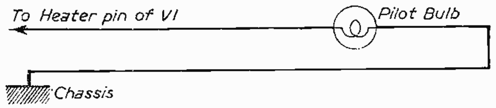


Fig. 3.—Wiring for pilot lamp.

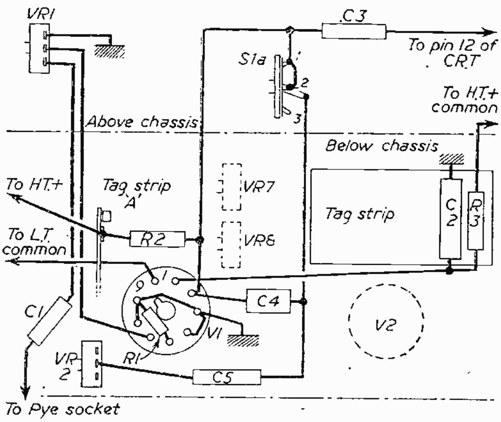


Fig. 4.—Wiring of the amplifier.

for those who are not over-confident about wiring up directly from a theoretical circuit.

One of the difficulties in providing this facility is that it may be difficult to sort out the various connections on a small print and so the circuit has been divided into its separate sections and a wiring diagram given for each.

The method to follow is to wire up each section individually, and when the last section has been wired, then it will be found that the circuit is complete. Components of different circuits which lie close to one another have not been shown unless they are directly concerned in the wiring of that particular section.

Many of the components and a lot of the wiring are carried out above the chassis. The wiring is, of course, run through the chassis. In our diagrams the top of the chassis and the bottom of the chassis are shown one above the other and where there is a dotted section to a wire this indicates that the wire is run through the chassis from the underneath to the top.

Fig. 4 shows the wiring of the amplifier stage. Note that the tag strip "A" appears in this figure and in Fig. 5. The approximate location of V2 is given as a guide as is also the position of the focus and brilliance controls.

Fig. 5 gives the wiring for the oscillator circuit. Most of the condensers associated with the coarse frequency control are mounted on a paxolin panel or tag strip.

In order to clarify the wiring of the coarse frequency control the slider is shown separately; e.g., the slider of the rear section of the switch goes to pin seven of the valve.

Fig. 6 shows the C.R.T. network. To simplify the wiring, the C.R.T. holder is shown with all terminals on top. This, of course, is not the case as the terminals surround the holder, but the method in the drawing makes the wiring clear.

Note that MR1 and MR2 should be kept well clear of the chassis.

Fig. 7 shows the wiring of the power supply. No difficulty should be experienced here.

Testing

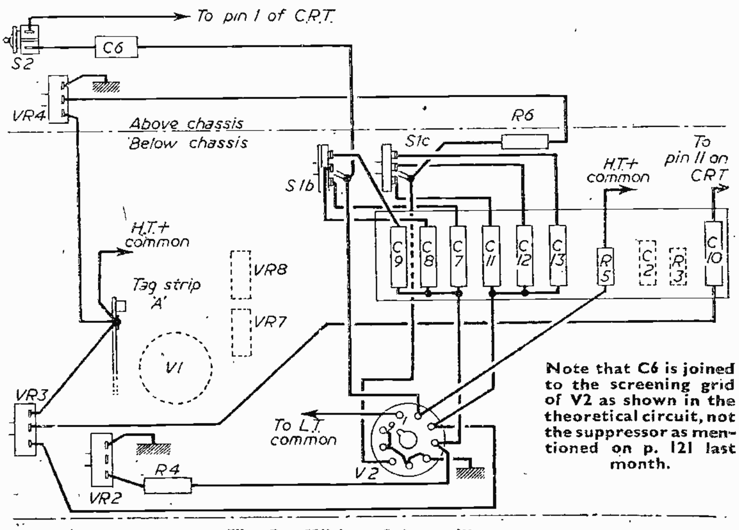
After completion the wiring should be checked carefully and the inexperienced constructor is advised to check the circuit with the wiring diagram. Pay particular attention to H.T. and L.T. (heater) lines.

Connect the mains transformer input to the correct tap, according to the voltage of the local mains; insert the valves and switch on.

After allowing a short period for the valves to warm up, turn up the brilliance control until a trace is seen on the screen and adjust the focus so that a horizontal line is seen. The coarse control should be set in position 1, i.e., at the lowest frequency band, and adjust the width so that the scan does not quite fill the tube.

Adjust the shift controls so that the scan is centralised.

Now adjust the fine control and it will be observed that the speed of the horizontal scan is varied. It may be possible to reduce the speed so that a very low frequency is obtained. On the prototype the lowest speed enabled the spot to be observed making the actual trace.



Note that C6 is joined to the screening grid of V2 as shown in the theoretical circuit, not the suppressor as mentioned on p. 121 last month.

Fig. 5.—Wiring of the oscillator.

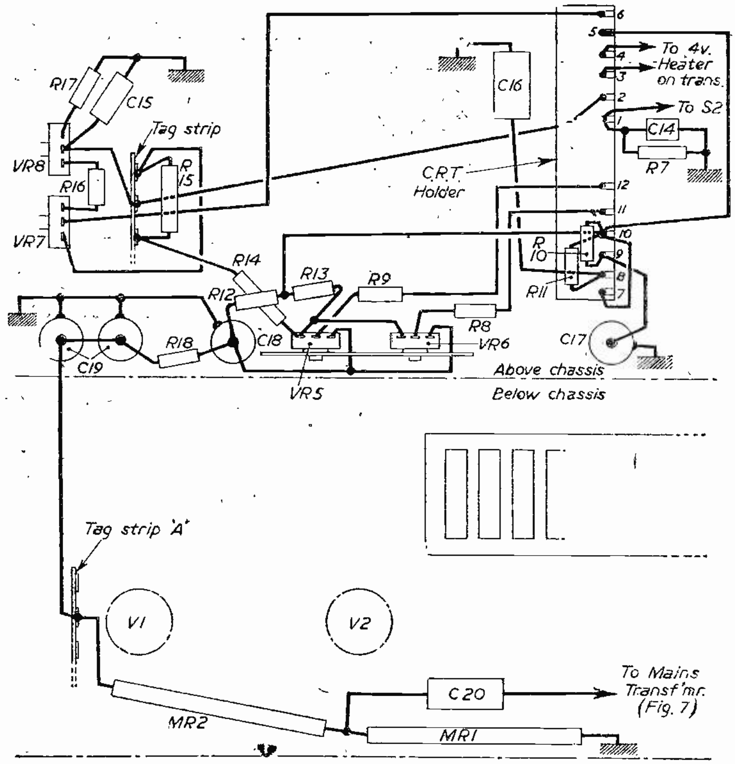


Fig. 6.—The E.H.T. and C.R.T. network.

If the frequency control is now advanced it may be found that the trace is distorted. This can be corrected by reducing the amplitude control to zero. A screened connection should be made to any circuit which is being checked and it is convenient to use coaxial cable for this.

Now turn the coarse control to the highest frequency band. It should be possible to hear the whistle from the oscillator, the pitch being made variable by operation of the fine frequency control.

The sync control should be kept at zero.

Now connect a length of coax attached to a Pye plug to the input socket and tap the centre conductor on to the heater line on a valveholder. Set the coarse control to its lowest frequency band and the fine control to mid-position. Now carefully advance the amplitude control until a trace appears on the screen ; it may appear as a pattern at first but the trace can be formed into waveforms by the operation of the fine frequency control.

Check the operation of the fine frequency control by turning it carefully ; at various settings it should be possible to resolve from one to three or four complete sine waves. These waves are, of course, the A.C. mains frequency.

Observation of the waveform will enable the degree of linearity to be assessed ; it should be very good, each complete cycle being the same width.

If the coarse control is now turned to position (2), it will be found that a kind of shallow raster is formed.

It will probably be found possible to resolve one complete cycle with the fine frequency control at its lowest point. This demonstrates that the frequency bands are overlapping correctly.

If the coarse control is now turned to position (3), then a raster somewhat similar to the appearance of the normal TV raster will be seen.

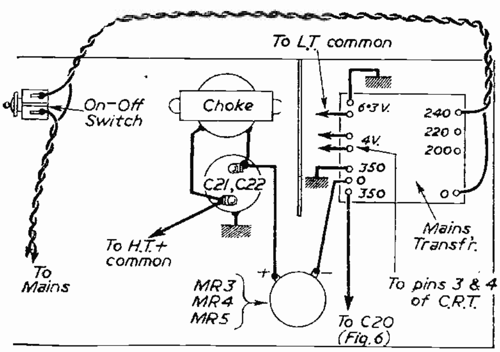


Fig. 7.—Wiring of the power supply.

Checking Synchronisation

When these preliminaries have been completed, the 'scope can be used on a TV timebase. Switch on the televisor but do not connect the aerial so that the time base is free of sync pulses.

Now switch the coarse control of the 'scope to the lowest band and connect the centre conductor of the coaxial cable to the frame oscillator anode circuit. The outer of the coax should be taken to the chassis of the televisor but the usual precautions must be taken if the televisor is one of the A.C./D.C. types.

The amplitude control of the 'scope should be advanced until a pattern appears on the screen of the 'scope, and the fine frequency control is then adjusted until one or more complete cycles of the frame oscillator are seen on the screen. The sync control should be advanced until the trace locks.

For best operation the sync control should be adjusted so that the trace just fails to slip.

Now try the line time base, switching the coarse control to band (3). Advance the sync control to maximum and transfer the coaxial lead to the line oscillator. Advance the amplitude control until the trace is of sufficient height and then rotate the fine frequency control until the waveform is seen on the screen.

It may be observed that the trace is spoilt by a spurious wavy line. This is the flyback and it can be cleared by operation of S2.

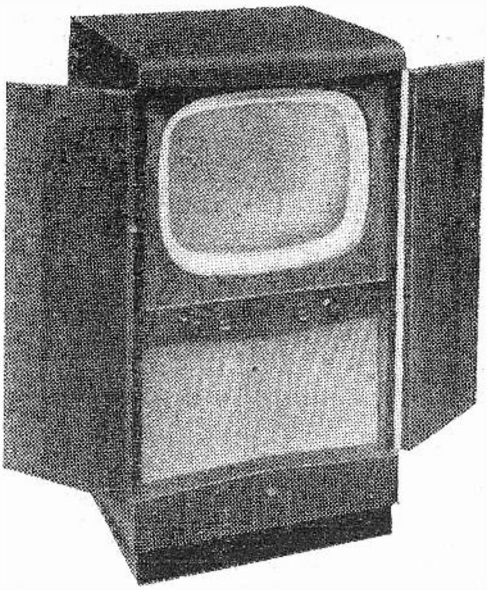
Television at Earls Court

A PRE-VIEW OF THE EXHIBITS TO BE SEEN THIS YEAR

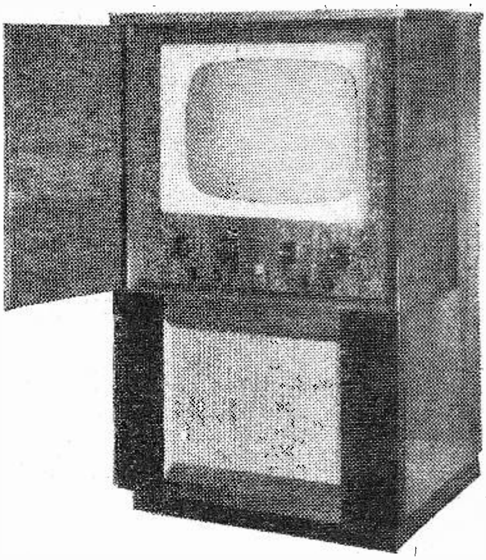
THE task facing the organisers at the forthcoming 21st National Radio Show, is to provide television programmes all day—from 11 a.m. till 10 p.m. This is something which neither the BBC nor the future commercial television companies are likely to be called upon to do under normal conditions.

Programmes will be taken from Alexandra Palace when suitable, and from six sources within the Exhibition, namely the BBC studio ; the outside broadcasting arena ; the Radio Industry Council's own studio ; the celebrity dais ; the roving-eye camera, and the film scanner working in public view in the R.I.C. control room.

The BBC programmes to be rehearsed and performed in public view in the exhibition have not been announced at the time of going to press. It can be stated, however, there will be six days of television in the studio and four days of sound programmes. On each television day there will be five or six sessions at which the public can watch rehearsals, and one for the evening transmission. On each of the four sound days four popular programmes are to be rehearsed and either transmitted or recorded for transmission during the run of the Radio Show.



This is the Hartley-Baird model D2117, which costs 102 guineas.



Philips model 1747U has a multi-programme tuner. It costs 99 gns.

Thirty-eight Transmissions

In the BBC outside broadcasting arena there will be something going on all the time, with a probable total of 12 transmissions. The arena is to be turfed over an area of 100 ft. by 80 ft.

Two BBC programmes, such as Starlight and Children's Hour, are likely to be broadcast from the R.I.C. studio each day.

This means there will probably be 38 television transmissions from the Radio Show during its 10-day run, and 16 sound programmes originating therefrom, a total of 54.

For the closed circuit, on which 400 to 500 television receivers will be working, the Radio Industry Council is providing eight live TV programmes a day, professionally produced. These will come from the R.I.C. studio and the celebrity dais. Some of the studio programmes are likely to be in the nature of try-outs for BBC transmissions later in the year.

In charge of the R.I.C. programmes, specially seconded from BBC television, will be, Mr. Clive Rawes, as programme officer, and Mr. Lloyd Williams, as producer.

Mr. Lloyd Williams says : " Provision for eight programmes a day requires a technique not normally experienced, which must resolve itself into the minimum amount of studio rehearsal time and maximum amount of preparation. This is in the nature of an experiment.

" Programmes include :

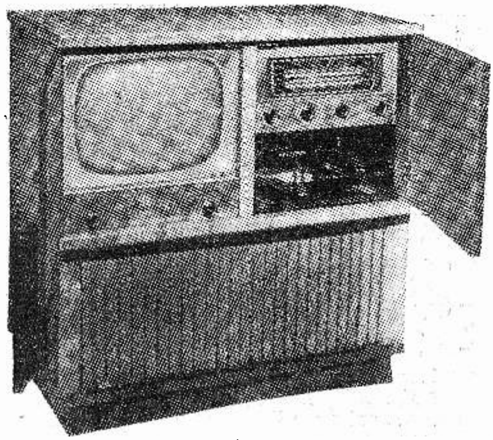
Radio on the Roads
Parlour Tricks
The Weather Story
Roving with Robertson
Scream in the Night

and, especially for the ladies visiting the Exhibition, there is to be a fashion display and ' Beauty and You.'

" All programmes will be linked with candid interviews with stars and celebrities, and there will also be the well-established Radio Show favourite, the Television Tea-Party, at which stars of television, screen and stage will be 'at home' to the visitors. All through we are aiming at topicality through personalities and events."

Mr. Clive Rawes, presentation editor for BBC television, has had in his control the linking of all television programmes, arrangements for announcements and announcers during the past two-and-a-half years.

Mr. Lloyd Williams, who was formerly assistant to Henry Caldwell on "Cafe Continental" and "Shop Window," for the last twelve months has been engaged on finding talent and material for television's teen-age programme "Teleclub."



A combined radiogram and TV. This Regentone model costs 149 gns.

Demonstrations

All of these transmissions will, of course, go out to the general public over the air and will also be seen on most of the stands and in the special viewing or demonstration gallery. In addition, demonstration transmissions will take place at odd times during the day. Those who are interested in the technical side may like to be reminded that the relay throughout the Exhibition takes place on the frequency of Channel 2—in order to avoid interference which was originally experienced when the relay was carried out on the London frequency. This means that the receivers which are demonstrated are Birmingham models or multi-channel receivers tuned to Birmingham.

NOTE THE DATE

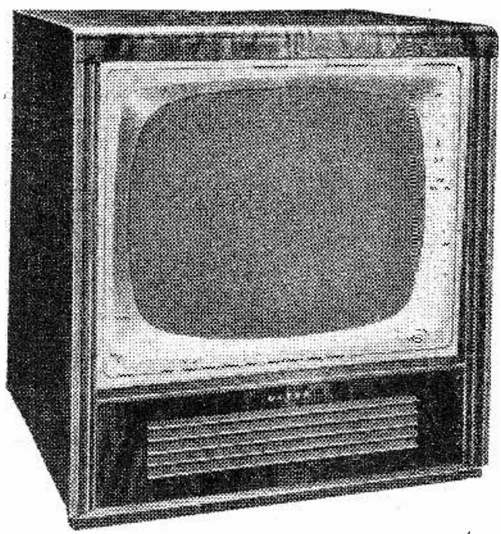
AUGUST 25th

TO

SEPTEMBER 4th

Band III

With the introduction of Band III transmissions in the future, many of the receivers which will be on view will be either designed for tuning on both Bands I and III, or will be so designed that they may easily be converted or adapted when transmissions commence on Band III. To facilitate demonstrations of such equipment as is available in this connection, a further relay is to be provided throughout the Exhibition on 189.75 and 186.25 Mc/s, and no doubt many of the receivers on show will be working on these frequencies. As is usual with the Radio Show many manufacturers erect an "iron curtain" round their proposed exhibit and accordingly we may expect some interesting surprises when the Exhibition finally opens. So far as actual novelty is concerned there does not appear that there will be anything startling.

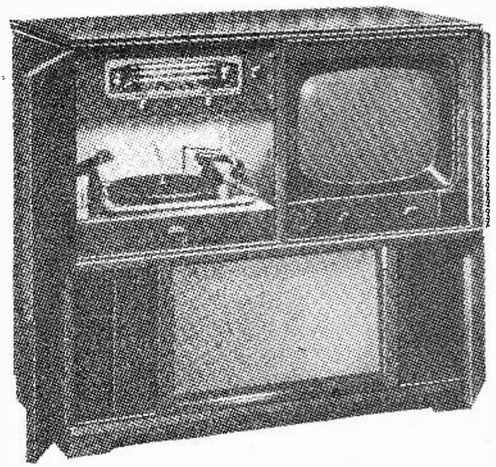


This Ultra model V-9-17 (for Band 1 only) has not been priced at the time we go to press.

Big screens will, it appears, be more or less standard this year, and it would seem from information so far released that the rectangular tube will be most popular. This does, of course, reduce the cabinet size for those who prefer the table model type of receiver, but there will be a fair proportion of console models with folding doors to hide what is regarded by many as the "dead eye" effect of the unused receiver. In the Philips model 1747U, for instance, the doors only cover the upper half the receiver, the speaker fret being left uncovered. The Hartley-Baird model D.2117, however, has the doors running the whole height of the cabinet, and this is typical of many. In practically all models fitted with doors these are hinged to fold right back flat with the sides if the owner does not require to make use of them, or to save space when the receiver is pulled out for use and there is not much spare room available. Doors do, of course, assist in shielding a tube face from any direct lighting in a room, and in this way help in obtaining a brighter picture without sitting in the gloom. Filter screens, or coloured filters in front of the screens, may almost be described as standard, although the tints used cover a very wide range.

Controls

There still seems a reluctance on the part of manufacturers to fit all the controls on the front of the chassis so that one does not have to perform acrobatic tricks when making adjustments. Whilst it is not difficult to arrange for all the controls to be grouped in a neat assembly at the front and covered with a



A fine combined radiogram and television receiver. By Cossor, this is model 935.

removable metal panel or inset of wood toned to match the cabinet, it must be admitted that there is some justification for the more or less standard placing of these controls at the back or out of reach. The unskilled viewer may be tempted to tamper with them and completely upset the essential adjustments, but the service engineer would certainly prefer to have them at the front, where it is not necessary to make use of an assistant or a mirror in order to see what effects the various controls have on any servicing adjustment which has been carried out.

OUR STAND:
No. 51
GROUND FLOOR

Combined Radiogram-TV

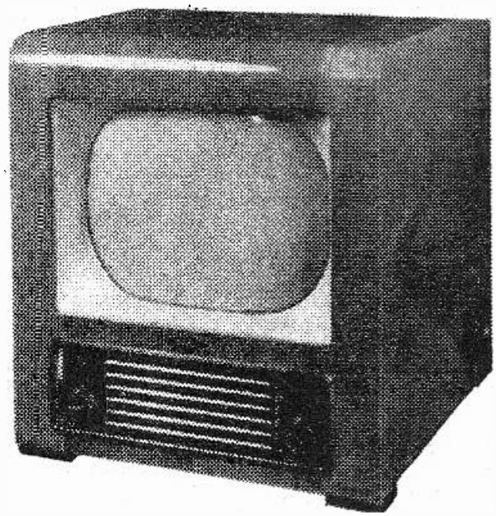
There would appear to be an increase in the number of combined radiograms and television receivers this year. Again, the wide-angle tube of the rectangular type has enabled the overall size to be kept down, and with the modern auto-changer and compact radio units, the overall size is very little larger (and in one two cases, smaller) than ordinary radiograms of a year or so ago. The news that the Government have approved the installation of V.H.F. transmitters for sound broadcasting will, no doubt, result in certain receivers being rushed through in time for the Show, in which not only normal medium-wave sound receivers will be combined with TV, but also V.H.F. FM receivers, and this is another new feature which will, no doubt, receive a prominent place at the Show. Incidentally, for those who are interested, FM provides a much higher quality than the normal AM, and as the quality of reproduction at television frequencies is also quite high, it is reasonable to suppose that high-fidelity equipment will become more popular, as a television receiver may be combined with a V.H.F. FM receiver to give much better quality of reproduction than is normally associated with broadcasting. The frequencies which have been authorised are in the band 88-95 Mc/s, and the exact frequencies for the individual stations will be announced later. These stations will be at Wrotham (Kent), Pontop Pike, Divis (Northern Ireland), Meldrum, Norwich, South Devon, Sutton Coldfield, West Wales, and Holme Moss. It will be seen, therefore, that they tie up with local television transmitters.

Circuit Features

A.V.C. or Flywheel sync, or Automatic Picture Control, first introduced last year, will be found in many receivers this year. In some cases, only the I.F. stages of the receiver will be controlled, whilst in others it will also be found that the sync circuits are locked in some manner to provide good hold in spite of very bad interference or weak signals. In conjunction with this, flyback suppression is also being featured, so that the brilliance control may be turned a little further to obtain a resolvable picture when faded almost to extinction. These features are invaluable on the remote fringe areas, and are not appreciated by those living in areas of high signal strength. At least one firm is making a feature of a point which is not often appreciated—the time-lag between switching on and the appearance of a good picture. In many receivers this is a matter of two or three minutes, and if one has forgotten a programme and suddenly realises that there was something it was required to see, the long delay can be quite annoying. Pilot are making a feature of the fact that the picture appears 20 seconds after switching on, and this will no doubt form quite a selling point. Other small features such as this will no doubt be picked out by other firms, as there appears to be nothing really new in the circuitry employed in the present-day receiver, and makers have to rely upon small features which either simplify the handling of the receiver or make for better viewing.

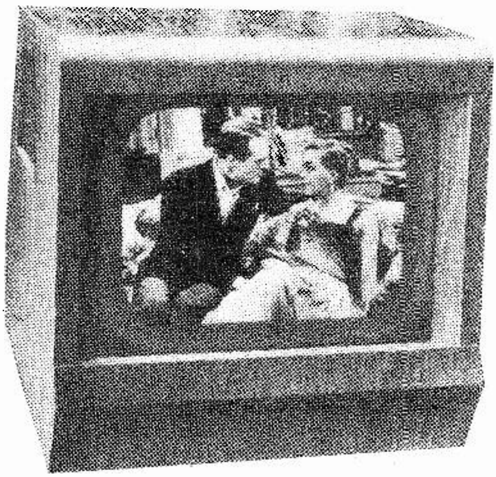
Components

So far as individual components are concerned, these now embrace practically everything requi.ed in



At 54 gns. this Bush receiver incorporates fly-back suppression.

the construction of the modern receiver. Unfortunately, component manufacturers who specialise in parts for the home-constructor are conspicuous by their absence, so that the constructor who expects to see and compare the various parts available will be disappointed. Trade suppliers may be showing some of these, but apart from loudspeakers it would appear that the makers of scanning coils, focusing units, E.H.T. units, etc., are absent. Certain manufacturers, such as Plessey, will be showing components as supplied to set makers, and this will prove worthy of inspection by the constructor, whilst focus units will be shown by certain speaker manufacturers (Goodmans, Elac, etc.). But we miss certain old friends in the trade who, due to increasing Government business, are unable to appear.



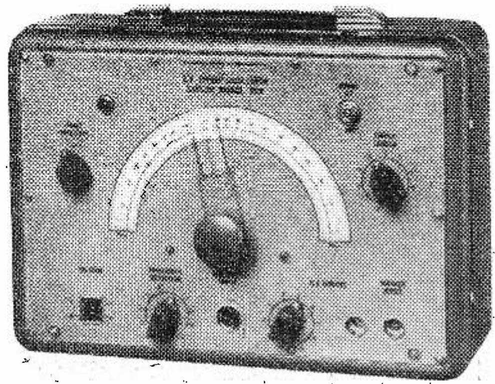
Invicta model 120/T is a 14in. table model costing 69gns.

Servicing Equipment

The range of servicing equipment is slowly increasing, and some novel pieces of apparatus are expected. Pattern generators are now standard pieces of equipment, but there still seems to be a marked absence of a good combined 'scope and wobbulator, of suitable size for taking "on site," and giving good bandwidth response. As we go to press we hear a rumour that there will be a tester which produces a replica of Test Card "C," and thus covers all the essential features of the television signal, whilst we also hear of a "dot" generator which is, in America, slowly replacing the line-pattern generator.

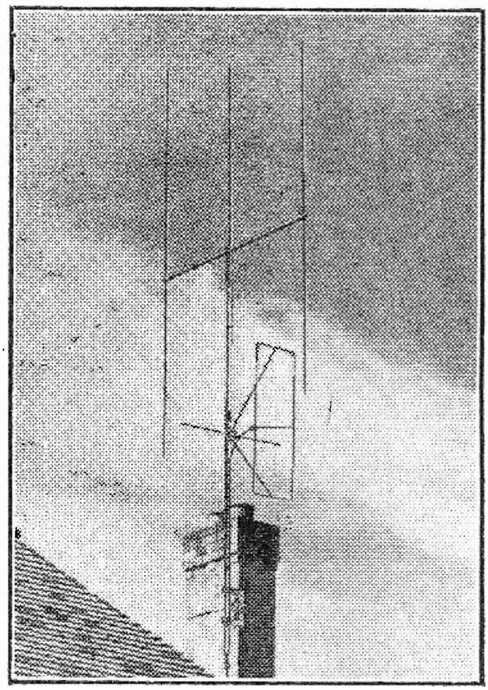
Aerials

With the forthcoming introduction of transmissions on Band III many new aerial arrays are likely to be seen. Viewers should remember, of course, that it is not merely a question of fitting an adaptor or converter to the receiver in order to pick up the proposed new transmissions. The aerial, too, must be changed, and fortunately these will be much smaller than those at present in use. Accordingly, they may be mounted on an existing mast, or combined in some way with an aerial for Band I. Existing installations may be modified, but new arrays will make their appearance, and one of these is illustrated on the right. Here the aerial for the new



A sweep oscillator for servicing TV receivers—by Taylor Electrical.

Band III is somewhat novel, and takes the form of a rectangle. In this respect it is what is known as a "slot" aerial with the material round the slot removed. Some time ago we described in these pages a slot aerial for Band I designed for use in a loft, in which a large expanse of ordinary wire netting was soldered together to leave a slot which formed the aerial. The exact manner in which this functions is something of a mystery, but it has been noted that one is erected on the new Television City buildings of the BBC. Experiments have shown that the surrounding metal may be cut away, without unduly influencing results, until only the edges of the slot are left, and the aerial shown takes this form.



An unusual aerial. This is the J-Beam, combined with a slot aerial for Band III—to be seen on Stand No. 31.

NEW SERIES

Servicing Television Receivers

No. 1.—H.M.V. AND MARCONI RECEIVERS WITH "1807" CHASSIS

THIS series of articles is designed to help those who possess a commercial set of popular make or who may be asked to help in the servicing of such a receiver. The whole point of these articles is that nearly every television set possesses its own peculiarities, which, if known, can make servicing much simpler. Time and time again the same faults crop up with surprising regularity.

A survey of this type can be presented best by taking each model and series in turn. To start with, it is proposed to deal with those H.M.V. and Marconi sets with "1807" chassis. This chassis is fitted in a large number of models and can best be identified by the rough description given below.

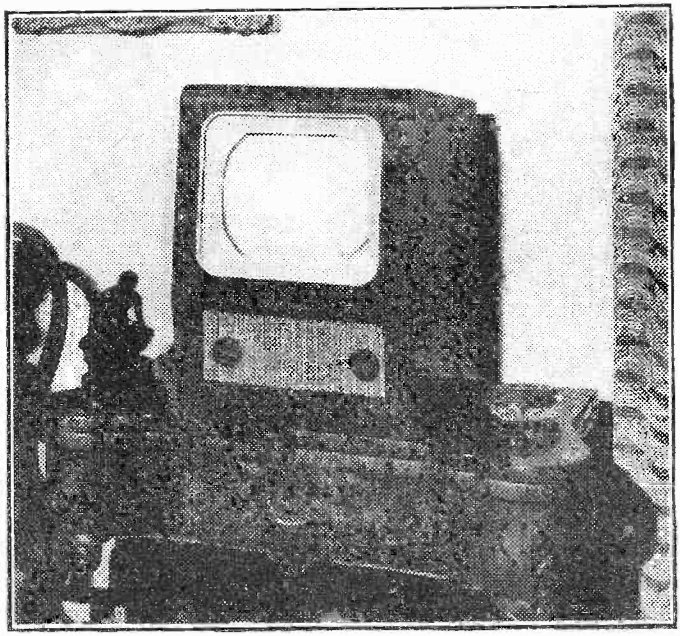
With the back cover removed and looking "in at the back," on the left side of the chassis is a perforated screening box containing a KT36 and a U35 E.H.T. rect. To the right is the U31 booster diode, behind this and in the centre of the chassis and protruding through, it is the metal H.T. Rectifier.

At the extreme left-hand side at the end remote from the rear of the chassis, is the KT33C frame output valve. Next to this is the smaller B36, with its twin heaters, and just to the right again is the Z63 sync. separator. The right-hand side is taken up by the vision and sound valves, the one at the far end being the sound output. All these valves are in black metal screening cans. A 10in. or 12in. tube may be fitted, depending on the model. An owner who intends to do his own repairs on these sets should always keep a spare B36 valve in hand, and whatever "weird" troubles crop up the insertion of this valve will often save a lot of headaches.

Line Hold

Now the most often heard complaint is that the "line hold" control has reached the end of its travel and will no longer lock the timebase. The B36 is often responsible, as half of this valve is used as the line oscillator. A slight change in its characteristic can cause this fault, although it may be blameless on the valve tester, and will probably work fine in another type of receiver.

This change of characteristic, can, and on most models, save the earliest ones, is counteracted by the addition of a 100 pF condenser from the line anode pin of the valve to chassis, which has a stabilising influence. The same effect is attained by the use of a 10 pF between the grid and anode pins of this part of the valve. Pin No. 5 is the anode and pin No. 4 is the grid. If the new B36 and the presence of the above condenser does not cure the fault, it is almost certain to be the 330 KΩ resistor in series with the grid of the B36. The resistor is located on the tag strip which is near the base of the KT36, and which carries the E.H.T. series resistor. The 330 KΩ resistor is very easily replaced as it is suspended in



H.M.V. Model 807A.

a very obvious position on this tag board. In some very early models it was 390 KΩ but in all cases a 330 KΩ should be fitted (orange, orange, yellow).

Frame Hold

The most usual other fault is that of "No frame lock" or "No sync. at all." This is nearly always due to the screen-dropping resistor of the Z63 sync. sep. going high. This resistor is a very small 680 KΩ and is mounted on the tag board that runs from the base of the KT33C to the Z63 valves. If the lead from Pin No. 4 of the Z63 is traced, no difficulty should be found in locating it. It is important to replace this with a 680 KΩ ½ watt to achieve trouble-free operation of the sync. separator.

Picture Jump

If the frame time base has the "jitters," the trouble can usually be located in the frame oscillator transformer. This is mounted above the chassis and two of its leads go direct to the B36 valve. A measurement of its primary should read 300Ω This defective primary can cause loss of frame sync, loss of height, and when the winding really goes "high," loss of line sync. as well. This is because the frame oscillator is no longer drawing its current from the primary, but is coming through the load resistor of the sync. sep., thus upsetting the operation of this stage.

Fold-over

A fold-over at the bottom of the raster is usually caused by a defective KT33C valve (frame output) and this should be replaced. The bias resistor of this valve should be examined and measured at the same time (2.2 KΩ or 1.8 KΩ) as a defective valve can cause it to change its value. When a new valve is fitted some adjustment of the frame linearity control may be required to space out the lines at the top of the raster. This control is mounted on its own at the back centre of the chassis. If this control is not fitted, a variation of linearity can be achieved by changing the value of the bias resistor from 1.8 KΩ to 2.2 KΩ or the reverse. The addition of a slider would be advantageous, if one is not fitted, to achieve the best scan.

On these models lack of width is usually due to the H.T. rectifier losing its efficiency. However, if there is no other indication of this loss a .001 μF condenser can be wired direct across the line scan coils, that is, from one line tag to the other on the coils and when this is done an increase in width is achieved. This is a very worthwhile tip as it saves the purchase of a new metal rectifier. A picture which varies in width is often due to the KT36. Distortion of sound is nearly always due to the 4.7 MΩ sound interference limiter going "high."

No Sound

No sound can usually be traced to the DH77 losing its emission, or to its load resistor going open circuit. The DH77 is on the right of the chassis behind the first sound Z77. The screening cans of the Z77 valves

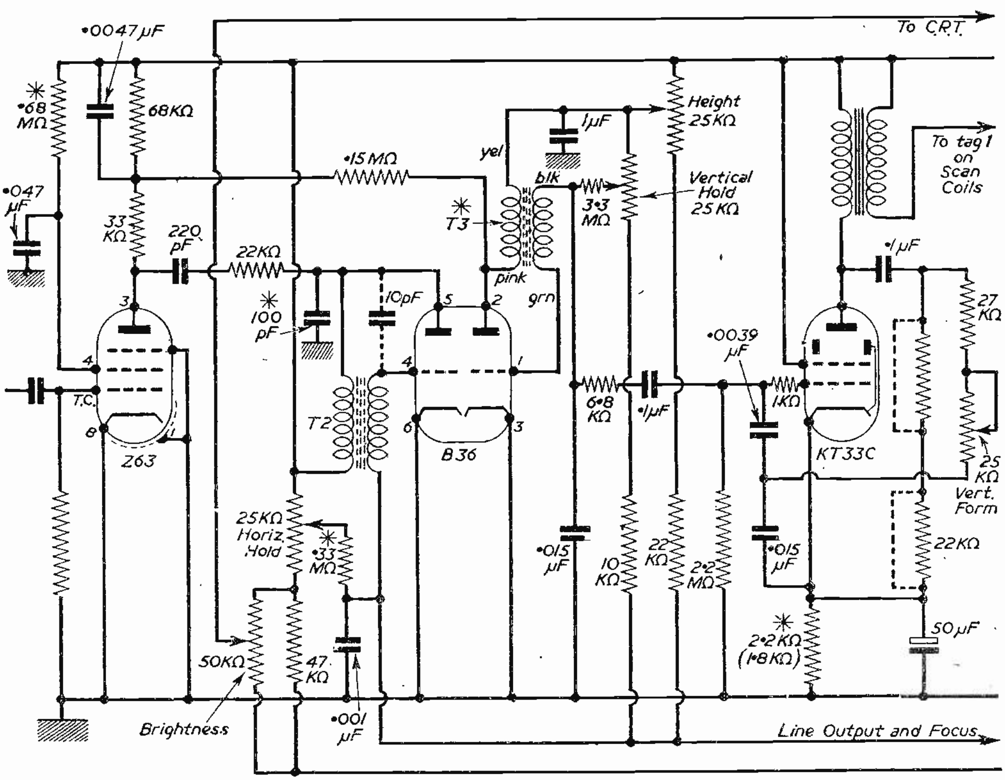


Fig. 1.—The components mentioned in the article are marked with an asterisk. Note : The component valves may be found to differ from those marked.

are often responsible for erratic vision (and sound) response. These must be in firm contact with their clips, and in one case I had to solder leads from these cans to chassis to achieve lasting stability.

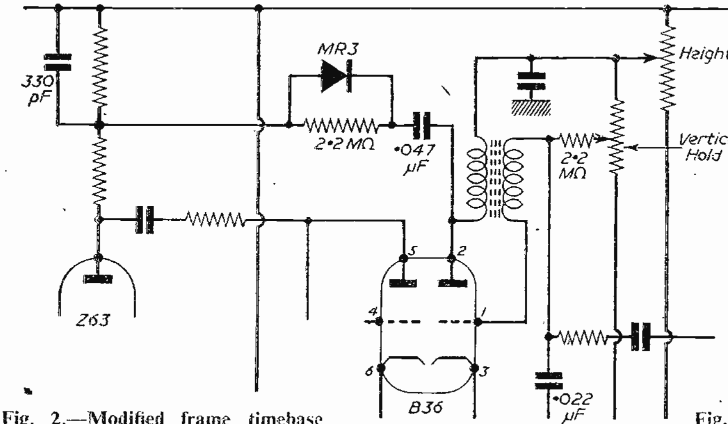


Fig. 2.—Modified frame timebase with component changes. Note addition of small rectifier shunted by 2.2 MΩ resistor.

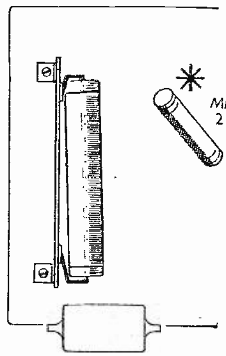


Fig. 3.—R.F. Unit—audio end. Note position of MR2 noise-limiter whose load resistor may be 3.3 MΩ in place of the 4.7 MΩ when valve-limiter is fitted.

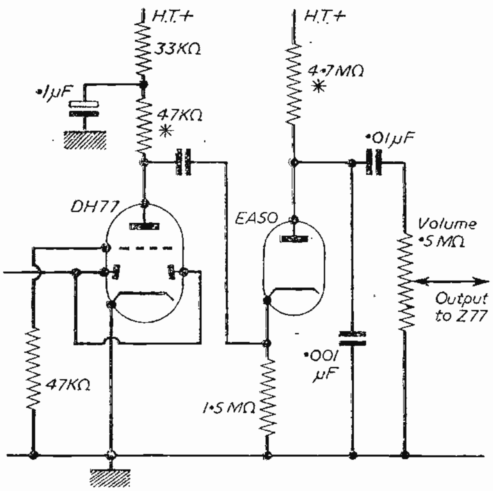


Fig. 4.—Valve-limiter circuit. The load resistor of the DH77 may be changed to 220 KΩ to minimise distortion with stressing of sibilants. Also the 4.7 MΩ resistor may be decreased to 2.2 MΩ.

Oxidised pins are also a prime source of fading and poor contrast, and the Z77 valves concerned should have their pins thoroughly cleaned to obviate this trouble. Care must be exercised in removing and replacing screening cans as the coiled spring in the top of each can will " nip " off the top of these small valves quite easily. The other troubles which beset these receivers are mostly tube defects, which can be, faint and blurred picture (low emission), cathode to heater leak, cathode to grid short. The first can sometimes be helped by re-activation, the second by a separate 12 volt transformer, the heaters place being taken in the heater chain by a resistor of 40Ω 10 watts, or by adjustment on the mains selector panel. This is obviously for A.C. mains only. Adjustment on the panel may cause loss of width.

The third fault may often be cleared by holding the bulb of the tube downwards and smartly tapping the rear of the base, best done by leaving the tube in the set where the bulb is protected and leaning the set forward. As this may result in an O.C. heater it should only be a " last resort " operation. A heater is less likely to break if it is still warm.

The next model in this series will be the very popular Pye B.18T and all its near relatives.

New Relay Cable

THE proposed introduction of supplementary television programmes has presented a number of problems to wire relaying companies. Much work has already been done in distributing the single programme at present available and additional programmes could follow the established practice, by using a different carrier frequency. This, however, would necessitate the provision of variable tuning facilities in each subscriber viewing unit.

British Insulated Callender's Cables Ltd. have developed a new range of precision cables in which the cross-talk interaction has been reduced to a remarkably low level. Using these cables, British Relay Wireless and Television Ltd. have engineered a television relay system capable of distributing a television programme on each pair of a screened quad cable at a common carrier frequency, thus reducing the subscriber's selective apparatus to a simple switch.

The network, now being erected to serve the area of South-east London, comprises two screened quads which between them provide four vision channels on a common carrier frequency and five audio channels, the fifth audio channel being the circuit provided between the screens of the two cables.

Polythene is used for the insulation, filling, belting and sheathing of these precision squads which have plain copper conductors and a lapped copper tape screen. A feature of this new range is that the three larger cables, intended for the main distribution network of a system, have the same characteristic impedance.

Frame Synchronisation from Mains

AN EXPERIMENTAL CIRCUIT

By G. L. Jepson

A METHOD is described of synchronising the frame timebase oscillator of a television receiver with the 50 c/s A.C. mains. Though postulated mainly as an academic curiosity, the method has possibilities in fringe areas, and it has been used experimentally with success. The timebase switching waveform, which is incorporated in the modulation waveform of the television transmission, is easily lost periodically during temporary fade-outs and even at times when the picture remains quite presentable. Except where " fly-wheel " circuits are employed, the slipping of frames occurs—a distracting phenomenon well known to fringe area viewers.

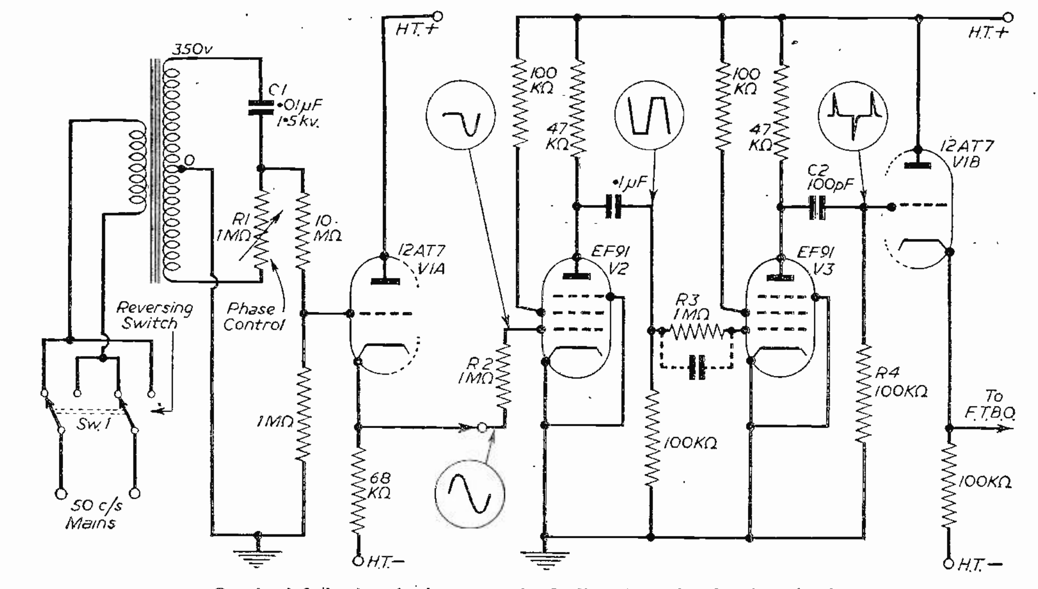
The BBC television transmissions are synchronised ultimately to the 50 c/s mains. Fortunately, Great Britain is blessed with an electricity supply grid system with an almost nationwide coverage, and a definite phase relationship must exist between all supplies taken from this grid. However, the receiver supply might be connected between the neutral conductor and any one of the three live phases which are spaced 120 degrees apart in time phase in the electricity supply, and further phase shift can be introduced by consumers' reactive loads. The method now described, therefore, necessitates the use of a phase-shifting network, as shown below.

The Circuit

Use is made of the earthed centre-tapped secondary winding of a transformer. This could be the existing H.T. transformer in an " A.C. only " receiver. From one of the outer (live) terminals of this winding, a capacitor C1 is connected in series with a variable resistor R1 to the other outer terminal. The required phase-controlled 50 c/s sine waveform is taken from the junction of C1 and R1. By suitable control of the value of R1, the network gives up to a theoretical maximum phase shift of 180 degrees, and in practice not much less. If this be inadequate for the purpose, however, the leads to the primary winding of the transformer can be reversed, and nearly 180 degrees of phase control in the opposite direction will be obtainable. In either case, the resultant voltage vector has constant amplitude. The purpose of the cathode follower V1A is to present a constant high impedance to the phase control network, thus preventing its functioning being upset by the circuits to follow.

Squaring

It remains to adapt the phase-controlled 50 c/s repetition rate, which is taken off the cathode of V1A, for suitable presentation to the frame timebase oscillator. It would not be satisfactory simply to utilise the raw sine wave, because " jitter " would arise due to firing occurring at an indefinite point in the cycle. Moreover, the cycle lasts much longer than the time allocated for frame sync signals and post-sync frame suppression. Hence, the sine wave is squared and differentiated in order to produce pulses of duration within the prescribed limits. The squaring is carried out, either by purely overloading an amplifier with too great an input amplitude, or with the aid of the circuit shown, which effectively functions in a similar manner and which was designed as a general purpose squaring circuit. The negative swing of the sine wave input rapidly runs through the grid base of V2 and shuts the valve off, causing the anode to rise sharply to H.T. potential. The positive swing of the input is shorted by grid current flowing through R2, and V2 is rapidly made to conduct, with a consequent rapid fall in anode voltage. Accordingly, the circuit features are designed to satisfy the con-



On the left is the phasing network, feeding the pulse forming circuit.

ditions for efficient squaring. These are : (1) Short grid-base video voltage amplifying valve. (2) Large grid self-bias resistance but total grid-to-cathode path not greatly to exceed one megohm, and (3) Large value of anode load resistance to ensure good anode "bottoming," bearing in mind the conflicting requirement that this value should not be too large, because its self capacitance must be kept down in order to accommodate a large bandwidth, since the rectangular waveform generated may be analysed as a fundamental sine wave which is rich in harmonic components up to a high order. The grid resistor R3 may require to be shunted by a capacitor of a few micro-microfarads for high-frequency compensation of the input capacitance of V3. The valve V3 represents a further stage of squaring similar to V2, and an order of magnitude in rise time reduction is obtained again at this stage. The rectangular waveform is differentiated by a network whose time constant is short, compared with the pulse duration. (C2 and R4.) This gives a positive-going and a negative-going spike corresponding to each rising edge and falling edge, respectively. It must be borne in mind that sufficient spike duration and amplitude must be preserved, by suitable choice of C2 and R4, fully to re-set the particular oscillator to be triggered. The spike of sign not required, together with any undesired overswing in the wanted spike, may be shorted out by a diode. Though the cathode follower V1B may not be essential in some cases, depending on the nature of the input circuit to the oscillator, it is generally desirable for overcoming loading problems. The connection generally existing from sync separator to the oscillator must be broken, and the signal now described is fed to the oscillator.

By the system described, it is not possible to obtain interlacing of alternate frames as is intended normally, unless some device is available to simulate the conditions obtaining at the end of alternate odd and even frames in the television waveform.

A Non-linear Resistive Element

A DESCRIPTION OF THE METROSIL AND SOME OF ITS USES

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

THE answer to a reader's query published in the May issue of PRACTICAL TELEVISION referred to Metrosil, which is an element possessing a non-linear volt-ampere characteristic, produced by Metropolitan-Vickers Electrical Co. Ltd. (not Standard Telephones as originally mentioned).

In view of the interest evidenced so far as Metrosil for television application is concerned, it is felt that a short article in this connection would be of general interest to constructors and experimenters.

The Properties of Metrosil

For general use Metrosil takes the form of either a round or square rod, or a disc, and from the composition aspect appears very similar to that of an ordinary carbon resistor. As opposed to an ordinary resistor, however, which follows faithfully Ohm's law, the current in the Metrosil can be made to rise approximately 20 times simply by doubling the voltage across it ; and further, by trebling the applied voltage the current increases by approximately one hundred times. This property of Metrosil is shown in graphical form by Fig. 1, and can be expressed mathematically as $I = KE^a$—where I is the current, E the applied voltage, and K and a are constants.

The value of K depends mainly on the physical characteristics of the element, while a is mainly dependent on its make-up. A normal Metrosil element has a value a of 4 or 5, which means that the current in the element varies as the fourth or fifth power of the applied voltage. (R. W. Sillars, "Metrosil" "The Metropolitan-Vickers Gazette," July, 1944.)

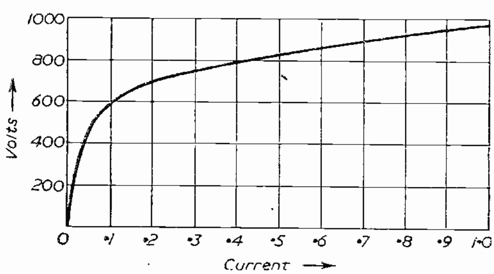


Fig. 1.—A graph showing the non-linear volt-ampere property of Metrosil.

Applications

Before proceeding it should be mentioned that, as opposed to a Thermistor, a Metrosil is primarily a voltage operated device and, for normal application, use is not so frequently made of its inherent negative temperature-coefficient, although in certain circuits it may be desirable to allow this characteristic to compensate for the positive temperature-coefficient

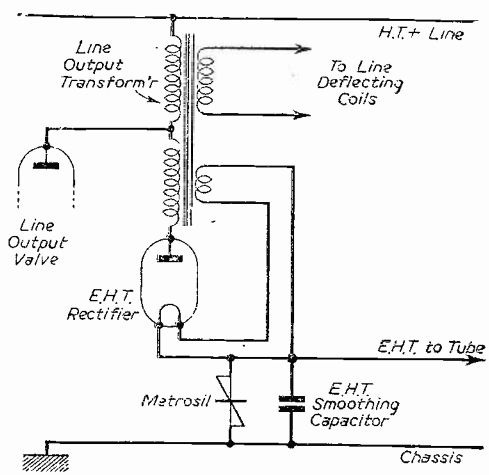


Fig. 2.—Showing how Metrosil can be used to enhance E.H.T. regulation.

of a copper coil which might also be included in the network.

A typical application for Metrosil in a television set is shown in Fig. 2. Here the element will be seen to occupy the position of a bleeder resistor in the E.H.T. system. It does, in fact, load the E.H.T. system to a varying degree, but the actual magnitude of loading depends on the voltage. If, for instance, the voltage tends to rise as a result of a reduction in beam current—due to the overall brightness level

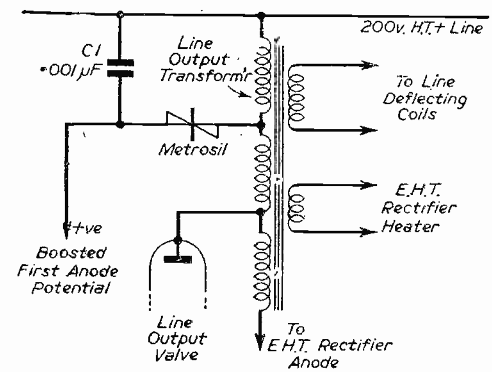


Fig. 3.—Circuit showing how Metrosil can be used to obtain a boosted first anode potential.

of the picture falling—the voltage across the Metrosil will also rise, and as a consequence it will pass more current. This rise in E.H.T. current will, therefore, counteract the rise in voltage, and in this way maintain a fairly even E.H.T. loading, irrespective of beam current. The same effect will, of course, occur should the picture become brighter, and the E.H.T. voltage have a tendency to fall. It can be clearly seen, therefore, how a considerably enhanced E.H.T. regulation can be achieved in certain circuits by the non-linear volt-ampere characteristic of a Metrosil element.

H.T. Boost

Another application of this versatile element is an aid to obtaining a first anode potential for a tetrode picture-tube. A potential here in the region of 300 volts or more is desirable to provide optimum focus, and in certain sets 200 to 250 volts represents the maximum D.C. voltage available.

A suitable pulse voltage can often be found on one of the inductive components associated with the line timebase. This voltage can be rectified by a Metrosil and used quite successfully as a first anode potential. Fig. 3 shows a typical circuit of this arrangement in which the pulse voltage is picked up from a tapping on the line output transformer. This produces about 200 volts above the H.T. line potential across C1.

It is often possible to obtain a pulse potential of suitable magnitude from the blocking oscillator transformer or from a feedback winding on the line output transformer, while in certain cases the voltage which is developed across the line deflecting coils can be used. In all cases, however, the revalent voltage is in the form of a pulse which is developed in the line output stage during the line flyback. (Gordon J. King, "Energy From the Line Flyback," PRACTICAL TELEVISION, September, 1951.)

Pulse-voltage rectification takes place mainly owing to the relatively low A.C. impedance, as opposed to D.C. resistance, of Metrosil. This characteristic can also be used to advantage in the cathode circuit of a video amplifier valve. Fig. 4 shows such a circuit in which the Metrosil acts quite successfully as a bias resistor, but owing to its low A.C. impedance it tends to prevent the feedback of inverse video voltages. It can, therefore, be compared in operation

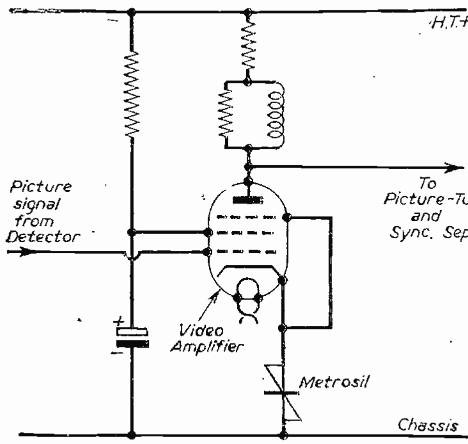


Fig. 4.—A Metrosil in the cathode circuit of a video amplifier assists in maintaining a linear response.

to a bias resistor by-passed by an infinitely large value capacitor to minimise attenuation at the low video frequencies.

In conclusion it should be mentioned that the three briefly described Metrosil applications must not be considered exhaustive. For in the field of electronics generally it has hosts of applications, some of which it is hoped may now appear obvious to the experimenter.

Books Received

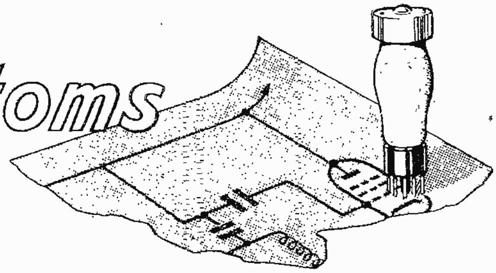
Decibel Tables, Power and Voltage Ratios. British Sound Recording Association ; 8 pp. small quarto, paper covers ; 1s. 2d.

THIS pamphlet is a reprint from the tables which appeared in official journal of the British Sound Recording Association.

"The Oscilloscope At Work," by A. Haas and R. W. Hallows, M.A.(Cantab.), M.I.E.E. Published on June 16th 1954, at 15s. 0d. (postage 6d.) for "Wireless World" by Iliffe and Sons Ltd. Size 8¾in. x 5½in. 172 pages. 102 diagrams and 217 oscillograms.

LIST of Contents : Preface by R. W. Hallows—General Characteristics—Investigating Electrical Magnitudes—Audio-Frequency Amplifiers—Radio-Frequency Amplifiers—Oscillators—Rectifiers and Detectors—Modulators—Phase-Changing and Wave-Shaping Circuits—Oscilloscope Operating Troubles—The Television Receiver—Improvements and Additions—Index.

Fault Symptoms



THE CAUSES OF COMMON FAULTS, AND METHODS OF CORRECTION

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

(*Continued from page 112, August issue.*)

THE defects described last month are also influenced by the Miller effect. We can clearly realise, therefore, that disturbed wiring will almost certainly impair the efficiency of the vision section as a whole. Due to the Miller effect, an alteration in electrode potentials of associated valves, especially the grid-bias potential, will also tend indirectly to alter the magnitude of capacitances reflected across the tuned circuits, apart from reducing the stage gain as a direct cause.

A dim picture as a result of low-vision channel sensitivity is frequently accompanied by impaired synchronising performance, particularly so far as line synchronising is concerned, the line-hold generally being very critical, often with the top of the picture wobbling to and fro as though affected by a strong breeze (see also " Synchronising Defects "). The contrast control under such conditions is nearly always set at maximum and, in an endeavour to obtain a brighter picture, the brightness control is generally much too far advanced, thereby bringing into display the frame flyback lines.

Check Aerial System

It is of extreme importance to remember that an inadequate aerial signal is liable to provoke synonymous symptoms in this respect, coupled with, perhaps, excessive picture " noise." " Noise," in this sense, meaning the grain effect displayed over the entire background of the dim picture. Little assistance is generally yielded by the use of an aerial pre-amplifier in such a case, for such an inclusion would, most likely, magnify the picture " noise " to an extent that would make it necessary to operate the set with a less advanced setting of contrast anyway, and no marked improvement would, therefore, be achieved.

The only really worthwhile solution here lies in experimenting with the aerial system itself in an endeavour to acquire an enhanced signal pick-up. It is advisable to consider the receiving aerial system as the weakest link in the transmitting receiving chain, and for this reason, particularly in so-called fringe areas of low signal to interference ratio, the aerial MUST receive extra special attention. The use of multi-element arrays connected to the receiver through high-quality low-loss feeder are factors absolutely essential for good fringe area reception.

For the sake of a good picture it is much better to spend a few extra pounds on a good quality, high-gain aerial system than attempting to strengthen a poor signal from an aerial of dubious characteristics by hopefully adding a high-gain pre-amplifier. This was recently illustrated to the author when asked to advise on an interference-free system 60-odd miles from the Midland Channel 4 transmitter in the low-lying centre of the interference-infested City of Oxford. Aerials of mediocre gain were experimented with, together with pre-amplifiers and filters. Success was at last achieved—negligible interference on a large screen projection receiver and a feeder signal in the region of 150 microvolts—by using, without a pre-amplifier, a double four-element array, providing a vision gain of approximately 14 db. over a standard dipole. The photograph at Fig. 59, shows the J-Beam array positioned on the main chimney stack of the well-known Union Society.

Ghosts

In difficult cases, especially in towns and hilly country, the position of the array for optimum signal pick-up and minimum interference may be extremely critical. Plenty of time should be devoted to the siting of the aerial, and the employment of a simple field type telephone system (ex-Government) between viewer and aerial rigger provides speedy assistance in orienting the array for maximum signal and minimum interference.

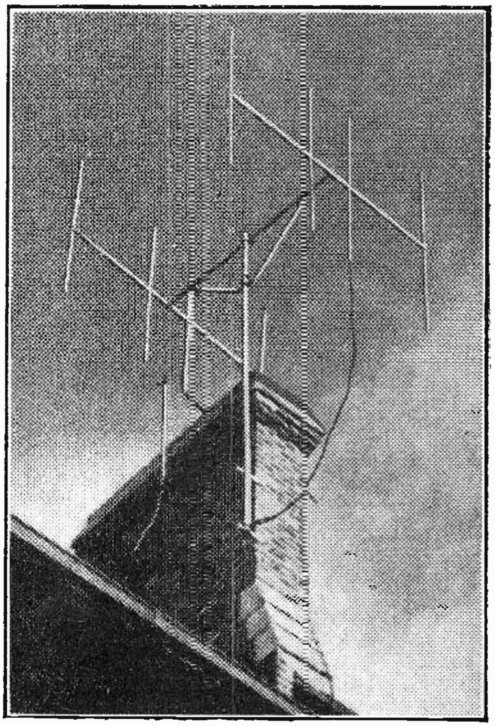


Fig. 59.—This type of double four-element aerial system is often essential for good pictures in fringe areas.

In areas where ghost interference is troublesome the telephone represents an invaluable helpmate. Although it is not intended to dwell too long over aerial installation problems at this stage, it would be worth mentioning that in areas exhibiting standing-wave conditions (resulting in ghost interference) the precise position of the array may be even more critical. Moving the aerial from one corner of the chimney-stack to another corner of the same stack, for instance, may make the difference between a good picture and a very poor picture, or, in certain cases, no picture at all! Moreover, a good picture may be obtained when the aerial is mounted *below* the maximum available height. Buildings can be successfully used as screens to minimise ghosting and interference of the impulsive kind, including car interference.

Check R.F./I.F. Decoupling and Coupling

A fall-off in efficiency or the total collapse of a decoupling or coupling capacitor associated with the vision stage is another possibility that must receive due attention. Faults of this nature are liable to prove responsible if, for instance, the symptom (reduced sensitivity) was sudden. If sound volume is also affected the first two or three stages which are common to both sound and vision must be suspected. The sudden development of a defect in the aerial system has also been known to provoke the same symptom.

Suspect the Picture-tube

From the picture-tube viewpoint a dim picture is, in most cases, caused by a worn-out tube. This condition is evidenced by the following: (1) a maximum setting of contrast may not be necessary; (2) if an advanced setting of contrast and/or brightness is used the picture may tend to resolve in negative form; (3) the picture may possess poor definition and bad focus, even though an optimum focus point is available on the focus control; (4) the contrast ratio (ratio between black and white) may tend to be reduced, and the peak-white content of the picture will almost certainly be limited.

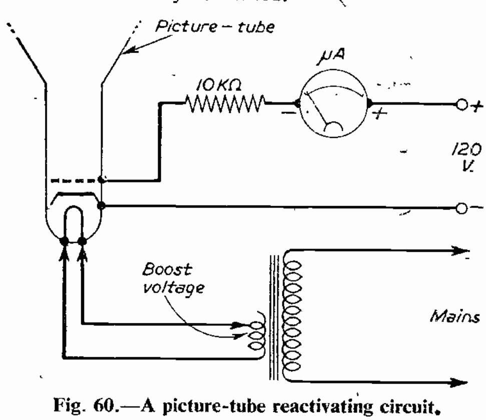


Fig. 60.—A picture-tube reactivating circuit.

A receiver exhibiting the above symptoms will, with little doubt, respond to a new picture-tube. There are various defects that can occur in a tube to impair its light-emitting efficiency. Low emission is one of the more common causes; and in this respect the heater deteriorates with age to result in a reduction of electrons that it produces for a given heater current. Sometimes low emission is caused by an internal short-circuit in the heater itself so that only a portion of it contributes towards producing electrons.

Fluorescent screen deterioration is another factor that reduces its light-producing efficiency. This may be caused by negative ionic bombardment destroying the fluorescing quality of the screen phosphors evenly, or the effect may be aggravated towards the centre of the screen, to give rise to the well-known symptom of an ion-burn.

Insufficient vacuum can also impair the operating efficiency of a picture-tube, though the accompanying symptom here may not be so much a dim picture as a picture lacking in definition plus poor focus. This is sometimes caused by a flaw during manufacture, though it does often develop with use, particularly if the tube is overrun or if the tube has been used for any length of time with the ion-trap magnet incorrectly adjusted.

From the emission aspect there are several palliative measures that can be adopted in an endeavour to revive or reactivate a faulty picture-tube and thereby endow it with a further lease of useful life. Essentially, each method is centred on overrunning the heater by 25 per cent. or 50 per cent. It must be stressed, however, that success in a given case is by no means certain, and for this reason the attempt should be made only on obviously worn-out tubes, for it is possible, of course, that the process of considerably overrunning the heater may render a weak tube completely inoperative.

One method which does work, provided the tube heater can stand the strain, is by permanently overrunning the heater by connecting it to a higher voltage source, derived either from a separate transformer, or picking up a low tension voltage from another part of the set. A two-volt tube heater, for instance, can be energised from a four-volt or 6.3-volt valve heater line with a suitable series resistance. For the sake of the heater life the applied boost voltage should not exceed 15 per cent. to 25 per cent. of normal.

Another method which does not necessitate a permanent overrun, is to overrun the heater by 25 per cent. or more for a period depending on how rapidly the heater responds to treatment. This should be done with all other electrodes disconnected, and the process should be continued for not longer than, say, five minutes at a time, after which the tube should be reconnected to the set when the success or otherwise of the operation can be observed. If the operation is not wholly successful the first time, it is quite in order to repeat it.

Certain tubes may not respond to this treatment at all, and in order to determine as quickly as possible by a less hit-and-miss method whether or not the operation is going to succeed, the tube grid electrode can be wired as an electron collector (anode) and the heater emission measured. The general circuit arrangement is shown in Fig. 60, and as will be seen a positive potential with respect to cathode is applied to the grid electrode through a 10,000-ohm limiting resistor and a microammeter. A 120-volt battery, or a mains derived D.C. potential of similar magnitude can be used for this purpose, whilst the boosted heater voltage can be picked-up from any convenient source as already described.

The reading on the microammeter can be taken as an indication of heater emission, which will be seen

(*Continued on page* 165)

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3Q4(N18)	9/-	6K8GT	9/-	12A6	6/9	EZ40	11/-	EC52	5/9
3Q5	10/6	6J6	8/6	12AU7	9/-	EM31	9/-	EC91	15/-
3D6	5/-	6L6G	9/-	12AT7	9/6	EY91	9/-	EF36	6/6
3S4	8/6	6L7M	7/6	12BA6	11/6	EY51	13/6	SP61	3/9
3V4	8/-	6N7	7/6	12C8	8/-	EZ41	11/-	EK32	8/-
4D1	3/-	6P26	10/-	12H6	5/-	HD14	10/-	SP41	3/6
42	8/-	6Q7G	9/-	12J5	6/-	H63	7/9	EF50	6/-
5U4G	8/6	6Q7GT	9/-	12K7	9/-	H30	8/-	EF50 Syl	8/-
5Y3G	8/-	6SG7	7/6	12K8GT	9/-	HL23DD	8/-	EA50	2/-
5Z3	8/6	6SH7	6/-	12SG7	5/6	KT2	5/-	VR116	4/-
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6A7	9/6	6SK7	6/9	12SJ7	7/6	PX25	15/-	EF8	6/6
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6AG5	7/6	6SS7	8/-	12SQ7	8/6	KTZ41	6/-	EL32	8/-
6AK5	9/-	6U5G	8/6	12Q7	9/-	KTZ63	6/6	TT11	6/-
6AL5	7/-	6V6G	7/6	20D1	10/6	LN309	11/6	VP23	8/-
6AM6	7/6	6V6GT	7/6	20F2	11/6	MH4	5/6	VU39	8/6
6AT6	10/-	6X4	8/-	20L1	11/6	MS/PEN	5/-	VU111	3/6
6AM5	9/-	6X5GT	7/6	20P1	12/6	N78	11/6	VU120A	3/6
6B8G	4/-	6X5G	7/6	25A6G	9/6	PEN25	8/-	VU133	3/6
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6C4	8/-	7C5	8/6	25Z4G	9/-	PEN220A	4/9	W81	16/-
6C5GT	7/6	7C6	8/6	25Z6GT	8/6	PL33	9/6	X65	10/-
6C6	6/6	7H7	8/6	278U	13/-	PL81	13/6	X66	11/6
6C9	8/-	7R7	8/6	35L6GT	8/9	PL82	11/6	X79	11/6
6D3	7/6	77	8/-	35A5	8/6	PL83	13/-	Y63	9/-
6D6	7/3	7S7	8/6	35Z4GT	8/6	PY82	11/6		
6F1	12/6	7Q7	8/6	50L6GT	8/6	PY80	11/6	**BARRETTERS**	
6F6G	7/6	7Y4	8/6	ATP4	6/6	PY81	11/6	Type 150A	
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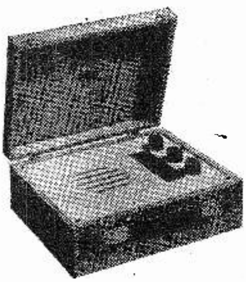

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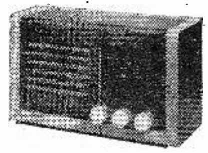

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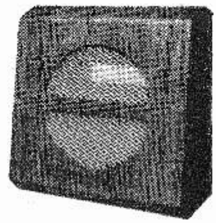

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GOODMANS	5in.	Round type	14/9
PLESSEY	5in.	Latest type	13/6
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LECTRONA	6½in.	With transformer	18/-
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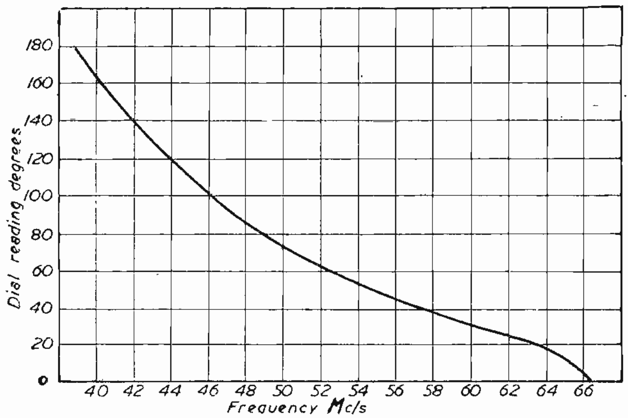
oscillations which provide horizontal bars the switch S1 is turned to the position where feedback from V3 to V2 is positive. The feedback control R19 and the reaction control R9 determine the number of bars. These controls are adjusted until a steady pattern of horizontal bars appears on the screen of the C.R.T. of the TV set. Provided one is content with a number of bars between two and six, the adjustment of R9 and R19 is not difficult. The instrument used in this way permits the frame timebase linearity to be adjusted.



Graph 1.—Calibration graph for the tuning dial.

To draw vertical bars on the C.R.T. S1 is set to the position for negative feedback, and the reaction control is turned up so that the detector is oscillating. In this condition V2 and V3 start oscillating at a frequency between 10 Kc/s and 30 Kc/s when R19 is set to a low value. No doubt the determining factor is the leakage inductance of the output transformer T1. The writer used a small Elstone multiratio output transformer, type MR/T. In this application the instrument permits the line timebase linearity to be adjusted; it also permits ringing to be observed if it is taking place in the R.F. stages of the vision unit or in the video amplifier.

Adjusting Number of Bars

A larger number of vertical bars could be obtained by using an auxiliary oscillator, such as the Avo, the output of which was applied to R15. With a large unmodulated output the frequency of the auxiliary oscillator was set to a value in the range 80 to 100 Kc/s. At a frequency which was a multiple of the line timebase frequency a steady pattern of vertical bars was obtained. When the modulation of the auxiliary oscillator was switched on, the vertical bars were modulated by the audio frequency of the auxiliary oscillator, and the resulting pattern permitted both the line and frame timebases to be adjusted for linearity. It was necessary to set the frame timebase to a sub-multiple of the audio frequency modulation.

When reaction is used on the medium wave-band it sometimes leads to a loss of "top" because the tuned circuit is too sharply tuned. On the ultra short-waves, the danger is less likely since the audio frequency spectrum is such a small fraction of the resonant frequency of the tuned circuit. The writer is satisfied with the quality of the sound unit; some may consider the output is not large enough, although it is adequate for the writer's needs. They could, presumably, take the output from C9 and apply it to an ordinary A.F. amplifier.

θ	f	f^2	$\frac{1}{f^2}$
0	66.2×10^6	4382×10^{12}	2.282×10^{-16}
20°	63.2×10^6	2503×10^{12}	2.503×10^{-16}
40°	57.2×10^6	3272×10^{12}	3.056×10^{-16}
60°	53×10^6	2809×10^{12}	3.506×10^{-16}
80°	49×10^6	2401×10^{12}	4.165×10^{-16}
100°	46.2×10^6	2134×10^{12}	4.686×10^{-16}
120°	43.8×10^6	1918×10^{12}	5.215×10^{-16}
140°	42.1×10^6	1772×10^{12}	5.646×10^{-16}
160°	40.4×10^6	1632×10^{12}	6.128×10^{-16}
180°	38.8×10^6	1505×10^{12}	6.646×10^{-16}

The calibration chart.

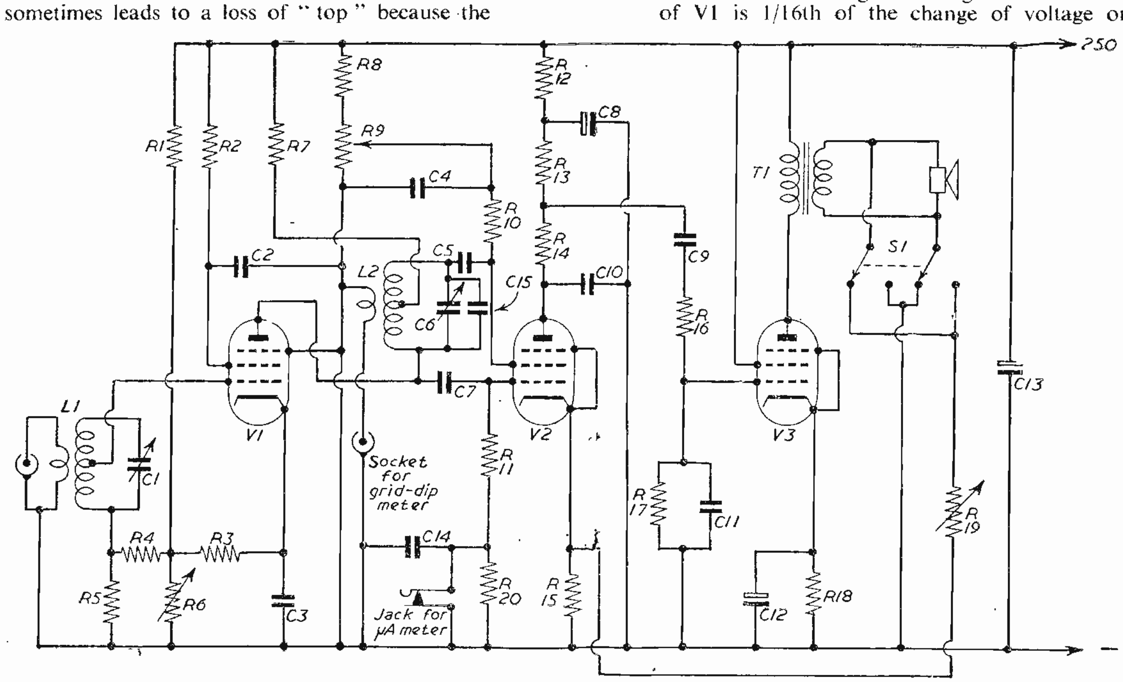
TABLE I

A coil of five turns with a winding length of ¾in. on a paxolin former ¾in. in diameter is tuned as follows:—

	Fixed capacitor	Variable capacitor
Channel 1: Sound: 41.5 Mc/s Vision: 45 Mc/s Range required: 41-50 Mc/s	10 pF	A capacitor of 25 pF, which had originally four stator plates, two of which were removed.
Channel 2: Sound: 48.25 Mc/s Vision: 51.75 Mc/s Range required: 48-52.5 Mc/s	12.5 pF	The same capacitor with three stator plates removed.
Channel 3: Sound: 53.25 Mc/s Vision: 56.75 Mc/s Range required: 53-57 Mc/s	7.5 pF	As for Channel 2.
Channel 4: Sound: 58.25 Mc/s Vision: 61.75 Mc/s Range required: 58-62.5 Mc/s	2.5 pF	As for Channel 2.
Channel 5: Sound: 63.25 Mc/s Vision: 66.75 Mc/s Range required: 63-67.5 Mc/s		As for Channel 2.

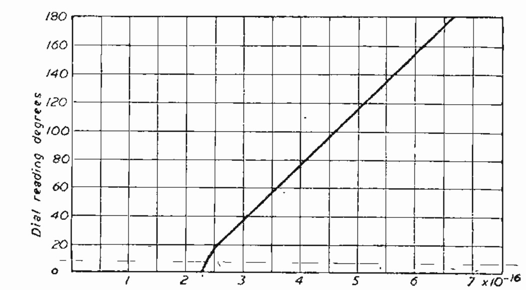
Construction

Most details of the circuit will be self explanatory in view of the previous notes, but perhaps it is worth adding that R6 is a R.F. gain control. R4 and R5 form a potential divider, the purpose of which is to ensure that the change of voltage on the control grid of V1 is 1/16th of the change of voltage on the suppressor grid when R6 is operated. This arrangement helps to keep the input capacitance of V1 constant. Since V3 is an R.F. valve it is very desirable to ensure that no R.F. reaches its grid; the purpose of C10 and R16 is to prevent this.



Theoretical circuit of the sound unit and pattern generator.

When the sound unit is being constructed some experimental work may be necessary to ensure that C6 covers the range 41 to 49 Mc/s. In the writer's set L1 and L2 were coils of nine turns, centre tapped, wound eight turns to the inch on a paxolin former ¾in. in diameter. C6 took the form of two capacitors which originally had four rotor plates each; their maximum capacitance was probably 30 pF. One capacitor had two of the plates removed; a capacitor of 5 pF was wired in series with the other one, and these two were connected across the first. When the sound unit was being adjusted, immediately after construction, the second capacitor was set to such a position that the first one could cover the range 41 to 49 Mc/s. Subsequently the second one was not touched.



Graph 2.—Calibration chart for the alternative arrangement.

It is suggested that when the sound unit is being constructed a coil of five turns, spaced over a length of ¾in., on a paxolin former with a diameter of ¾in., should be used for the second tuned circuit. The coil is centre tapped. The writer used 22 s.w.g. wire. When the constructor is first trying the set he can tune the coil with a capacitor of 25 pF or 30 pF, and he should find that he can pick up the sound and vision frequencies of the channel in which he is interested. Having thus been assured that the set is working satisfactorily, he then has the task of arranging the circuit so that about 140 deg. rotation of the tuning dial of the second tuned circuit corresponds

LIST OF RESISTOR AND CONDENSER VALUES

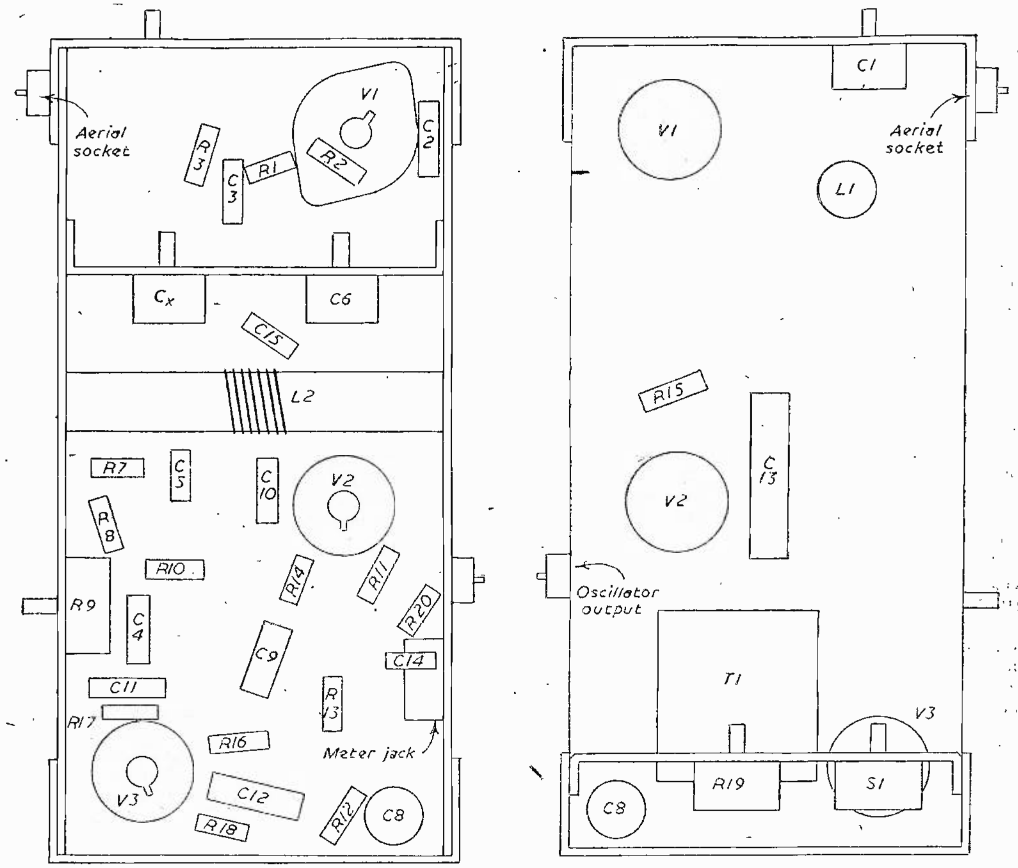
R1—68 kΩ
R2—500 Ω
R3—100 Ω
R4—5 kΩ
R5—75 kΩ
R6—25 kΩ variable
R7—500 Ω
R8—25 kΩ
R9—50 kΩ
R10—47 kΩ
R11—100 kΩ
R12—5 kΩ
R13—100 kΩ
R14—10 kΩ
R15—27 Ω
R16—100 kΩ
R17—470 kΩ
R18—120 Ω
R19—500 Ω variable

C1—25pF variable
C2—.01 µF
C3—.01 µF
C4—.01 µF
C5—50 pF
C6—15 pF
C7—100 pF
C8—32 µF electrolytic
C9—.01 µF
C10—500 pF
C11—100 pF
C12—50 µF 50 v. Elec.
C13—8 µF Elec.
C14—.01 µF
C15—See text.

to the range of frequencies in which he is interested.

For accurate frequency calibration it is desirable that the vision and sound frequencies should not correspond to positions within 20 deg. of the settings for maximum and minimum capacitance. At this stage the constructor will find it convenient to replace the 25 pF variable capacitor by one of lower value.

If the range of frequencies covered by the tuning capacitor is too limited the constructor should reduce the value of his fixed capacitor and, if necessary, increase the inductance of the coil, either by reducing the spacing of the end turns or, if the inductance cannot be increased sufficiently by this method, by adding a turn.



Underside and top chassis layouts for the unit. Note that C6 should be insulated from the chassis. Cx was an experimental condenser and is replaced by C15.

The writer began with a capacitor of 25 pF which had four stator plates. For Channel 1 two of the stator plates were removed; for the other channels three of the stator plates were removed. (It is emphasised that, if the set is to be frequency calibrated by plotting dial indication against the reciprocal of the square of the frequency, in the form of a straight-line graph, it is essential to have a capacitor with semicircular vanes.)

It is then necessary to add a fixed capacitance in parallel with the variable, and for this it is convenient to have a number of 5 pF capacitors which can be connected in series or parallel to give the desired effect. Table 1 shows the values required, but since stray capacitance is large in comparison with the lumped capacitance which is added, and since stray capacitance is likely to vary from set to set, the constructor may have to try values which are slightly different.

Variations

Many variations are possible; at one stage the writer used a coil of eight turns, spaced over a length of 1in. on a paxolin tube with a diameter of ⅜in., for Channel 1. A fixed capacitor with a value of less than 5 pF was required. When the fixed capacitor was removed the coil was suitable for Channel 2. A coil of seven turns, with the same winding pitch, could be tuned from 51 Mc/s to 56.7 Mc/s. When the spacing of the end turns was increased the coil could be tuned from 52.3 Mc/s to 58.5 Mc/s, and was suitable for Channel 3. A coil of six turns was suitable for Channel 4.

Within the limits of the experiments which the writer has carried out the sensitivity of the second tuned circuit does not seem to depend on the L/C ratio of the tuned circuit; so far as Channel 1 is concerned, results seem rather better with the five-turn

(Concluded on page 184)

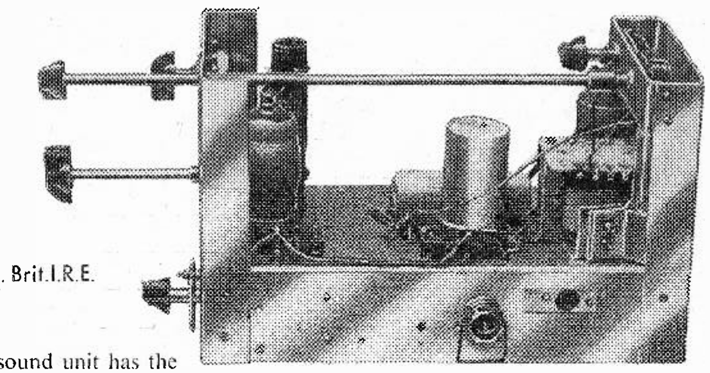
A Versatile Sound Unit

A SELF-CONTAINED UNIT

WHICH MAY BE USED ALSO

AS A PATTERN GENERATOR

By T. Palmer, Grad. I.E.E., Assoc. Brit.I.R.E.



THE use of reaction in a TV sound unit has the following advantages:

(a) For a given number of valves the sensitivity is higher.

(b) The sound unit can be used as a test oscillator for tuning the R.F. stages of the vision unit.

For this purpose it is desirable to have the R.F. stages of the sound unit tuned by small variable capacitors; the frequency of the tuned circuit should be between 41 and 49 Mc/s. During a transmission the unit is tuned to the sound frequency and the dial indication is noted; it is then tuned to the vision frequency and the dial indication of the variable capacitor is again noted. The tuning capacitor is 25 pF; it should have semicircular vanes. The dial readings are then plotted against $1/f^2$, where f is the frequency in Mc/s of the sound and vision transmissions. The two points are then joined by a straight line, which then serves as the calibration curve for the range 41 to 49 Mc/s.

To prevent the reacting detector interfering with other TV sets when reaction is turned up too high an R.F. buffer stage is interposed between the detector and the aerial. To help in screening the aerial from the detector it is convenient to have the detector tuned circuit, L2 C6, below chassis and the tuned circuit to which the aerial is coupled above chassis; an SP61 is suitable for the R.F. stage since it has a top cap grid; an EF50 can be used for the detector since its grid pin is below chassis.

The circuit for the reacting detector should be such that the reaction control has very little effect on the tuning; the scheme in which the reaction control varies the voltage on the screen grid of the detector was found to be much better than others in which the reaction control takes the form of a variable capacitor.

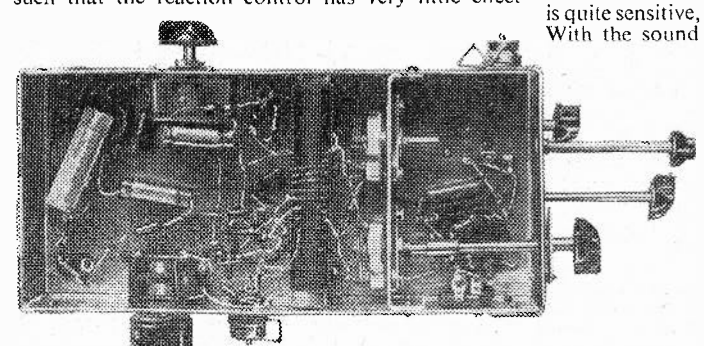
For the output stage another EF50 was used, since it happened to be available. Negative feedback was applied from the secondary of the output transformer to a resistance R15 in the cathode circuit of V2 via R19 which serves as a volume control.

Grid Dip Meter

Once the sound unit had been frequency calibrated, as described, a loop of one turn was added to L2 and this was connected to a Pye socket. A closed-circuit jack was wired in series with the grid resistor R11 of V2. The unit could then be used as a grid dip meter when a microammeter was plugged into the closed circuit jack. The dip was found to be quite sharp if the external circuit under test was loosely coupled to the Pye socket. For this application, of course, the reaction control R9 was tuned up until the detector started oscillating.

When it is desired to line up the vision unit of the television set, a 1 mA meter is wired in series with its diode load. The sound unit, used as a test oscillator, is set to the required frequency, and the appropriate circuit of the vision unit is adjusted to give the maximum reading on the 1 mA meter.

The writer's TV set uses a Pye 45 Mc/s strip, which is quite sensitive, and a very loose coupling is sufficient. With the sound and vision unit separated by about 6ft. a length of coaxial cable was connected to the aerial socket of the Pye strip, and it was found that a crocodile clip hooked on to the inner conductor of the coaxial cable served as an adequate pick up aerial at a distance of 3in. or 4in. from the Pye socket of the sound unit. In this application, of course, the reaction control R9 of the sound unit is turned up until the detector oscillates.



Underside view of the unit.

Pattern Generator

It was also found possible to use the unit as a pattern generator. To obtain low-frequency at this juncture to look-in at the double ion-trap protection assembly employed in the new range of Mazda picture-tubes. Such a protective feature is entirely new to Mazda tubes, for in the past screen protection has been yielded by the use of an aluminised screen coupled with a high vacuum. In the new tetrode range, however, a unique ion-trap gun assembly that combines the techniques of electrostatic and magnetic deflection is also embodied.

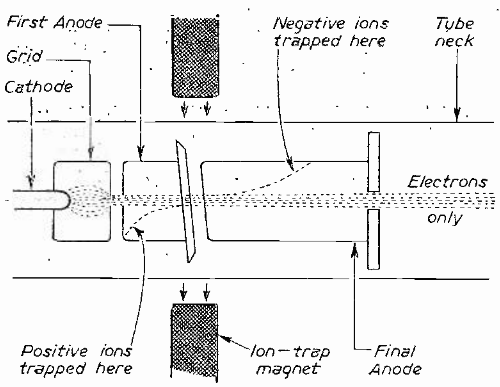


Fig. 62.—Illustrating the electron-gun assembly as used in the new Mazda tetrode tubes.

Before we consider the tube in detail it will probably be desirable to get straight in our minds a few of the associated governing factors. In the first place, it is probably known that both positive and negative ions are formed in a picture-tube by the ionisation of gas which is always present in a tube—for it is, of course, impossible to achieve a perfect vacuum.

What happens in the case of a positive ion is that the electrons in the gas atoms are displaced from their normal positions by the high velocity beam electrons, so that the atom splits up into positively charged ions and free electrons. The electrons contribute to the beam, while the positive ions, which are relatively large and slow moving compared with the high velocity beam electrons, tend to travel away from the positive—towards the cathode, which they eventually hit, and because of their large mass frequently cause damage in this connection.

It is thought that the negative ions are formed by neutral molecules of gas acquiring a negative charge from the beam electrons, though in some circles the possibility that they are emitted by the tube cathode due to secondary emission, when the cathode is bombarded by positive ions, is also considered. However, they are created, makes little difference to us at present, for since they are negatively charged they are strongly attracted by a positive potential, and therefore travel in the direction of the beam towards the screen, but—most important—because of their greater mass and other factors they are less susceptible to the influence of magnetic than electrostatic fields. This means, then, that while the electron beam is being focused and deflected magnetically during its travel along the tube axis the ions continue moving in their original direction, and converge outwards, to strike an area of screen near its centre (see Fig. 61), where they penetrate deeply—since they store more kinetic energy than the electrons—and over a period of time damage the fluorescent screen, as already described.

The gun assembly of the new Mazda tube is illustrated by Fig. 62, and as will be seen the main feature is the inclined gap between the first and final anodes. Further, the entire gun assembly, although formed on an axis straight within itself, is offset slightly from the axis of the tube neck.

So far as the beam electrons and ions are concerned the inclined gap and the difference in potential between the two anodes acts as an electrostatic deflector to pull the composite beam away from the normal axis of the tube, depending on the angle of incline, towards the inner wall of the final anode. To bring the electrons back on to course, but leaving the negative ions to impinge on the final anode without causing any damage, an ion trap magnet is used on the neck of the tube, whose field is adjusted to counterbalance the inherent electrostatic field.

As an additional feature, the positive ions are also deflected electrostatically towards the negative or lower potential gradient, and find themselves trapped inside the first anode, where they impinge on the inner face of this electrode without causing any damage to the cathode.

Uncontrollable Brilliance

Recalling our recent discussion relating to picture-tube control circuits, it should now be evident that the symptom of a brightly illuminated screen that cannot be corrected or brought to a normal working level, even when the brightness control is turned fully anti-clockwise, means that somehow or other a fault in the set is preventing the picture-tube grid from falling negative with respect to cathode. Let us get the picture more clearly in our minds by examining the circuit used in the video amplifier, vision interference limiter and tube control circuits, of the G.E.C. BT6641 series receivers (to be reproduced in the next issue).

We are well aware that the brightness contro and associated circuits are arranged to allow a positive excursion of tube grid potential, relative to chassis, from zero to a little below the positive potential at the tube cathode. Relative to tube cathode—that is, as an illustration, with the positive terminal of a testmeter connected to *cathode* and the negative terminal connected to grid—is exactly the same as saying the grid goes less negative as the brightness control is turned clockwise, or more negative as the control is turned anti-clockwise.

The first test on a set exhibiting uncontrollable brilliance should, therefore, be that of ascertaining whether the grid circuit is working normally. A voltmeter is essential for this test, and furthermore, a fairly sensitive instrument is desirable in order to minimise the resistive shunting imposed on the grid circuit by the meter.

For television work a testmeter having a sensitivity of at least 10,000 ohms per volt is essential; a 20,000 ohms per volt one is even better. Such instruments, providing a multitude of ranges and various tests, are now readily obtainable, and are certainly much less expensive than might at first be realised. It should be the aim of every television experimenter and builder to acquire a versatile instrument of this nature; in fact, it can be safely said that very little service work can be done without one.

(*To be continued.*)

AERIALS FOR BAND III

SOME HINTS FOR THOSE WHO ARE GETTING READY FOR THE ALTERNATIVE PROGRAMMES

By Simeon Edmunds, A.M.T.S.

NOW that the frequencies on which the first two alternative programme stations will operate have been announced—Channel 8 (Midlands), 186-191 Mc/s, and Channel 9 (London and South Lancs), 191-196 Mc/s—much interest is being shown in the types of aerials necessary for reception on Band 3. Although questions of polarisation, power and location of transmitters are not yet settled, it is safe to make a number of assumptions about the arrangement and requirements of the receiving aerials which will be used.

Owing to the smallness of aerials, diffraction effects, transmitter losses and other causes the service areas of the Band 3 transmitters will be considerably smaller than those of the present Band 1 high power stations, and elaborate arrays will therefore be necessary at quite moderate distances. It is fortunate that their smallness at these high frequencies renders design and construction of such aerials comparatively easy.

Types of Aerials

Except in the case of those who are literally "next door" to the transmitter, indoor aerials such as the loft type will be out of the question, and at distances at which such an aerial provides sufficient signal strength on Band 1 an "X" or "H" type will normally be required for Band 3. Where an "X" or "H" would be needed on Band 1 a multi-element array will be required, and stacked and other elaborate arrays will, no doubt, be common. At distances corresponding to Band 1 fringe areas reception on Band 3 will not normally be possible.

It follows that in some cases an indoor Band 1 and an outdoor Band 3 aerial will be in use together, while in the majority of cases both will be of the outdoor kind. In rare instances, where Band 1 strength is high, a single Band 3 aerial may prove effective for reception of both programmes.

Ghosts

At the frequencies involved signals are much more easily reflected from near-by objects, and the position of the aerial in relation to them will therefore be much more critical. Trouble will, no doubt, be experienced from ghosts to a greater extent than on Band 1, but the use of the elaborate arrays which will commonly be necessary will offset this to some extent. "Exorcism" will follow the same procedure as at present, but small changes of position will have more effect.

Installation

The question of siting leads to the problem of installation, in which certain difficulties will have to be overcome. Where an outdoor Band 1 aerial is already fitted on a fairly long mast it may be possible to mount the Band 3 aerial on an extension bracket or arm, but in many cases a complete additional installation may be necessary. Much will depend on whether the polarisation of the two aerials is in the same plane or not.

Complete additional erections will present new difficulties, especially when a shared chimney stack is the only one on a pair of semi-detached houses, and the occupiers of both of them require two complete aerials. The stupid restrictions imposed by many local authorities may well make two-band reception in some council houses quite impossible; even now it is quite beyond the ingenuity of the best riggers to set up aerials in the correct direction without breaking some petty regulation or other.

Feeders

The various feeders now in common use have far greater losses at the higher frequencies, and many will prove unsuitable except at very close range. Air-spaced coaxial cable will be essential in most cases and separate feeders for the different aerials will be desirable. An alternative will be to use 300Ω twin feeder with a matching unit at the receiver end. This 300Ω feeder is cheaper than air-spaced coaxial, but it must be run well clear of gutters, etc., and not fixed down the wall as in common present-day practice. If circumstances such as a multi-point outlet system necessitate a single cable a filter unit will be needed at the junction of the two aerial lines.

Feeder arrangements and terminations will depend largely, of course, on the method of connection to the receiver or converter, and in this the user is in the hands of the manufacturer. For the constructor the most efficient method would be a change-over switch or merely the changing of plugs.

In cases of fairly high Band 3 signal strength a single feeder could be used and the Band 3 aerial connected to that for Band 1 by a length of feeder used as a matching transformer. This would necessitate the two aerials being close together, and if polarisations were the same could possibly cause trouble on Band 3 through the Band 1 aerial producing reflections. The length of feeder for correct matching would depend on the impedance of the Band 3 aerial, and could be found by trial and error without much difficulty.

Detailed Information

In the absence of more detailed information concerning the nature and location of transmitters these notes are necessarily of a general nature. Much can be established, however, from the study of development elsewhere, particularly in Canada, where somewhat similar two-band conditions exist. The experience behind the export and overseas divisions of our larger aerial manufacturers will no doubt be of great assistance in this respect.

T.C.C. CATALOGUE

IN last month's issue details were given of a new coloured catalogue which has been issued by the makers of the well-known T.C.C. condensers. We are asked by T.C.C. to make it clear that this particular edition is not available to the general public, but is for the use of manufacturers only.

NECESSARY EVILS

A B.B.C. PRODUCER DISCUSSES THE PROBLEMS ENCOUNTERED IN TELEVISION INTERVIEWS

By S. E. Reynolds

HOW wonderful it would be if all speakers in television programmes would "say their pieces" concisely and interestingly. But to expect this is to ask too much of life. We have only to recall how we have suffered at public functions from speakers who take far too long to get to the point and are then as dull as it is possible to be.

If speakers are bad in familiar surroundings how can they be expected to do better in a television studio, where everything is unfamiliar? Put yourself in the place of somebody seeing a studio for the first time. It appears crowded with bright lights and there are several cameras on wheels with a disconcerting habit of moving about the floor without apparent reason. Overhead there dangles a microphone at the end of an arm called a boom. Now and again a man known as the studio manager answers out loud a question which was inaudible to you. There appear to be lots of men and it is only by degrees that you learn something of their respective functions.

How in conditions such as these can you be expected to give a good performance? Yet speakers in television do not "dry up" or make fools of themselves. Incidentally, I have seen one man only faint in front of a camera and a horrible experience it was. But, ironically enough, he happened to be the one professional actor in an otherwise amateur cast of specialists and they, to their credit, carried on superbly as if nothing untoward had happened.

The reason why non-professional speakers perform so well on the whole before the cameras is that, over the years, a system has been evolved which largely eliminates risks by reducing the responsibility placed on them. The keystone of the system is the interviewer.

Many people have told me that they consider themselves ideal persons to become interviewers. I wish them luck and then give them the following food for thought. Since television started at Alexandra Palace in 1936 scores of people have been tried as interviewers. Yet to-day how many successful interviewers are there? I won't mention names, but in my private reckoning the fingers of one hand are sufficient to count them.

Quality

What are the qualities required by a good interviewer? First and foremost should be the desire to be an unobtrusive living question mark. Let me explain this in more detail. The ideal interviewer must realise that he is present to enable the person being interviewed to get quickly to the point, and then to develop his story logically and, if possible, interestingly to its predestined conclusion. The interviewer must by every means avoid dominating the interview and acting as the major attraction. He is there to serve, but he can only do this efficiently if he has primed himself with the full story and noted the salient points to be emphasised. This preparation has frequently to be done in a hurry and so a quick and retentive memory is called for. Then there is required an ability to ask similar questions in different ways. It is all right to say "tell me" once or twice in a series of interviews, but to preface many questions in this way would lead to exasperation on the part of viewers. Again, all interviews are rehearsed. So when the interviewer asks the question he already knows the answer. Yet, even so, he must appear as interested as if hearing the information for the first time.

One golden rule for an interviewer is never to ask a question which can be answered by a simple "yes" or "no." This is not always easy. It is a happy occasion when with a suitable person he can say "tell me in your own words what happened" and feel confident that the answering statement will not call for any interference from him. The greatest requirement of television interviewers, those necessary evils, is that they shall have the power to assure those they are to interview that they are in competent and sympathetic hands. I think that the best of the interviewers succeed brilliantly, but inevitably their work evokes different reactions. Each of us has mannerisms, some of which delight and others infuriate, and inevitably by repetition these become magnified in the eyes of the beholders and lead to strong views for and against particular interviewers which, in my opinion, tend to get out of proportion. Only the producer can fully appreciate the work of the interviewer. I have had an interviewer criticised adversely for "interfering too much" when, in fact, he was saving the day by "building up" somebody who without strong help might have appeared foolish. By far the greatest number of people being interviewed in television programmes are not experienced in public appearances. Often their behaviour at rehearsal is different from that at transmission; the garrulous at rehearsal becomes the tongue-tied in transmission, and *vice versa*. It is all so understandable, but plays havoc with that tyrant the clock. With the garrulous in full blast it is a comfort to the producer to know that a discreet signal will result in the interviewer bringing about a timely end with, it is to be hoped, no apparent rudeness. But, as we all have seen, even the best interviewers sometimes meet their Waterloo with speakers who just will not shut up.

A further requirement is a good appreciation of the technicalities of television. How, for example, exhibits can be shown to best advantage.

Yes, interviewing is a tough job, calling for rare qualities and hard training. To repeat myself, speakers in television do not "dry up" or make fools of themselves. For this they should, in many cases, thank the interviewers.

to rise gradually as the heater responds to treatment. When the reading has reached its ceiling the tube should be reconnected to the normal voltage heater supply in the set, with the other electrodes disconnected, for about 30 minutes.

It may be considered desirable to check the normal heater emission before and after the operation. In this case a microammeter reading can be taken before and after the reactivating process, using the normal heater voltage for both tests. The efficacy of this treatment is evidenced by the higher current indication on the final test.

It is interesting to note that more than one company markets an instrument called a "Reactivator" for the purpose of reviving worn tubes, and their methods are somewhat similar to that just described. The Radar instrument, however, provides additional features—such as a filament continuity test; a check for inter-electrode shorts; an emission test; and a cathode-to-heater insulation test to over 10 megohms at 100 volts. This instrument is manufactured by Waveforms, Ltd., Radar Works, Truro Road, London, N.22.

Low E.H.T.

Low E.H.T. can also provoke the symptom of a dim picture by reason of causing a reduction in the velocity of the electron beam. We must remember, of course, that the intensity of light emitted from the fluorescent screen is dependent on the *velocity* at which the beam impinges on the screen. We have already seen (see "More About the C.R.T.," PRACTICAL TELEVISION, October, 1951) that light is emitted from the fluorescent phosphors due to liberation of kinetic energy stored by the beam electrons by reason of their velocity, when the electrons strike the screen material. The increased brightness in the later types of tube results primarily from the use of higher E.H.T. voltages.

At this point it must be established that the light variation on the tube screen in sympathy with the modulation at the tube grid or as the brightness control is adjusted, is produced by varying beam *intensity*, or beam current, as opposed to beam velocity.

If a reduction in E.H.T. is responsible for the dim picture, however, it is generally found that the optimum point of focus cannot be achieved within the range of the focus control. This is, in extreme cases, accompanied by over-scanning both horizontally and vertically, and the appropriate amplitude controls are found to have small influence in reducing the picture to the normal size. Over-scanning and poor focus due to low E.H.T. occurs because the resulting lower velocity beam is more readily influenced by the scanning and focusing magnetic fields.

Essentially, low E.H.T. is caused by a worn rectifier valve or a defective E.H.T. smoothing capacitor where one is used. Some sets use a relatively high value fixed resistor connected in series with the E.H.T. output and a picture-tube anode connector. This component sometimes tends to increase in value or become completely open-circuit to create a similar symptom, particularly if—as in certain receivers—the resistor is incorporated in the E.H.T. feed cable or in the connector cap. In flyback E.H.T. systems the possibility of a reduction in voltage due to inadvertent damping across the line deflecting coils or line output stage must not be overlooked.

A Dirty Screen

The picture-tube screen and the implosion guard seem to be particularly vulnerable to the collection of dust. In certain sets, particularly those that use a moulded implosing screen whose contour follows that of the tube screen, the dust deposit is not so easy to see, and the mistake of suspecting the picture-tube has been made in such a case.

The diffusion of light created by the dust deposit can sometimes be evidenced by viewing the tube face obliquely through the guard, when a virtual image can be observed on the inside of the implosion guard. Cleaning the screen and associated guard cures the apparent fault, of course, though to do this simple operation in some sets necessitates removing the chassis and picture-tube from the cabinet. On other sets screen cleaning is easily catered for from the front of the cabinet without the need of dismantling the receiver. The Ferguson 991 series, and the Murphy V114 are typical examples in this respect.

It would appear that dust is readily attracted to this section of the receiver by reason of electro-static charges existing on the tube face and on the implosion guard. Various "anti-static" creams and liquids have been evolved for cleaning and polishing the screen and implosion guard, the application of which, it is claimed, tends to destroy the large electrostatic charges which might otherwise remain for long periods, even after the receiver has been switched off. A cream application specially prepared for this purpose and marketed by Radiospares, Ltd., is available from most television dealers.

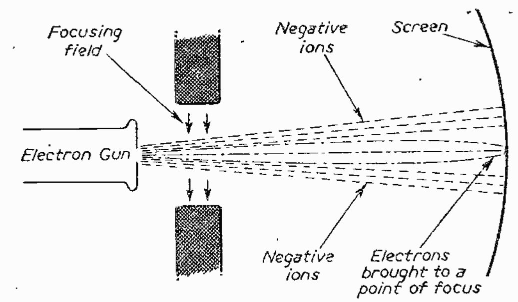


Fig. 61.—Showing how the negative ions are little influenced by the magnetic focusing field.

Efficient sealing between the picture-tube, the mask and the implosion screen goes a long way in minimising the ingress of dust, and where a rubber mask is used, special care should be taken to ensure that it makes good contact with the implosion screen. Certain receivers, the G.E.C. series for instance, incorporate an excellent dust-tight rubber mask and implosion screen unit.

Check Setting of Ion-trap Magnet

We have already considered the possibility of a maladjusted ion-trap magnet being responsible for a blank screen, and with considerable detail described the best method of establishing the precise setting for the magnet. There is, of course, an equal possibility that a dim picture may be provoked by the same cause, and this should receive due attention during the general process of analysing.

Although a lot has been written regarding the general function of the ion trap it will be instructive

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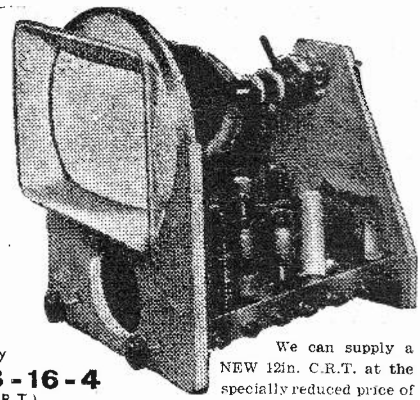

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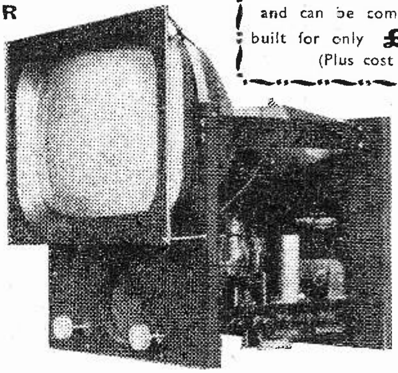

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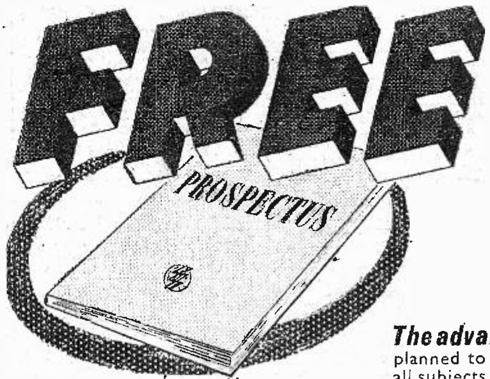

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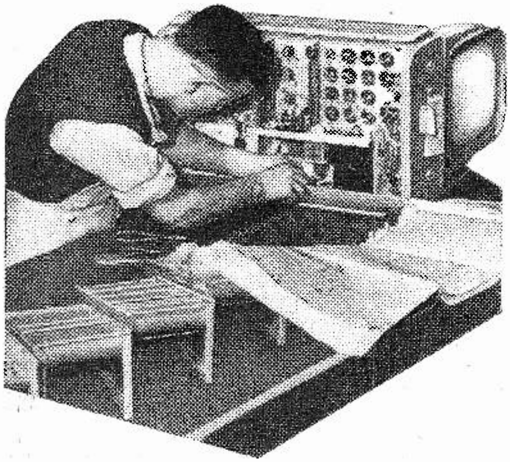


20.—OSCILLATORS AND MIXER COUPLINGS

Oscillators

OSCILLATORS designed for use in television mixer stages require three points of consideration. They are, in order : stability, frequency of operation and the actual circuit form. This is also the order of relative importance.

Dealing first with stability, this obviously must be of long-term order, no drift in frequency being tolerable over a period of several hours. Most drift occurs within a few minutes of switching on, but with care this, too, can be reduced to a minimum. The stability of the oscillator is generally more important on sound than on vision, this being due to the relatively narrow bandwidth of the sound I.F. amplifier. Suppose, as an example, that the bandwidth of a sound I.F. strip is 10 kc/s, and that the oscillator, working at a frequency of 50 Mc/s, drifts 0.02 per cent. This amounts to a drift of 100 kc/s, which would eliminate the sound completely, although the same change in the vision passband of, perhaps, 3 Mc/s, would produce no appreciable change. This is an extreme case, of course, but it follows that narrow band sound circuits soon feel the effect of an oscillator drift, even if this amounts to only some few kilocycles.

Serious drift is nearly always the result of a poor layout, the oscillator tuned circuits being near a hot part of the set or being constructed of components of poor design or poor temperature coefficients. Fixed condensers are particularly prone to change their value when subjected to heat, as are some of the cheaper trimmers. It is usual to build the oscillator section, in fact the whole mixer stage, well away from any large valves or heat-producing components, having a fixed tuning condenser of negative temperature coefficient in parallel with the normal trimmer. The changes in capacity are then in opposite directions and the effects nullify.

Some commercial televisors provide a small oscillator tuning control for the user's benefit, and such a control, usually a few picofarads across the tuned circuit, is often useful on the home-built superhet. Drift is then always under control, although excessive wandering is still intolerable as it necessitates constant readjustment of the control throughout a programme. Small drifts can be tolerated if the passband of the sound circuits is fairly large. A figure of 50 kc/s is not unusual.

Choice of Frequency

The choice of oscillator frequency, which, in turn, depends upon the I.F. frequency, depends upon such factors as second-channel interference, the tuning range of the oscillator (if this is to be tunable in a multi-channel receiver), and the problems of the I.F. amplifier design itself, which have been mentioned in a previous article. There is also the question of whether the oscillator should work above or below the R.F. input frequency.

For the problems of second-channel interference and tuning range, it is best to have the oscillator working above the signal frequency. This is especially true when working into a transformer-coupled I.F. amplifier chain, as the gain-bandwidth product increases as the frequency increases. It should be noted that an inversion occurs whenever the oscillator frequency is greater than the signal frequency, the resultant sound output I.F. being higher in frequency than the vision I.F. output, opposite to that which is entering the mixer from the R.F. amplifier. This is useful when the sound and vision spacing needs to be increased, thus helping with the sound trap problem on vision, and vice-versa.

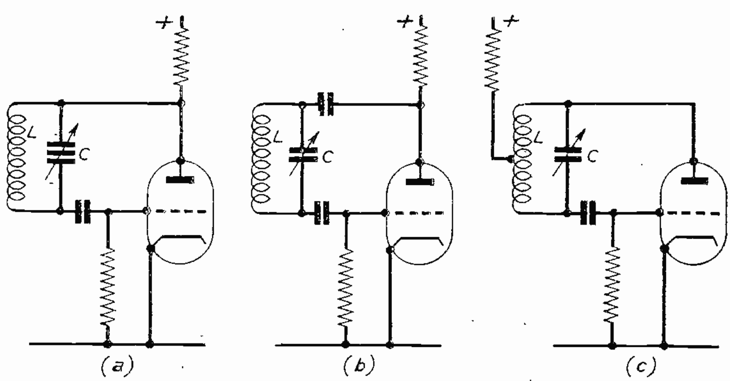


Fig. 1.—Showing (a) Colpitt's (b) Hartley, and (c) Ultraudion oscillators respectively.

From the point of view of oscillator stability, a frequency as low as possible, and hence below that of the signal input, is desirable. There is then no frequency inversion, but the problem of inter-modulation and breakthrough between the I.F. channels is then more serious.

Common frequencies for I.F. amplifiers in the early days of television were between 5 and 10 Mc/s, but later designs were often centred around the 13 to 20 Mc/s band. The latest tendency is to go for higher I.F.s, and the region of 35 Mc/s has many advantages, particularly from the point of view of interference problems.

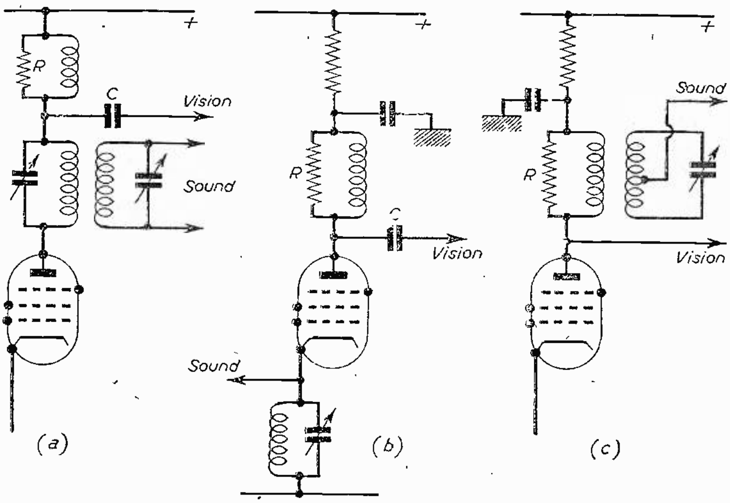


Fig. 2.—Methods of separating the sound and vision I.F.'s at the output of the mixer.

Circuits

The commonly employed oscillator circuits are shown in Fig. 1, where (a) and (b) show the Colpitt's and Hartley circuits respectively, with the so-called Ultraudion at (c). For single station receivers there is little to choose between these circuits but where switching is concerned, it becomes necessary to keep "hot" leads to a minimum. Hence, for example, the tuned-grid oscillator with a feedback winding from the anode circuit is ruled out. In these circuits C constitutes the tuning capacity with L the tuning inductance. The condenser at (a) has an earthy spindle, and is useful therefore in the type of circuit where a control is made available to the user. For stability, L should be rigidly wound and mounted on good class insulation and C should be treated as the earlier remarks have indicated.

The valve is shown as a separate triode; this may, of course, be a strapped pentode or similar arrangement, or it may be part of a combined valve, such as a triode-hexode.

Mixer Couplings

The output from the mixer stage consists of both sound and vision signal in their respective I.F. channels since all the R.F. signal is mixed and lowered in the mixer; the 3.5 Mc/s separation must be preserved.

There are many methods of coupling off the outputs into their respective I.F. amplifiers. The three most common are drawn in Fig. 2. In (a) and (b) the separation occurs by means of parallel tuned circuits, while at (c) an absorption principle is used.

In circuit (a) the two I.F. tuned circuits are connected in series, the sound transformer being relatively sharply tuned and only slightly overcoupled, if at all, and the vision circuit made flatly resonant by the damping resistor R. Each circuit will present an appreciable impedance at its particular frequency, and the sound and vision signals will be shunted into their respective channels. The "Combined Televisor" (July, 1951, PRACTICAL TELEVISION) used series transformers in the sound receiver in this way to separate either 10 Mc/s telesound or 465 kc/s broadcast I.F. frequencies, no switching being necessary. It is difficult with this scheme to eliminate sound breakthrough into the vision strip on account of the wide passband of the vision take-off coil and sound traps must be used in later stages.

At (b) the cathode parallel circuit takes off the sound frequency, and also works as a sharply tuned sound trap for the vision take-off, the cathode impedance becoming very high at sound frequency and so reducing the gain at this point. The trapping effect is better than the circuit of (a).

At (c) the sound I.F. is taken off by the parallel circuit which acts as an absorption trap at the sound frequency. It has an advantage in that it not only operates as a sound trap but also enables the stray capacity across the vision coil to be kept at a minimum so improving the bandwidth.

By way of comparison the reader might care to study the arrangement used in the "Super-Visor" receiver, in which a centre-tapped grid coil is used in the mixer stage and the two separate sound and vision I.F.'s are taken from the anode and one end of the anode coil respectively.

First Steps in Picture Transmission

In our issue dated July, 1954, reference was made to various articles on the subject in other publications. In response to many requests we give below the various articles referred to on page 73 of that issue :—

References :

R.S.G.B. Bulletins, Vol. 27, *No.* 11 ; *Vol.* 28, *Nos.* 5, 8, *and* 10 ; *Vol.* 29, *No.* 3.

"*Radio and Television News,*" *May, June and July*, 1950.

"*Television Engineering,*" *by D. Fink.*

"*Practical Television Engineering,*" *by Scott Helt.*

"*CQ-TV,*" *quarterly magazine of the British Amateur Television Club.*

TELENEWS

Soccer Broadcasts

THE BBC and the Football Association have agreed in principle to the televising of the England v. Germany soccer match on December 1st and the Cup Final next year, together with other representative matches, subject to negotiations before each game on such matters as the satisfactory sale of tickets in advance.

Television Licences

THE following statement shows the approximate number of television licences issued during the year ended June, 1954. The grand total of sound and television licences was 13,512,275.

Region	*Number*
London Postal ...	968,964
Home Counties ...	366,257
Midland	653,649
North Eastern... ...	456,108
North Western ...	478,708
South Western ...	148,486
Wales and Border ...	169,442
Total England and Wales	3,241,614
Scotland	156,793
Northern Ireland ...	12,639
Grand Total	3,411,046

Hungarian TV Developments

OWNERS of about 200 foreign-made television sets in Budapest have been invited to criticise experimental transmissions of films being made by engineers now planning Hungary's first TV section.

Mass production of receivers is to begin by the middle of 1955. It was originally intended to make these with a 9in. screen, but plans have now been made to manufacture them with a 15in. picture.

Continental Exchange Scheme

THE Programme Committee of the European Broadcasting Union, which met at Sestri Levante, near Rapallo, from July 9th to 15th for a critical examination of the summer season of television exchanges in Europe, has announced a second experimental period from the end of September to the beginning of next January.

The organisations concerned are contemplating programme exchanges between neighbouring countries as well as a certain number of common transmissions involving the whole European network.

Audience Research

THE BBC Audience Research Department has recently issued a report on TV viewing trends for the period April to June, 1954.

It is estimated that the average size of the adult "TV public" in the April-June quarter of this year was approximately 9,000,000, compared with 7,000,000 in the same quarter of 1953. Of this "television public," 38.8 per cent. viewed each evening from April to June this year, an increase of 1 per cent. on the average audience for the same quarter last year. These figures indicate that in both quarters the average adult viewer watched just under two out of every five evening broadcasts transmitted.

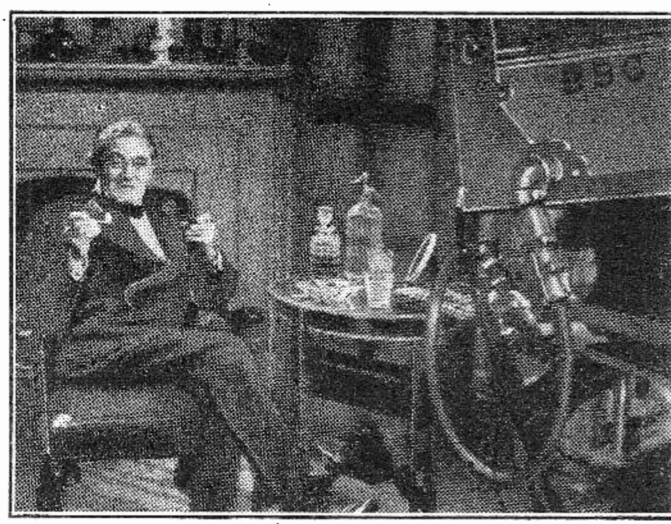
Joy Nichols Again

ALTHOUGH Joy Nichols appeared on television on the day of her arrival back in this country from her native Australia, it was only to act as member of the panel in a parlour game and her fans were not given the chance to hear her sing as she did for six years on sound radio's "Take It From Here."

It is now understood, however, that she is to take part in the August 28th edition of "Variety Parade," when viewers will be again afforded the opportunity of hearing her sing as well as seeing her.

Northern Ireland TV and Radio Show

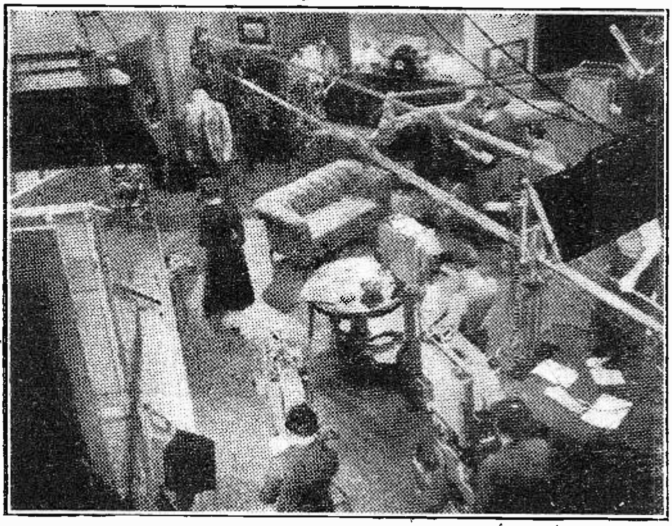
PLANS have been drawn up for a grand TV and Radio Show to be held in Belfast some time next year. The organisers include the Northern Ireland Radio Retailers' Association, the BBC, the G.P.O. and some of the leading



Grand old actor Bransby Williams is seen reminiscing before the camera in one of his recent programmes.

manufacturers of sound and television receivers and equipment.

It is hoped that the exhibition will be held in the King's Hall, Belfast, during the week in which the new television transmitting station is opened on Divis mountain. The BBC also intends to produce sound and TV programmes at the show, enabling visitors to see their own favourite stars performing.



A typical studio scene during the transmission of a play. Note the four cameras and microphone boom.

Sponsored Radio As Well ?

SHOULD commercial television prove to be successful in this country the next Conservative Government may also consider launching a commercial radio service.

East Anglia Gets Look In

IT looks as though most parts of East Anglia, including Norfolk, will have television by Christmas. It is announced that the transmitter at Tacolneston is expected to be finished by then.

Canadian Sales Rise

MORE TV receivers but fewer radio sets were sold by Canadian firms in April and the first four months of this year.

Television sales went up 32 per cent. in April and 42 per cent. over the four months ; radio sales decreased by 34.5 per cent. in April and 25 per cent. from January to April. Over 136,700 TV sets were bought in those four months.

A Winter Investment

MANY people have wondered in the last few months whether the old English summer is a thing of the past. A national daily even published a cartoon of a family huddled in a promenade shelter with the caption : "Never mind, a few days back home over a hot stove will soon bring the roses back to our cheeks."

What has the bad weather to do with television ? It is reported that many families have decided to forfeit their holidays and spend their money on a TV set—a memory of summer, 1954, to keep with them all through next winter.

Camera Watches Operation

AT a recent inaugural meeting of the British Association of Pediatric Surgeons about 100 surgeons from all over the world watched a series of operations on television at the Hospital for Sick Children, Great Ormond Street, London.

For nearly three hours world-famous surgeons clustered round half-a-dozen television receivers in a first-floor lecture room, while a miniature Pye television camera, situated in the operating theatre five floors above, peered over the shoulders of surgeons conducting a number of important operations on young children between two and six years old.

Luxembourg Station

LUXEMBOURG'S first television station is planned to open on January 1st next year, serving an area of 55 miles radius, says M. Mathias Felten, a director of Radio Luxembourg.

International Conference

AN international conference on television held under the auspices of the United Nations revealed that snobbery is retarding the progress of TV in many countries.

All over the world, many people who consider themselves highly "intellectual" refuse to have a receiver in the home.

Newsreel Costs

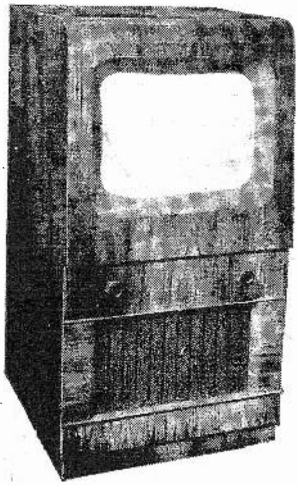
THE experts that prepare the BBC's Television News and Newsreel each day do so on a record budget of £5,000 a week.

Lifts Interfere

BECAUSE lifts on an estate in Old Street, Finsbury, London, interfere with local TV reception, the Council have been requested to spend £47 10s. for a suppressor to be fitted to each lift.

Fish Research

THE Canadian Fisheries Research Board has been using an underwater TV system at Nanaimo, British Columbia, to study fish in their natural surroundings. Trials were carried out successfully in both fresh and salt water. Apparatus used was comprised of a camera in a water-tight metal cylinder, handled by remote control.

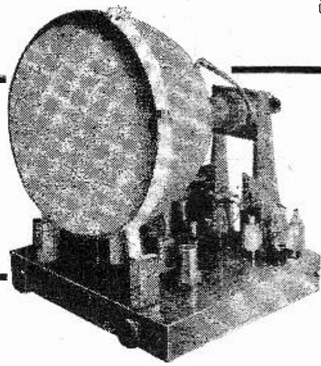


"Superior 15"

SOME QUESTIONS ANSWERED—

QUESTION	ANSWER
Can I expect sound and pictures equal to factory made sets ?	The picture compared favourably with any set at the Radio Show.
Is it robust and likely to go for long periods without trouble ?	Yes, because all parts are standard size and proved types.
Why is it so much cheaper than any other big picture televisor ?	The reason is because you assemble it yourself and thus save labour and other costs.
Does it look like a home-made set ?	No, because it isn't really home made, it is simply assembled from factory made parts, just as are all so-called "factory-made" TV. models.
How about soldering ? Is it difficult like repairing a kettle or saucepan ?	Soldering radio parts is simplicity itself.
Is aligning the set difficult ?	No, the coils are all specially designed which "pre-aligns" them and you have only to follow the simple directions to ensure receiving the perfect picture. No instruments are necessary.
Will the Elpreq "Superior 15" receive all B.B.C. stations ?	Yes, and all constructors will be notified of the modifications that will be necessary when Commercial TV. starts.
What happens if I cannot get my televisor to work once I have it finished ?	You send for a service form which you complete and then our engineer will indicate your trouble.

UP TO THE MINUTE BIG PICTURE TV.



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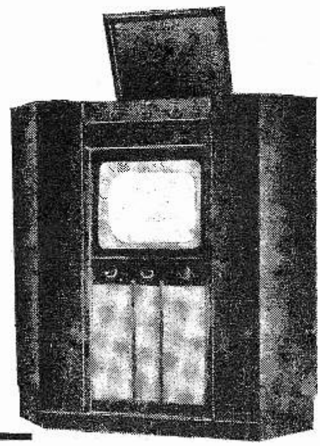
QUESTION	ANSWER
What is the cost ?	All components, valves and Cossor 15in. cathode ray tube cost £37-10-0.
Are Hire Purchase terms available ?	Yes, the deposit is £12-10-0, the balance is spread over 12 months.
Are there any guarantees ?	You are covered by two guarantees, one covers the components and the other ensures that you will get perfect results.
Are cabinets available ?	The illustrations show the cabinets which are available. The Console costs £11-10-0 and the Super corner model £18-0-0. H.P. terms again are available.
How much is the data and can I have it on approval ?	The data costs 7/6, but providing you keep it clean and in good condition you can return it within 7 days if you think you cannot make the televisor (7/- will be refunded to you).
How can I order ?	An order form is enclosed with the 7/6 data, which you can complete and post to us.



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With VCR-97 tube and valves 16-VR65-CV118 (SP61), 2-VR54 (EB34), 2-VR92 (EA50), etc. Dim.: 18in. x 18½in. x 11½in. Wgt. 42 lbs. In original wood case.
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BRAND NEW. REF. 10QB/6504
With Tubes VCR-524A, VCR525, and valves 7-VR91 (EF50), 2-VR54 (EB34), 6-VR92 (EA50). Dim.: 12in. x 7in. x 18in. Wgt. 30 lbs.
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A.C. Mains. Input 230 v. 50 c.p.s. Outputs E.H.T. 2 Kv. 5 m/a., H.T. 250 v. 150 m/a., L.T. 6.3 v. 10 a. and 6.3 v. 5 a. Fully smoothed and rectified with valves VU120, 5U4G, VR91 (EF50), plus cond., resistors, etc.
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Mains Transformer ... ... 28/6 each
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350-0-350 v 150 ma, 6.3 v 4 a, 0-4-5 v 3 a, 33/9
350-0-350 v 250 ma, 6.3 v 6 a, 4 v 8 a, 0-2-6 v 2 a, 4 v 3 a, for Electronic Engineering Televisor 69/6
425-0-425 v 200 ma, 6.3 v 4 a, C.T. 6.3 v 4 a, C.T., 5 v 3 a, suitable Argus Televisor, etc. 47/9
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VOL. CONTROLS (standard long spindles.) All values, less switch, **2/9**; with S.P. switch, **3/9**; with D.P. switch, **4/6.**

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EX-GOVT. BLOCK PAPER CONDENSERS.—4 mfd 500 v, **2/9**; 4 mfd 1,500 v, **5/9**; 4 mfd 2,000 v, **7/9**; 11-7 mfd 500 v, **7/9**; 0.1 mfd plus 0.1 mfd 8,000 v, common negative isolated, **11/9**; 0.5 mfd 2,500 v, **2/11**; 1.5 mfd 4,000 v, **5/9.**

EX-GOVT. SMOOTHING CHOKES.—
50 ma 5-10 h 2/9
100 ma 10 h 150 ohms Tropicalised ... 6/9
150 ma 10 h 150 ohms 11/9
250 ma 3 h 50 ohms Potted 7/11
250 ma 10 h 150 ohms 16/9
250 ma 10 h 50 ohms 14/9

EX-GOVT. MAINS TRANSFORMERS
Primaries 230/250 v 50 c/cs 4 v 2.5 a, **4/9**; 4 v 6 a (High Ins.), **7/9**; 48 v 1 a, **9/9**; 175 v 150 ma, **9/9**; 300 v 200 ma, **9/11**; 250-0-250 v 40 ma 6.3 v 2 a, 5 v 2 a, **9/11**; 2,800 v C.T. 5 ma, **22/9**; 2,200 v C.T. 120 ma, **21/6**; 400 v C.T. 150 ma 4 v 6 a, 6.3 v 6 a, 6.3 v 0.6 a, 4 v 6 a, 4 v 3 a, 4 v 3 a, 4 v 3 a, 5 v 2 a, **22/9**; 300-0-300 v 120 ma 4 v 1 a, **17/6**; 865-775-690-0-690-775-865 v 500 ma, **29/6**; 610-0-610 v 150 ma, 300-0-300 v 150 ma, 1,220 v 350 ma, **29/6**; 460 v 200 ma, 6.3 v 5 a, **29/6.**

EX-GOVT. AUTO TRANSFORMERS
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EX-GOVT. E.H.T. SMOOTHERS
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7 valves for Vision and Sound Section 29/6
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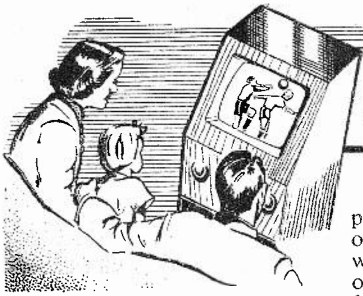

UNDERNEATH THE DIPOLE

By Iconos

THE TELEVISION BILL

MILLIONS of words are spoken in Parliament before a controversial Bill becomes an Act, the law of the land and an instrument which is likely to affect our way of living. This particularly applies when measures which might well be of a non-party type are turned by internal pressures into political dynamite, such as the Television Bill or the proposal to increase M.P.s' salaries. The lengthy process of piloting a Bill from a White Paper, through its Committee stages to its final Royal Assent, is beset with many pitfalls for the Minister or Member responsible. With great patience, and, in the later stages, with sweet reasonableness, Earl de la Warr has dealt with the hundreds of amendments from both sides of upper and lower Houses and, though much changed in detail, the foundations of independent television have now been truly laid.

TELE-RECORDING

MEANWHILE, the BBC is spurred on to improve its TV programmes, to keep a tight hold upon its key technicians and to retain a lead in technical developments. There are some developments, however, in which the commercial television technicians have already forged ahead, notably in tele-recording. Norman Collins' High Definition system was recently demonstrated to the British Kinematograph Society at the Highbury Studios for the benefit of the film industry and also to representatives of the BBC. This company has also undertaken the tele-recording of features for the BBC, a good example of which was Wolf Mankowitz's play *The Baby*, based on Chekhov's story. The entire production was carried out at the Highbury Studios, including rehearsals, and electronically recorded on film for transmission at a later date from Lime Grove. The producer was Eric Fawcett, one of the BBC's top line TV producers, who has been watching the progress of the High Definition system from the start. Norman Collins and his genial technical director, T. C. Macnamara (G2TQ), have always pursued a progressive policy of keeping all interested parties well informed. The result has been worth while—the build-up of good will with British and American TV sponsors, with the film industry, and with the BBC itself.

CHANGING SHAPES

COMPETITION with TV has led the American film industry to try out all kinds of technical gimmicks which will change the shape, colour and sound of films. Many of these technical developments have previously been mentioned in these columns and already quite a few have been tried out and have failed. Still in the field are "Cinemascope," the super-wide picture with a 2.55 : 1 aspect ratio, and "Vistavision," a large screen super-definition system of more normal proportions. Many cinemas are projecting films made in the old way upon huge metalised screens, using indifferent lenses and unsuitable arc-lights. The result is a fuzzy and slightly out-of-focus picture, full of grain and odd scratches, made even worse by an exaggeration of the inherent unsteadiness of old projection machines. Large pictures demand closer technical tolerances. This means that old fuzzy lenses and obsolescent projectors are just not good enough for the magnified images on the colossal screens. The result is to drive the patrons from the two-and-threepenny seats into the two-and-eights—or, more likely, back to their television sets.

Nevertheless, when the very best equipment is used for photography and projection of "Vistavision," "Cinemascope," Technicolor or Eastman Colour, the result is quite remarkable. The technicians have responded to the challenge. An unexpected development has been a sudden improvement in colour values, both in balance and definition. Technical costs have rocketed in the process. In the space of six months, the quality of all the film colour systems has leaped ahead. The demonstrations I have seen of colour television by Marconi, E.M.I. and R.C.A. are all first-rate, but they are relatively crude compared with the best that can be obtained with colour film.

DR. KNOCK

KNOCK, Jules Romain's satirical comedy, has been adapted at various times into stage plays, films and for broadcasting. I seem to have seen or heard versions of the play before and have been only mildly amused by the subject but moved to laughter by the interpretation of the part by the leading actor. The television version, adapted and transferred to Scotland by Robert Kemp, was quite funny in incident, but not in theme. The idea of a doctor buying a poor practice in a Scottish village and making it into a prosperous one by inducing the inhabitants to "enjoy" imaginary ill-health seems to be utterly phoney. Deluding patients into paying fees for quack treatments provides situations which have greater humorous possibilities than charging the treatments up to the State. But, either way, it is completely out of line with the ways of the medical profession. It was certainly not the fault of Moultrie R. Kelsall that this play failed to make the grade.

"WILDERNESS OF MONKEYS"

STORY writers and dramatists have long found good material for comedy and drama in life at an English public school. The austerity, discipline, traditions and dignity of these institutions have contrasted strongly with the free and easy holiday camp atmosphere of American high schools and universities, as conveyed to us on the stage and screen. The backgrounds in both cases are usually exaggerated for story reasons. In Peter Watling's play, *Wilderness of*

Monkeys, the story is not subsidiary to the usual overweight of atmosphere and gains considerably thereby. In this case the action of the story takes place largely in the matron's sitting room at Wyvern School where the attractive and sympathetic Miss Haslam, played by Rachel Gurney, dispenses wisdom as well as medicine to both masters and boys. It was perhaps too much to hope that she could reconcile the widely differing points of view of Mr. Reynolds (Classics Master) and Mr. Payne (Sports Master), whose respective charges got themselves into troubles which might have led to expulsions. John Robinson played the part of Mr. Reynolds with great sincerity and power, and if his manner of speaking was not always as intelligible as we have come to expect on television, his performance was brilliantly authentic in mannerisms, speech and mental approach. Indeed, I felt that I was watching one of my own classics masters of a good many years ago whose slight eccentricities I used to imitate for the entertainment of the dormitory. *Wilderness of Monkeys* was a smoothly and professionally presented TV play, produced by Dennis Vance and directed by Chloe Gibson, a team well worth watching. Another schoolboy presentation was the reappearance of that very fat monkey from the other wilderness of Greyfriars, Billy Bunter. Again a woman producer, Joy Harrington, succeeded where mere man might well have failed, and the school atmosphere was retained in spite of the burlesque demands of script. Bunter is now well known to an entirely new generation, thanks to TV. Kynaston Reeves plays the part of the rather dense Mr. Quelch in exactly the manner I imagined when I used to read the famous Frank Richards stories, and John Stuart is a fine Dr. Locke. These school TV plays gain quite a lot from the interpolated film material, showing exteriors of school buildings, sports fields and so forth. The BBC TV film library section must be collecting quite a stock of school film backgrounds suitable for this type of TV play.

FILMED TV PLAYS

THERE seems to be a move by the BBC towards filming more plays and features for subsequent re-transmission as an alternative to direct live transmissions from the studio. This will call for a fairly large expenditure in cameras and other equipment which has, up to the moment, been largely obtained abroad. The process of film editing, for instance, is carried out by technicians of TV and film studios, using equipment mainly imported from Hollywood. The introduction of magnetic sound recording in place of photographic sound tracks will result in considerable changes in method of handling, and the time is opportune for the design of entirely new film editing machines. This is a situation in which nothing would be lost by the engineers of both BBC and the film industry getting together to evolve British editing machines and other equipment common to both fields. Similar action could be taken with motion picture cameras, nearly all of which are imported from abroad. Photographic recording of TV images calls for film cameras which enable the longest possible exposure to be made, and this has been accomplished on the High Definition system by an extremely rapid pull-down of the film between exposures. Colour kinematography calls for much greater exposure, too, and the same system could well be utilised as an alternative to the present method of increasing the amount of light used to illuminate the scene. TV is a very strong opposition to the cinemas but nothing would be lost if the technicians of both sides were to get together a little more to pool some of their ideas as well as their problems.

A VERSATILE SOUND UNIT

(*Continued from page* 170)

coil and a fixed capacitance of 10 pF than with the eight-turn coil.

Few experiments have been carried out on the first tuned circuit in the grid of V1. The constructor could begin with a coil of five turns, centre tapped, tuned by 25 pF, when he is first trying the circuit, but subsequently he may find it desirable to work with the highest L/C ratio if he wishes to obtain maximum sensitivity.

When a five-turn coil was used for the second tuned circuit, and the correct value of fixed capacitance was being investigated, attempts to use a variable capacitor as a band-setting device for the tuning capacitor were not always successful. Each capacitor had its rotor plates insulated from chassis, and it is thought that perhaps the capacitance to earth of the rotor of the band-setting capacitor was responsible for the failure.

Graph 1 shows the effect of a five-turn coil tuned by a capacitor of about 25 pF when the dial indication is plotted against frequency. Graph 2 shows the effect when the dial indication is plotted against the square of the reciprocal of the frequency. 180 deg. corresponds to maximum capacitance and 0 deg. to minimum.

The graphs show the principle of frequency calibration to be adopted when the set has been completed. Dial indications corresponding to vision and sound frequencies are noted for the channel for which the set is intended. The straight-line graph is then drawn on the basis of Graph 2. From this dial indication is plotted against frequency on the basis of Graph 1.

Lining Up

It is suggested that when a television set is being constructed the sound unit should be used as follows :

During the construction of the vision unit the sound unit, used as a grid dip oscillator, can check the frequency of the coils. When the vision unit has been completed the sound unit, used as a test oscillator, enables the vision unit to be "lined-up." When the whole set has been completed the unit, used as a pattern generator, enables the linearity of the line and frame timebases to be adjusted. Finally, when the television set is in service, and poor pictures are being received because of a fault in transmission, in the interval which sometimes elapses before the apology is offered to viewers, an interval in which one sometimes develops an uneasy feeling that the set has gone wrong, one can use the sound unit as a pattern generator, and find out very quickly whether the set is at fault or not.

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. 191 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

PROJECTION TUBE FAILING

I have a Philips model 600A (Projection), the picture of which is getting rather dull although only 18 months old ; is there any way of "doctoring" the tube, so making it give a brighter picture ?—N. Cooper (Birmingham).

When a projection type picture-tube loses brightness it is generally due to deterioration of the fluorescent screen. Unfortunately, in such cases, there is little that can be done in the way of a palliative measure to enhance picture brightness.

VIEW MASTER—V8 FAULT

Could you please tell me what is wrong with my View Master ? A few days ago the sound became harsh and distorted, with V8 becoming very hot ; this valve has now burnt out and I replaced it with a new one, a KT61, same as the old one, but the fault still remains. After about five minutes V8 overheats with sound becoming harsh and distorted. Switching off for a few seconds brings it back to normal, but not for long. In an effort to trace this fault I have replaced all resistors and condensers on V8 and 7, also MR1. As a last resort I changed values, put the KT61 in the main vision chassis and the 6P25 in the sound, this brought the sound back to normal, but this valve is overheating and doubt if it will last much longer. In changing these valves over the vision has suffered slightly. I would be most grateful for any help you can give me in clearing up this fault.—G. Macmahon (Glasgow, S.W.3).

If V8 distorts and overheats, then it can only be due to either the bias being faulty, possibly due to R39 or C35 or to C34 having become short-circuited.

D.C. RESTORER FAULT

I am writing to ask you for some information for my View Master set. Some while ago my tube developed heater-cathode short, tube is 12in. Mazda, so I altered the set to grid modulation according to details in a previous issue of yours. I am now troubled with two faults, although the picture is fairly good in general. The first fault is that the flyback lines appear when the studio lighting is dimmed and the second is, that the picture is cramped on the right-hand side of the screen which I cannot seem to correct in any way. Could you help me in this ?—S. A. Comber (West Hendon).

The appearance of the fly-back lines when studio lighting changes is most probably due to the D.C. response of the receiver being at fault ; possibly due to the use of a diode for D.C. restoration it is, however, possible that the diode itself may be faulty, or the grid leak may be of the wrong value.

Cramping on the right side of the picture can be due to the volts in the V10 stage being low, possibly due to the H.T. being on the low side, or to MR2 being faulty. We suggest carrying out voltage measurements on the V10 stage to confirm that this is working satisfactorily and also check that inserting the core into L14 does have the effect of reducing the width of the left side of the picture.

"SIMPLEX"—TUBE MODIFICATIONS

I am contemplating building the Simplex receiver, and being only a novice I have much to learn about TV. A friend of mine has told me the picture received on a VCR97 tube is a green and white, is this correct and what is the difference between a VCR97 and VCR517 ? Will you be publishing a wiring diagram for the conversion to a larger tube ? Which channel have I to wind the coils to receive the new station building in the Isle of Wight ?

Can you connect the wires marked (a) from V3 to (a) on V5, the same with valve 6 and 7 and what part of the 6.3 v. heater line you connect these to ?—J. Ward (Southampton).

The VCR97 gives a green trace so that the picture is in black and green.

The VCR517 types give a trace which will vary from green to pale greeny-buff colour.

Data for the conversion to a larger C.R.T. is being prepared.

For the I. o' W. you will have to wind the coils for Channel 3.

The heater wire goes to one side of the heater on each valve holder. It comes from the 6.3 v. transformer winding and then is looped from valve to valve.

"RINGING"

I have a Bush TV36 (17in. screen) which has a white line running down the left-hand side of screen. (This is only seen on raster or when the screen has dark surrounds.) I have been told it is due to ringing. There is a coil on the tube which is movable. Is this the ion trap magnet? Will the alteration of this cure the white line? If so, how do I go about it?—J. W. Smith (S. Shields).

If the fault takes the form of a single vertical white line only, it is very unlikely the result of "ringing" in the line timebase. A flashover in the line output transformer during the line flyback should be suspected if close examination of the line reveals that it is made up of a vertical column of short horizontal lines. Try the effect of reducing the setting of the picture width control, and slightly readjusting the horizontal hold control. If these adjustments do not eliminate the disturbance, do not attempt adjustment of the coil on the tube neck, but we would advise that you contact your dealer.

TIMEBASE DEFECT

A short while ago I asked you about the anode resistor of the Video valve in my 1355 conversion burning out. I have replaced the 20K resistor with a 4.7K which seemed to work all right because I have listened-in to signals on the I.F. 7.5 Mc/s with an aerial to the grid of V3.

The anode current is in the region of 20 milliamps. Is this excessive?

I have another query now, which I'd be grateful if you could answer.

I am trying out the C.R.T. circuits (I haven't had an aerial up yet because I'm waiting for the Isle of Wight transmitter to open) and I find I get a raster with lines going up instead of across.

I've tried changing over X and Y plates but the same fault is there at a 90 deg. angle. Another fault is that the raster is slightly diamond-shaped. A third fault is that when the brightness control is touched now and then the raster flies half off the side of the tube, but can be brought back by turning brightness down and then up again.

I am using just one valve each for line timebase and frame with no amplifier SP61 valves.—J. B. Knight (Southsea).

We assume that the valve to which you refer is an EF50 : if this is the case then the total cathode current should not exceed 15 mA. You may, therefore, find it desirable—from the valve life aspect—to adjust the valve electrode potentials so that the valve operates within the stipulated limits.

It would seem that a timebase defect is responsible for the unusual raster effect ; check that the timebase free-running speeds are reasonably accurate and that the tube is mounted correctly. Unfortunately a certain degree of trapezium distortion is almost certainly bound to occur with asymmetrical deflection methods. With the usual push-pull deflection, trapezium distortion is rarely severe and when it is detectable it is a sign that the amplifiers are badly out of balance.

A so-called " noisy " or intermittently operating brightness control potentiometer is likely to be the cause of the control of brightness fault.

FAULTY E.H.T. NETWORK

Having finished building your " Argus " Televisor some time ago, I have found on trying the set a rather peculiar series of faults.

My first tryout was as follows : no sound, no picture, trace on screen all right, but after a short time the VU111 rectifier glowed with a bluish-red light and R66 500 KΩ burnt out. I have now changed to a 2X2A rectifier and wired up as blueprint. On trying again I found that I get a raster about 3in. long by 1in. wide, but still R66 burns out after about 10 minutes. I was advised to try ½ meg. 2 watt, or 2.1 meg. in parallel, and so I have had another try with this result.

I get raster as above all right with all controls at minimum setting, but it seems to be far too bright and the same resistance still gets very hot. No picture, no sound.

Could you please advise me as to the following ?

Is using 2X2A quite in order? Is it right that I should get raster at minimum setting of controls, and can I still use a higher wattage resistance to overcome the above fault?—J. Fyfield (Glasgow).

R66 overheating indicates that you have a serious fault on the E.H.T. network—probably a leakage to chassis—and this must be corrected. R66 should work quite coolly. Check the circuit round VR9, R65, C64, C61 and the EA50 for a direct or near-direct leakage to the chassis.

There will be a small raster with the height and width controls at zero.

If difficulty is experienced in the frame circui check that C43 is 0.005 μF and try a value of 0.002 μF for C44.

Check that the vision and sound stages are working by tapping the grids of the R.F. valves with a screwdriver. A distinct click should be received from each stage. Where no click is heard a faulty stage exists and that stage must be checked (you should use the listening method for the vision section to carry out this test).

Use an aerial of the type normally in use in your locality and erect it as high as possible.

FAULTY POWER PACK

I am the owner of a Masteradio Model T612L, and I am beginning to get a little bit desperate about a fault with my set that keeps recurring.

I have tried three different repair people but still can't get satisfaction.

The trouble is in the power pack. There are four resistors, two under each UU6 valve. Their value is 30 or 15 ohms, ¼ watt.

Either one pair or the other periodically burn out, sometimes the corresponding valve goes with them. I would be delighted if you would let me know what is causing the trouble, as it is obviously no use continually renewing the resistors as the shops have been doing so far.—Mr. S. J. Dean (Dagenham).

The four 15 ohm ¼ watt resistors—one included in each anode circuit of the two UU6 valves—are mainly to protect the rectifiers against excessive voltage surges. It often happens that a short-circuit occurs in one of the rectifiers, and this generally results in immediate burn-out of the associated limiting resistor. Frequently the valve fault is of an intermittent nature, in which case the set works normally again after the resistor(s) have been replaced. Sooner or later, however, the short will again occur and it will be necessary to repeat the replacement process.

CRAMPED LEFT

I have a Decca projection set Model 1000.

This has given good results for nine or more months. Now the picture on the *left*-hand side only has reduced. I shall be very glad to have your suggestion. —A. J. Norris (Beaminster).

If no effect of any sort is shown on the picture by operation of the left-form and line linearity controls, the EL38—left-form—valve and associated circuitry should be checked—this valve is positioned in the far right-hand corner of the chassis when viewing from the rear of the cabinet. Also, check by substitution the T41 line oscillator valve—this is positioned towards the left-hand side of the chassis, directly in front of the line output transformer.

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).

CORRESPONDENT WANTED

SIR,—In the January issue of PRACTICAL TELEVISION you printed an article regarding television reception here in Eire.

I am in possession of an "Argus" kit and I would be obliged if through the columns of your paper I might make contact with other experimenters in this country for the purpose of exchanging notes regarding results obtained.—JOHN J. MURPHY (Radio Service, Charlestown, Co. Mayo).

MODIFYING THE R3118 AND ZC8931

SIR,—As a regular reader since your No. 1, which I still have as a souvenir, may I register a howl of protest at the articles by B. L. Morley in the May and June issues, entitled "Modifying the R3118 and ZC8931"—Conversion details for a powerful sound and vision receiver.

Encouraged by the opening words, "The units R3118 and ZC8931 are identical, except that the R3118 contains its own power supply for 200-250 volt mains," I bought two ZC8931's at a Liverpool dealer's, as I noticed that one was roughly tunable for Band III, and I thought the same conversion would do.

I did nothing until this week, and when I dig into the articles and look at the circuits and compare them with the units ZC8931, I find them totally different. Here are the main differences between ZC8931 (Design A) and R3118.

One H.F. stage only.

Front panel layout very different.

No fuses, no on-off switch. No "pulse input."

Only one output, not marked + or —. (There is another "output" terminal on the back of the chassis.)

I can't find V8 at all. (In fact, there is only *two* VR92's, instead of four.)

No magic eye. No triode.

Which makes me wonder whether your contributor ever laid eyes on a ZC8931. I have since seen a R.A.F. R104, and this is almost identical with the ZC8931's I have, but this has controls on the panel "Sensitivity," "Low," "Modulator," with a VR92 on the back of the front panel, otherwise it is similar in every way.

The full designation of the receivers in my possession is APW4790, ZC8931 Responser unit. Design A, Serial No........... Year 1944.

As these are extremely useful looking units, I am naturally extremely disappointed that I have been misled by your articles, and beg of you to publish another article dealing specifically with the ZC8931 and, incidentally, giving the connections to the mains plug.—GEORGE TWIST (Liverpool).

(The author states: *When I wrote this article I made inquiries from dealers advertising in* PRACTICAL TELEVISION *about the availability of the item. The reason for this was, of course, to avoid having details published for an item which was not obtainable in quantity. I was informed that the R3118 was now in poor supply but that the ZC8931 which was identical but for the power pack was available. It was on this information that I mentioned the fact, in all good faith, in the opening paragraphs of the article.*

I should imagine that the ZC8931 which is held by the reader is an earlier model than that referred to by the dealer.

The reader refers to the mains plug, but as the unit was designed for a separate power supply there will be no mains plug and fuses.

The reader may be willing to give the address if his supplier. Can any other readers supply information on these units?—B. L. MORLEY.)

HIRE PURCHASE DISADVANTAGE

SIR,—I have been a regular reader of your journal from the first issue and have made up both the "Argus" and the "Lynx" receivers. In addition, I read practically all the articles each month, as I feel you cater admirably for the amateur who likes his TV on the practical side.

It was, therefore, with some concern that I learned that the restrictions on buying by hire purchase were to be lifted. This, I understand, enables anyone to take away a complete TV receiver from the local dealer with less than a pound deposit. My worry is this. Are we to become a nation of unpracticals who prefer to buy a set the easy way rather than set to and learn to build one ourselves?

Think of the young man of the future. What is there to spur him on to constructing his own "Simplex" when he can get a super commercial model installed for a week's cigarette money?—L. LIGHTFOOT (Kew).

EX-SERVICE TUBES

SIR, I have been told that the VCR518 is definitely unsuitable for a television receiver. If this is so, I wonder whether any readers have used it in an oscilloscope or television test set? Perhaps, if so, they would pass on any helpful information. Apparently it is the long persistence which is the trouble and it would be interesting to know whether this can be overcome by any circuit arrangement.—G. BAKER (Merton).

SILENT VIEWING

SIR, It was with great interest that I saw the photograph in an issue of PRACTICAL TELEVISION some months ago of a couple viewing one of the new receivers developed which enable two people to look at the same set but see different pictures by means of a special viewing glass and individual headphones for the separate sound tracks. I am trying to visualise the day when my wife and I both view different programmes on the same viewer. My wife reaches the sentimental climax of a tragic play when suddenly the whole illusion is broken for her by my hearty guffaws at the comic antics of Benny Hill.—A. HORSLEY (Beckenham).

QUERIES COUPON

This coupon is available until Sept. 21st, 1954, and must accompany all Queries.

PRACTICAL TELEVISION, Sept., 1954.

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