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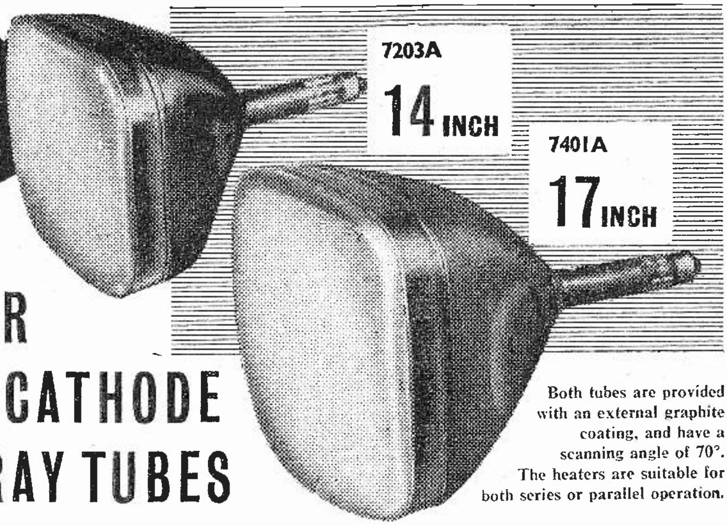
EDITOR
F. J. CAMM

A NEWNES PUBLICATION

Vol. 5 No. 59 APRIL, 1955

FEATURED IN THIS ISSUE

G.E.C.



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BRIEF DATA

7203A		7401A	
Vh	6.3V	Vh	6.3V
Ih	0.3A	Ih	0.3A
Va (min)	10.8kV	Va (min)	11kV
Va (max)	14.0kV	Va (max)	16kV

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350-0-350 v 150 ma, 6.3 v 4 a, 0-4-5 v 3 a 31/6
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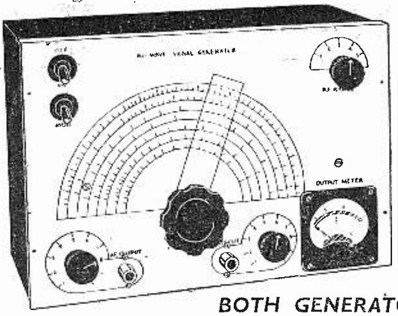

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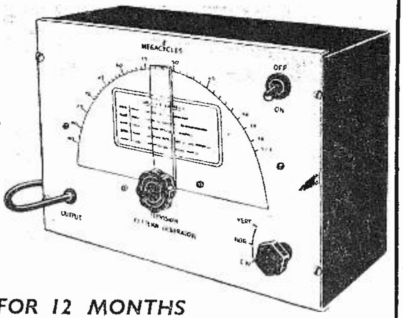

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Drop thro' 270-0-270, 80 mA., 6 v. 3 amp., 4 v. 1.5 amp., **13/6.**
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32 + 32 mfd., min. 275 wkg.	4/-
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& TELEVISION TIMES

Editor : F. J. CAMM

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Televiews

INTERFERENCE—NEW REGULATIONS

TWO sets of regulations relating to interference were recently placed before Parliament, giving the Postmaster General power to control interference with radio and television caused by refrigerators, domestic and industrial appliances which are driven by small electric motors, such as vacuum cleaners, hair driers and drills.

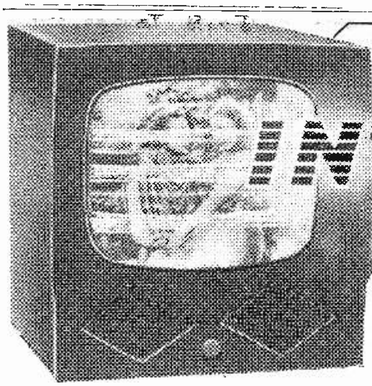
Both sets of regulations come into force on the 1st September, this year, and lay down the requirements which must be complied with by manufacturers, assemblers and importers of all electrical refrigerators, and by users of new and old electric motors. These requirements were recommended by the Advisory Committees appointed under the Wireless Telegraphy Act of 1949, and the regulations have been drawn up with the agreement of these committees. It is stated that the introduction of the regulations does not mean that everyone using a vacuum cleaner, hair drier or other domestic electric apparatus will have to fit a suppressor at once. Only a proportion of these appliances cause interference, and the Postmaster General hopes that in such cases the owners of the appliances will co-operate by having the trouble put right when it is pointed out to them by the Post Office. The new powers will be used only where it is necessary for the Post Office to insist on an appliance being put right because it causes interference and the owner will not voluntarily have a suppressor fitted. The P.M.G. hopes that there will be a progressive extension of the current practice of certain manufacturers who produce appliances already fitted with suppressors or who provide facilities for them to be fitted. The standards laid down in the regulations, i.e., the limits of interference and the frequency ranges over which they are to apply, have necessarily been based on data derived from existing sound and television broadcasting services, for which they are designed to give adequate protection in areas of moderate field-strength, provided the receiving installation, which includes the aerial system, is satisfactory. The standards are also expected to give adequate protection to the proposed frequency-modulated V.H.F. sound broadcasting service in Band II (87.7 to 100 Mc/s), and to go some way towards eliminating interference in the higher range of frequencies (Band III) to be used for the new I.T.A. television service.

It is important that components of suitable quality should be used for interference suppression and that they should be connected in circuit in a suitable manner. These aspects of interference suppression are dealt with in B.S. 613 "Components for Radio Interference Suppression Devices" and the B.S. Code of Practice on the General Aspects of Interference Suppression.

The Advisory Committees, when submitting to the Postmaster General their reports upon which the present regulations are based, made the following recommendation : that information should be issued drawing attention to the importance of earthing in accordance with the Regulations for the Electrical Equipment of Buildings issued by the Institution of Electrical Engineers. For many types of appliances used in situations where earthed metalwork is present, these regulations call, for safety reasons, for the exposed metalwork of appliances to be earthed ; earthing is even more important when interference suppressors are fitted to an appliance. Exceptions to the earthing requirement are "all-insulated" and "double-insulated" appliances, and appliances used in "earth-free" situations.

TELEVISION SALES

DURING the first half of 1954, television sales lagged behind those for 1953, but during the second six months they greatly increased, and in the last quarter reached the record figure of 602,000, bringing the 1954 total for television receiver sales to 1,263,000, or one hundred and forty thousand more than in 1953. The television licence increases in 1953 were 1,064,000 and for 1954, 1,199,000. It is interesting to compare these figures with the sales of TV receivers for 1953 and 1954—1,122,000 and 1,263,000 respectively.—F. J. C.



VISION INTERFERENCE LIMITERS

A DESCRIPTION OF SOME INTERESTING CIRCUIT DEVELOPMENTS

By W. J. West

IT is the fervent hope of all viewers that further steps will eventually be taken to make compulsory the efficient suppression of all interference producing apparatus, but at present it seems likely that the problem of interference, like some other evils, will be with us for an indeterminate time.

Working on this assumption, the Vision Interference Limiter as a Unit should be made as efficient as possible. This is particularly important when one is unfortunate enough to be situated near a main road as well as in an area of low signal strength.

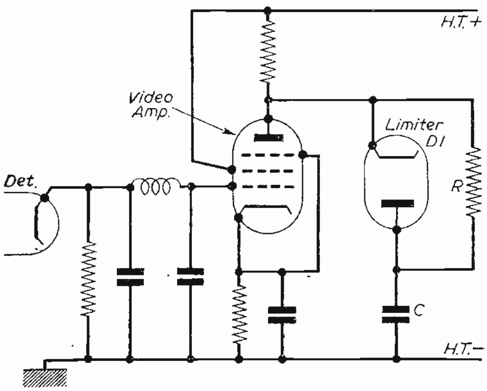


Fig. 1.—Simple automatic type of vision limiter.

In fact, the efficiency of the more advanced "Spotters"—to be described—is such that it is actually beneficial for the interference to be over a certain level with respect to the signal strength. This was borne out in practice, when careful siting of the aerial to reduce ignition interference from a main road resulted in an inferior picture, although the signal strength was—if anything—slightly greater. The reason for this effect, which is quite simple, will be explained in detail later.

By far the most common "Spotter" circuit met with both in commercial and home constructed television receivers is the so-called automatic limiter (Fig. 1). It is, of course, only automatic in the sense that no manual adjustment is necessary—bias for the diode being obtained by setting the time-constant of C and R so that C charges to a mean level approximating to peak-white. Pulses of interference exceeding peak-white level in amplitude cause the diode to conduct—thus shorting the video load and reducing the output. Designers who employ this circuit work on the assumption that "what you never see you never miss," for it is virtually impossible to obtain reasonable spot suppression without severely clipping the picture highlights.

Anyone who thinks the effect on picture quality is so slight as not to be noticed should try removing the limiter from circuit while viewing a good facial close-up. The highlights in a well designed receiver should give an illusion of rotundity and depth which is as near to three-dimensional pictures as we can get at present.

Highlights

To avoid losing highlights it is only necessary to provide means whereby the bias potential may be adjusted manually to suit the contrast level (Fig. 2). But this circuit suffers from the disadvantage that limiting is accomplished by shunting the diode and condenser across the video load and, although the condenser can be made large, the diode internal resistance—even if small—is not zero.

Instead of using the interference pulse as a switch to short-circuit the video load, it can be used in the form of negative feed-back to the video grid circuit, and in this form the internal resistance of the diode is not so critical (Fig. 3).

A similar method is to feed the pulse to the picture tube grid circuit (assuming cathode modulation is

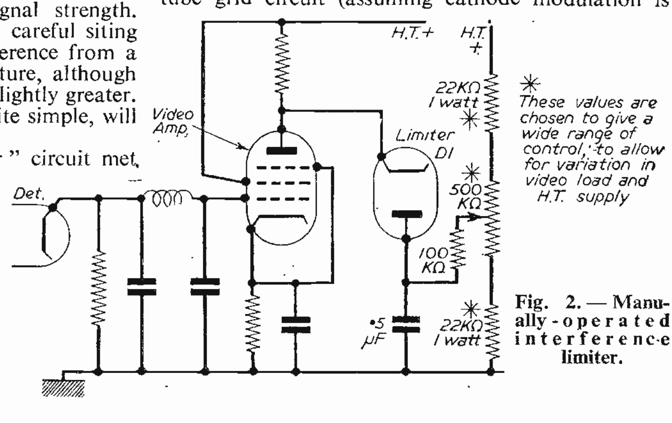


Fig. 2.—Manually-operated interference limiter.

in use), but the limiting efficiency of the circuits shown in the Figures (3) and (4) is only slightly better than the previous methods.

Black-spotters

In America, where negative modulation of the vision carrier is used, that is with zero modulation corresponding to the white level, interference pulses appear on the screen as black spots, and because of this visitors who have seen American television often think that they have conquered interference problems. This is not really true, of course, but it is a fact that black spots are far less noticeable—at normal viewing distances—than white ones. This is partly due to the light intensity being lower, but also because the average picture is predominantly in shades of grey.

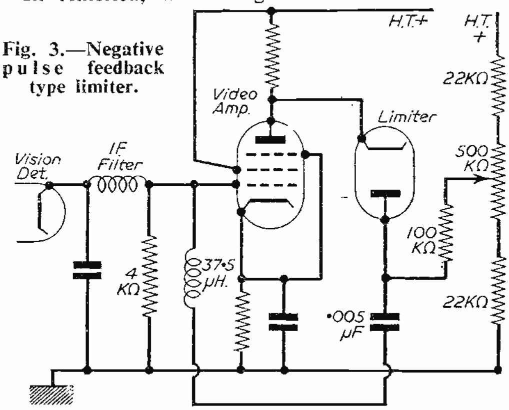


Fig. 3.—Negative pulse feedback type limiter.

If we take the circuit shown in Fig. 4, but amplify the interference pulse before feeding it to the picture tube grid, its amplitude will be in excess of that on the cathode, and the effect will be to drive the tube to beam current cut-off the visible effect on the screen being a black spot instead of a white one (Fig. 5). Thus an interference pulse in excess of peak-white level is no longer limited to that (peak white) light intensity, but can be reduced to zero (black level). Unfortunately interference pulses which do not exceed peak-white level do not operate the black-spotter circuit and this explains the statement in the opening paragraphs as to there being an optimum interference-to-signal ratio.

The "black-spotter" circuit is of no advantage where the prevailing interference level is below peak-white at the video anode, but—under certain conditions—principally in fringe areas, the reduction in visible interference spots cannot be stressed strongly enough. It is not always convenient, or practical, to add an extra stage to an existing receiver, but the circuit shown in Fig. 6 can be fitted to any receiver which already has some form of diode limiter. The modifications are simple to carry out, and in an area where its inclusion is worth while, the slight falling off in response, caused by the higher video load, should not be apparent.

If necessary a series correcting choke can be added and this will usually more than compensate for any high-frequency loss.

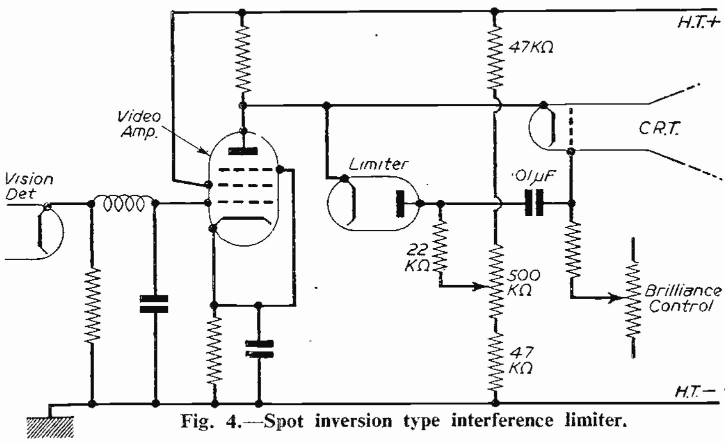


Fig. 4.—Spot inversion type interference limiter.

The extra amplification needed for the limiter circuit is obtained by using a tapped video load and it is an advantage to increase the H.T., if possible, to compensate for this additional resistance.

If the potential divider providing the bias for the diode is fed from the video anode, as shown, the circuit becomes semi-automatic in operation and small changes in contrast will not necessitate re-adjustment of the limiter control.

A further development which can be added to the black-spotter is an extra limiter to prevent the inversion pulse from exceeding a pre-set level and in this way the spots can be made grey; but the visual improvement is only slight and hardly worth the extra components.

Fig. 6 will be found at the foot of the next page.

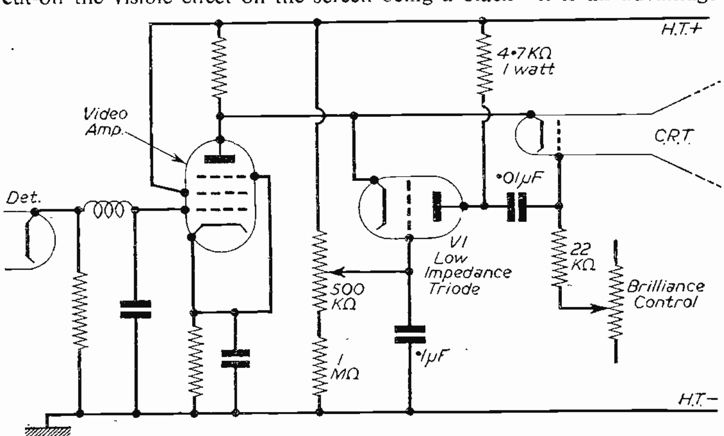


Fig. 5.—"Black spotter" limiter, using extra triode valve.

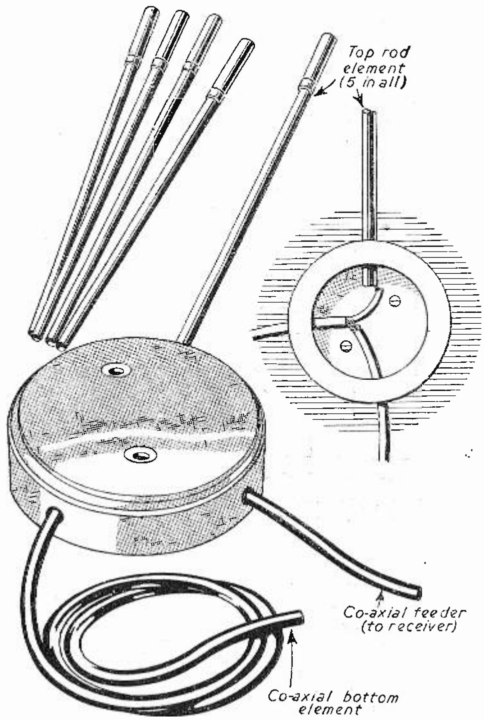
A Cheap, Robust and Efficient Indoor TV Aerial

By F. W. Austin

MANY constructors, having built their own receivers probably buy a ready-made indoor aerial, although a simple and sound solution is within their reach. It was only recently that the writer was confronted with the problem of installing a television receiver after repair (the owner having purchased a new one in the belief the tube had broken down). The new receiver now commanded the owner's outside aerial and so a new aerial fixture for the old set was imperative.

First thoughts were on pre-assembling a unit which would only need to be screwed to the wall or a wooden batten on site. This meant using telescopic sections for the top rod, one section fixed in the unit with four others to be inserted at the house. Metal brackets for fixing the elements in the unit were tried but proved unsound, taking up too much room on the wooden block and finally splitting the wood. The complete unit to be described only needs two long screws for fixing to the wall.

An electrician's round wooden wall-mounting block, approximately $3\frac{1}{2}$in. diameter, with a flange of about $\frac{3}{4}$in. to 1in., is drilled in the centre of the flange at top, bottom and midway round the circumference as shown. The drill should be of such size as to allow a push fit of the telescopic rod section. (These rods, by the way, are about 1ft. each in length, copper plated and obtainable at most surplus stores in the region of 2d. per section.) As previously stated, five of these rods are required for the London area ; other districts are catered for by suitably shortening to match.



Mr. Austin's aerial suggestion.

It should now be decided whether a left-hand or right-hand feeder to the set is required. As the centre hole is used for the feeder the block can be mounted in either direction. Having decided the feeder direction, one rod is pushed into the top hole until $\frac{3}{4}$in. protrudes inside the block. The rod is then heavily soldered at the inside and outside of the flange, making a perfect fixture to the block.

Next, sufficient 70 ohm co-axial cable is needed to provide both feeder to the set and bottom element to the aerial, the bottom element being same length as the total length of rod sections used. The feeder, passed through the centre hole of block, is bared of outer covering and the metal braid carefully cut lengthwise and peeled downward, twisting into a solid mass for soldering to the metal braiding of the bottom element. The illustration should leave no doubt as to the simplicity, adaptability and usefulness of the unit.

One very important point which should be borne in mind, especially by the beginner, is that the aerial feeder should proceed at right angles from the unit for at least half the length of the rods.

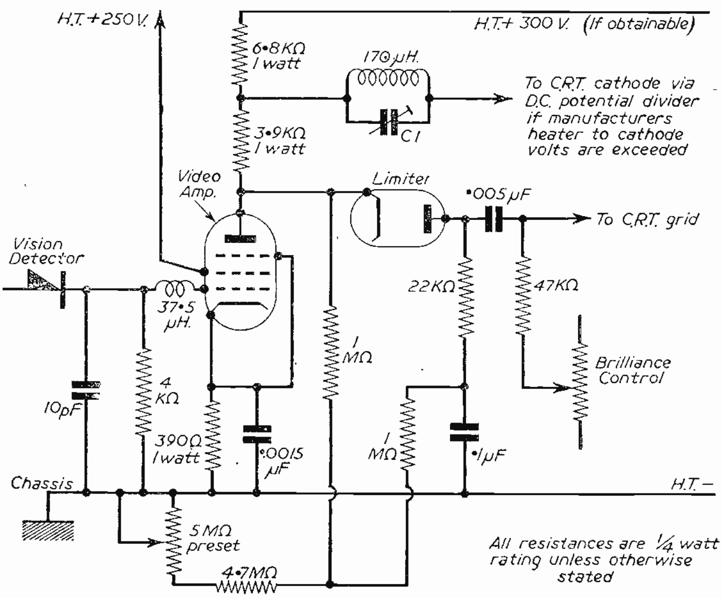


Fig. 6.—Circuit which can be added to any existing receiver.

Frame Flyback Suppression—1

SOME CIRCUITS FOR THE EXPERIMENTER

By "Erg"

CIRCUIT modifications to eliminate the frame flyback lines are coming more and more into favour, especially in those receivers which have the brilliance control arranged as a manual control, with the contrast control pre-set at the rear of the chassis. It is a useful device, especially in the fringe areas where the brilliance can be advanced beyond its normal level, when the signal is weak, without bringing the bright flyback lines across the picture.

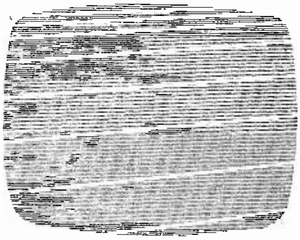


Fig. 1.—Raster showing flyback lines.

A further benefit obtained by the system is in cases where noise causes the effects of "snow" on the picture ; by sacrificing a little of the contrast it is possible to reduce the signal input and to compensate for the loss of overall brilliance by operating the brilliance control beyond its normal level.

The frame flyback shows itself on the screen as a bright line which zig-zags from the top to the bottom of the screen. It can be seen clearly on an unmodulated raster when no signal is being received and the brilliance control is advanced beyond its normal operating position.

The lines are usually spaced closely together at the top of the screen and become wider apart towards the bottom. Fig. 1 shows their general appearance.

If the televisor input is modulated and the brilliance control over-advanced, the flyback lines will appear in a similar fashion except that the bottom few lines are broken up by the continuance of the line sync pulse.

Under normal operating conditions, when no signal is being received, the brilliance control should be set so that the raster is reduced to the point of extinction. This is the "threshold" position and the tube is at its most sensitive point. The incoming signal will modulate the tube and the picture will appear when the contrast is advanced, this control being adjusted for the optimum balance between blacks and whites of the picture. The brilliance control can then be adjusted a little to ensure that the correct balance between black and white is obtained.

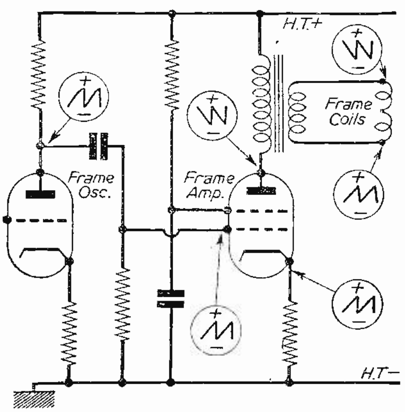


Fig. 2.—Showing sawtooth waveform at different points.

When these conditions have been obtained the flyback lines do not show on the screen because the sync pulse, which initiates the flyback of the frame oscillator, is also applied to the C.R.T. so as to bias it beyond cut-off. If the brilliance is advanced too far the blanking pulse from the sync signal is insufficient to bias off the tube to a point beyond the cut-off and the trace of the spot returning to the top of the screen will be seen.

Suppression of the flyback involves some method of supplementing the bias of the sync pulse which is applied to the C.R.T., and the method of doing this will depend upon whether the C.R.T. is grid or cathode modulated.

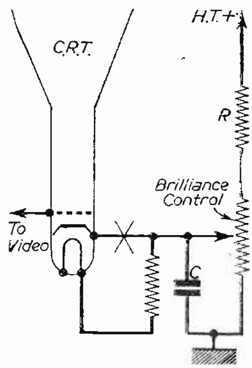


Fig. 3.—Basic tube circuit.

Cathode Modulation

If the C.R.T. is cathode modulated, then the sync pulse appears on the cathode as a positive pulse ; this drives the cathode positive with respect to the grid, or we can say in another way that it makes the grid more negative with respect to the cathode. Making the grid more negative than the cathode reduces the beam current in the tube and the spot is suppressed.

Grid Modulation

Where the C.R.T. is grid modulated, then the flyback pulse is negative and the spot is blacked out on receipt of the pulse.

In order to supplement the bias caused by the flyback pulse we have a simple and efficient method which can be used for most television circuits. Where the tube is cathode modulated, the grid is biased so as to control the brilliance of the picture ; if, when the positive flyback pulse is applied to the cathode we could apply a similar negative pulse to the grid, then the bias during the flyback period would be doubled and hence the average level of brilliance could be set above normal without the appearance of the flyback lines.

Similarly, if the tube is grid modulated the sync pulse is negative on the grid ; if we could at the same time apply an equal positive pulse on the cathode, then once again the tube would be doubly biased during the flyback period and the flyback lines would thereby be doubly suppressed.

Fortunately, this pulse of opposite polarity is readily available in the existing circuit arrangements and has only to be tapped off at a suitable point and applied to the appropriate electrode of the tube.

Fig. 2 shows the skeleton circuit of an average type of frame oscillator and amplifier. The oscillograms at different points of the circuit are shown on the diagram, and the top of each represents positive while the bottom represents the negative.

Please note that these oscillograms are "idealised." In each case they show the waveform as being perfectly straight; under practical conditions the sawtooth oscillations are far from straight and various methods have to be employed to ensure linearity in the actual scan. However, the basic principle is the same, the wave consisting of a comparatively slow movement in one direction (the scan), followed by a rapid movement in the opposite direction. All that we are concerned with here is the direction of movement of the pulses.

In order to understand the underlying principles, it is as well to start with the grid of the frame amplifier.

Now the frame output valve is a power valve and has to deliver strong sawtooth current waves to the deflector coils. It requires, therefore, quite a heavy current to operate it, and it is desirable to bias the valve as much as is practicable so that the standing current will be as low as possible. It is usual, therefore, to operate the valve with fairly heavy bias and to apply the sawtooth waveform from the frame oscillator so that it is positive-going on scan. At the grid of this valve, therefore, it is usual to have a positive-going waveform.

So as to avoid confusion, reference in this article to a positive waveform indicates that the long stroke of the waveform (that which is occupied by moving the scanning beam from the top to the bottom of the tube) moves from a negative position to a positive position. Under these conditions the flyback will be negative. A negative-going waveform indicates that the long stroke of the waveform (that which is occupied by moving the scanning beam from top to the bottom of the tube) moves from a positive to a negative position. Under these conditions the flyback will be positive.

Now let us go back to Fig. 2. With a positive-going waveform on the grid of the output valve, we shall have a negative-going waveform with a positive flyback.

At the cathode of the output valve we shall have a waveform similar to the input, unless the cathode is decoupled with a large value condenser. At the anode of the oscillator we have the same type of waveform as is applied to the grid of the output valve.

Across the scanning coils we shall have waveforms of opposite polarity and to obtain one which is in the direction required, then either side of the coil can be earthed, the waveform being taken from the opposite side.

It is clear that at the frame output valve we can obtain a pulse during the flyback period which is negative or positive, according to whether we take it from the anode or the grid.

At the anode the flyback is positive, and if this were applied to the cathode of the tube, the tube would be heavily biased during the flyback period. This would be quite practicable if the grid of the tube were modulated, but with a cathode-modulated tube (i.e., the picture signal is applied to the cathode and not the grid), we would have the frame output circuit coupled to the video output circuit and tube input with disastrous results to both!

In the case of a cathode-modulated tube, then, the only method of applying a pulse would be to the grid, and in this case it would have to be positive. We have such a pulse available at the grid of the output valve, at the anode of the frame oscillator, or at the cathode of the output valve provided it is not decoupled. We can also obtain a pulse of either polarity from the frame coils by the method given previously.

There is one further snag associated with the arrangement. This is that care must be taken to avoid upsetting the existing arrangements for controlling the brilliance of the picture and also to avoid upsetting the waveform applied to the scanning coils. Some method must be employed to separate the brilliance and scanning circuits so that they do not interfere with each other.

The reasons for this will be made clear from study of Fig. 3. This is the skeleton arrangement of a typical tube circuit using grid modulation. The cathode is biased by applying a positive voltage to it from the potentiometer network R and the brilliance control, the latter being variable so as to be able to control the brilliance. Imagine this circuit directly coupled to the anode of the frame output valve.

In the first instance the existing anode feed of the valve would be shunted by the brilliance control; then the bias produced by the brilliance control would be considerably altered by the potentials introduced at this point from the anode of the frame valve; then the flyback and the scanning pulses would be by-passed to earth via C, which is necessary to decouple the cathode of the tube.

The first and second effects can be overcome quite simply by insertion of a blocking condenser between the two circuits, and the third can be overcome by insertion of a resistance in the cathode circuit of the tube which will not affect the operation of the Brilliance Control. Very little current is drawn through the cathode and the extra voltage drop introduced by the resistor can be kept within the limits of the characteristics of the tube. The resistance is inserted at "X" in Fig. 3. *(To be continued.)*

German Exhibition

THE organisers of exhibitions in England, France, the Netherlands, Italy, Switzerland and also of the German Radio, Television, Gramophone and Radiogram Exhibition to be held from August 26th to September 4th, in Düsseldorf, are expecting record numbers of visitors. As far as Germany is concerned, it should be remembered that no radio exhibition was held in 1954, and that television has considerably developed during this year and will continue to develop until August. German Radio Exhibitions have always been a centre of attraction to international visitors as—compared with a few others which are arranged on the Continent—they prove profitable to experts and visitors in every respect. Everything ranging from the luxury radiogram to the most simple plug will be displayed at the Düsseldorf show. The large variety of exhibits is not the only attraction. Radio exhibitions somehow generate a special atmosphere which is all their own and both exhibitors and visitors find this most stimulating—this has always been one of the main attributes of German Radio Shows, whether held in Berlin, as before, or in Düsseldorf, as now.

R.F. Amplification at V.H.F.

USING R.F. AMPLIFIERS ON BANDS I AND III, AND ON 144/146 Mc/s

By H. E. Smith (G6UH)

WHEN considering the design of pre-amplifiers for the V.H.F. bands it is most important that consideration be given to the following points :

(1) That the valve chosen is designed by the makers for operation on the particular frequency, or band of frequencies, to be covered.

(2) The addition of the pre-amplifier must not add materially to the overall noise figure of the receiver.

(3) The tuned circuits must provide approximately equal gain over a bandwidth of 3 Mc/s for television, and 2 Mc/s for 144/146 Mc/s (2 metre) operation.

Many commercial types of pre-amplifiers for TV Band I incorporate a valve (or valves) of the Z77 class, and most of these are more or less satisfactory if one is prepared to suffer the increase in " grain " on the picture, plus a very " hissy " background on sound.

A single stage pre-amplifier of this type may provide as much as 20 db of so-called gain, but much of the increased noise level is due to noise generated by the valve itself. On the whole, however, this increase in noise must be tolerated, because the improvement effected in fringe areas does at least allow the picture to be held for longer periods and thus provide more entertainment value.

Band III

It may have come as a shock to many people with little experience of operating conditions above 100 Mc/s to learn that most of the Band III stations will have a range of up to 30/40 miles only. In many cases the range will be even less, due to local screening, and except where one is virtually in line of sight with the station, some form of pre-amplifier will almost certainly be necessary.

The Z77 class of pre-amplifier is little more than useless on these higher frequencies because the valve noise will override the signal in many cases. Strong signals will be made louder, but weak signals will still be as weak compared with the noise level. To get down to the problem of designing an efficient pre-amplifier for Band III we must study the points as given in the opening paragraphs.

Choice of Valve

There is a fairly wide range of suitable valves designed for operation on these higher frequencies but many of them are in the higher priced range and beyond the resources of the average constructor. Omitting the more expensive types, there is the question of *convenient* types. Valves such as the LZ319, PCF82 and PCC84, while being specially made for operation on the V.H.F. bands, are at the same time designed for A.C./D.C. operation and require 9, 9.5 and 7 volts heater supply respectively, which makes things a little difficult if they are to be used in a separate pre-amplifier stage in conjunction with an A.C. receiver. However, there are some well-tried and efficient types in the 6.3 volt heater range, the B309 (12AT7), ECC91 (6J6), EC91 (6J4, except for slight difference in pin connections), and the EF95 (6AK5). All the above valves are suitable for operation up to well over 250 Mc/s. Our final choice is determined by the original requirements as outlined in points 2 and 3 (noise and bandwidth).

The EC91 has the lowest equivalent noise resistance, and is designed for operation as a *grounded grid amplifier*. Grounded grid operation provides less gain per stage but has the following advantages :

(a) Ease of construction.

(b) Wide bandwidths easily obtainable.

(c) Being *degenerative* the circuits are less liable to R.F. feedback, causing an increase in noise level.

(d) It will not add to the noise figure of the receiver.

A Single Stage Grounded Grid Pre-amplifier

A single stage pre-amplifier of the grounded grid type will provide 5 to 6 db of effective power gain. This means that in the case of a normal fringe area,

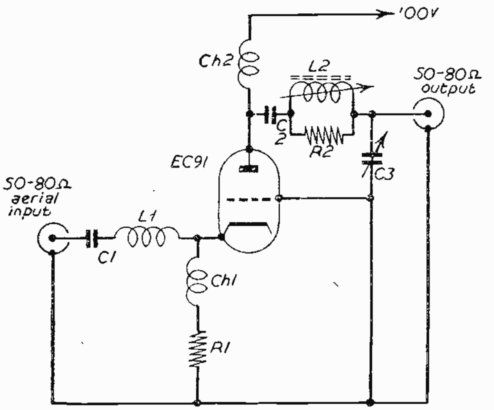


Fig. 1.—A single stage, grounded-grid amplifier.

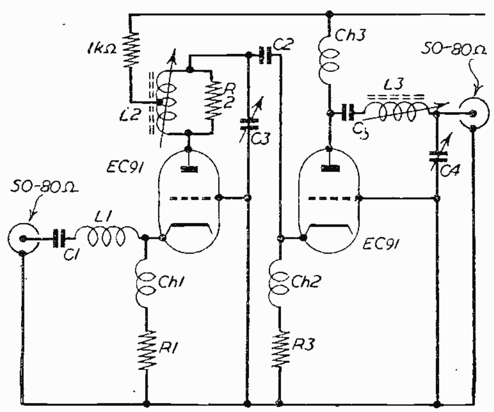


Fig. 2.—A two-stage amplifier suitable for Band III.

where the sound can be heard on a local station receiver, but the vision cannot be resolved because of weak line and frame hold, the addition of this single stage will usually enable satisfactory results to be obtained.

The circuit is given in Fig. 1. Component values should be as short as possible, irrespective of appearance. Where flat coupling condensers of the silver mica type are used, mount them *edge on* to the chassis. Keep all R.F. chokes well away from any tuned circuit. If this is not possible, mount the choke at right-angles to the coil.

LIST OF COMPONENTS FOR FIGS. 1 & 2

For Band I (Channels 1-5)

C1.—200 pF.

C2, C5.—.002 μF.

C3, C4.—25 pF trimmer.

R1, R3.—150 ohms, ¼ watt.

R2.—5k ohms, ¼ watt.

CH1, 2, 3. — 26in. 30 s.w.g. d.s.c. wound on ¼in. former.

L1.—12 turns 16 s.w.g. enam. ½in. diameter, turns spaced 1/16in.

L2.—9 turns 16 s.w.g. enam. close-wound on ⅜in. former, tuned with dust-iron slug ¾in. long (centre-tapped if for Fig. 2).

L.3—As L2.

For 144/146 Mc/s.

C1.—100 pF.

C2, C5.—.002 μF.

C3, C4.—25 pF trimmer.

R1, R3.—150 ohms, ¼ watt.

R2.—25k ohms, ¼ watt.

CH1, 2, 3.—15in. 30 s.w.g. d.s.c. close-wound on ¼in. former.

L1.—7 turns 16 s.w.g. enam. ½in. former, turns spaced 1/16in.

L2.—5 turns 16 s.w.g. enam. ⅜in. former, turns spaced 1/16in. tuned with dust-iron slug ½in. long (centre-tapped if for Fig. 2).

L3.—As L2.

For TV Band III

C1.—50 pF.

C2, C5.—.001 μF.

C3, C4.—25 pF trimmer.

R1, R3.—150 ohms, ¼ watt.

R2.—5k ohms, ¼ watt.

CH1, 2, 3.—15in. 30 s.w.g. d.s.c. wound on 3/16in. former.

L1.—4 turns 16 s.w.g. enam. ½in. diameter, turns spaced 1/16in.

L2.—3 turns s.w.g. enam. ⅜in. former, turns spaced 1/16in. tuned with dust-iron slug ½in. long (centre-tapped if for Fig. 2).

L3.—As L2.

and coil sizes are given above. (These also apply to the two valve circuit of Fig. 2.)

This single stage will provide approximately equal gain over a bandwidth of 3 Mc/s, and may be used with equal success for TV Band I, Band III, or 144/146 Mc/s.

The aerial input circuit is broadly resonant, matching 50/80 ohm co-axial feeder, and the choke-fed anode circuit has a capacity-coupled tuned circuit with reactive low-impedance output to match into a short length of similar feeder. (C3 being peaked for maximum signal.) The complete pre-amplifier may be constructed on a small chassis about 2in. square by 1in. high, with the aerial input coil mounted above, and the anode coil below, to ensure adequate screening.

Two Valve G.G. Pre-amplifier

For extreme fringe areas of Band III stations, or for general use on 144/146 Mc/s, the 2 valve arrangement shown in Fig. 2 is recommended. This will provide some 16 to 20 db of gain with an exceptionally low noise figure. Care must be taken to ensure that all three coils are screened from one another, and screened valveholders should be used. The trimming condenser C3 may be omitted if the pre-amplifier is to be used on Band-III, but should be used for 144/146 Mc/s operation. (When the unit is finally trimmed, C3 should be peaked for maximum signal on a station operating near the centre of the band.)

Constructional Notes

V.H.F. pre-amplifiers require very careful construction. Incorrect layout can easily turn a good circuit into a very bad one. All leads carrying R.F.

Finally, never use condensers and resistors which have been removed from surplus equipment. First-class results can only be obtained by the use of first-class components.

Hungarian Television

HUNGARIAN television has reached the second stage of its development with the completion of a new transmitter by the Beloiannis factory which is scheduled to begin the first daily transmissions on April 1.

For the last 12 months thrice-weekly experimental broadcasts have been made from the temporary station on top of Szechenyi Hill, Budapest, with pioneer apparatus working on a strength of 100 watts for vision and 50 watts for sound.

The new transmitter of 500/250 watts power employing Frequency Modulation, will radiate sound and vision from one butterfly aerial, unlike the first apparatus which used separate aerials.

The pioneer apparatus began transmissions with two-hour programmes three days a week. It was picked up and reported upon by 200 owners of imported or home-made sets.

Mr. Zoltan Marot, chief engineer of the Hungarian Television Enterprise, said in an interview : " Fitting of the new transmitter started in February. Buildings and equipment are all ready for assembly on the spot. Regular transmissions are planned for April 1.

" At first we shall be equipped only for showing films. A 500 watt transmitter is obviously too small a basis on which to build full programmes.

" Preparations have already begun for our 5 kilowatt transmitter and for the building of studio and spot-transmission equipment.

Sync. Pulse Separation

A SIMPLE EXPLANATION OF THE PRINCIPLES INVOLVED AND SOME POPULAR CIRCUITS

By W. J. Delaney

THERE are many constructors and experimenters who are not able to understand the full technical principles involved in various parts of a modern television receiver, but who, nevertheless, obtain considerable pleasure and interest from their hobby. They manage to make a receiver which works very satisfactorily, but it is when faults arise that they meet difficulty. Their experience in building and trying out various arrangements does, however, enable them to trace what may have gone wrong and to take steps to cure it, but when some particular types of fault arise their lack of technical knowledge does lead them into difficulties. Usually, however, provided that sufficient time is spent on it, the trouble is overcome, and probably one of the most awkward parts of a modern television receiver for this class of amateur is the sync separator. In most receivers this is merely a pentode, and it is commonly regarded as a simple stage which apparently carries out its function in a perfectly satisfactory manner, and seldom goes wrong. It is, however, a very important part of the circuit and many subsequent timebase troubles are attributable to the separator not functioning satisfactorily, whilst other receivers could be made to give a much improved raster if more attention were paid to this more or less insignificant part of the circuit.

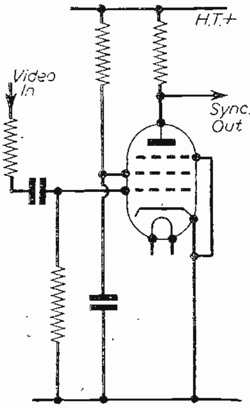


Fig. 1.—The ordinary pentode sync. separator.

What It Does

Without going into involved technical details, it is possible to give an idea of the function of the sync separator. Explained briefly, the television signal (which consists of picture details plus the sync pulses) comprises a fluctuation above and below a mean level. All the impulses on one side of this level are the picture details, whilst the impulses on the other side are the combined frame and line sync pulses. Usually these combined signals are taken from the video stage and passed to a pentode valve which is operated in such a manner that all the impulses on one side of the line are suppressed whilst the others are accepted. The essential point here is that the accepted pulses, which are the combined frame and sync pulses should be passed on without any trace of the signal details, as only then will the respective timebases be triggered at the correct intervals. The presence of signal details in the timebase circuits may lead to erratic triggering, which will result either in pieces of the picture being pulled out of their correct position, bad interlacing, or similar troubles. In many cases the necessary suppression of the signal and separation of the sync pulses may be obtained by using a standard valve so biased that it is cut off in its normal condition and only the sync pulses will produce a change in anode current. This condition is usually obtained by using a standard pentode valve with low H.T. voltage and the usual grid condenser and leak as shown in Fig. 1, the input series resistance serving to aid in the limitation of the picture pulses. As shown in this circuit, it is possible to take out the combined pulses and to permit the separate timebase input circuits to separate further the individual pulses. This means the fitting of integrating networks which again can give rise to difficulties, giving erratic working. Obviously, for perfect interlacing and a solid lock on both frame and line, it is essential that the appropriate pulses only are passed to each section of the timebase, and it is in this connection that the main troubles are usually experienced.

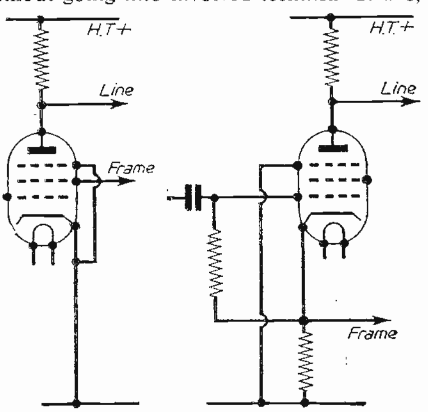


Fig. 2.—Two methods of taking out the sync. pulses to avoid interaction.

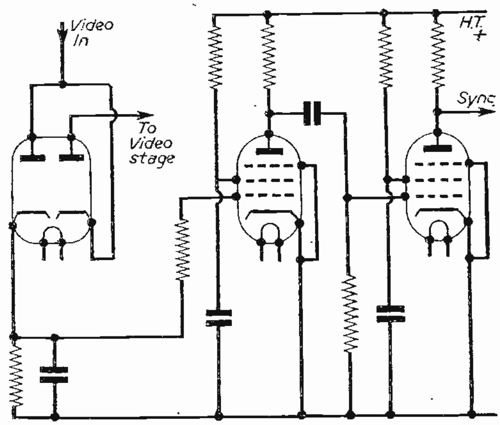


Fig. 3.—The ideal sync. separator arrangement, with isolation of picture pulses.

Pulse Separation

Assuming that the signal impulses have been eliminated, we now have the combined sync pulses to deal with, and two common methods of separating these are shown in Fig. 2. In the first case the line pulses are taken from the anode, and the frame pulses from the screening grid, whilst in the second case the frame pulses are taken from the cathode. It is important to realise here that the question of phase has to be borne in mind, and the arrangement shown in the latter circuit will produce a frame pulse of opposite polarity to those of the line and thus a different connection will be called for in the frame oscillator stage. It may even be desirable in this case to add a further valve to act not only as a phase reverser, but also to shape the frame pulses and eliminate any possible trace of signal or line pulses to ensure accurate interlacing. To avoid this added difficulty one method often employed is to separate the two sets of pulses in the anode circuit as shown in Fig. 4, where both sets of pulses are of the same polarity, but the resistor between the two outputs serves as an isolating component, and in addition, a series R/C network is often interposed in one of the leads, usually the frame output. It will be seen from the above that there are a number of places where it is possible to meet difficulties in obtaining suitable pulses for the timebases, even assuming that the picture pulses have been completely eliminated.

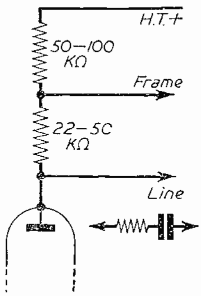


Fig. 4. — Another method of isolating the sync. pulses.

Improved Circuit

To ensure accurate interlacing, therefore, one of the first requirements is the elimination of picture pulses, and undoubtedly the arrangement shown in Fig. 3 has much to recommend it. It will be seen that the video detector takes the form of a double diode (or two crystal diodes may be used), so connected that two outputs are available. One is taken from a cathode and is used for the sync circuits, whilst the other is taken from the anode and is used to feed the video stage. The latter may now be adjusted to give maximum effect to the picture impulses, as it is no longer necessary to take any precautions to preserve the sync pulses for subsequent use. (It will be remembered, of course, that the usual sync separator *follows* the video stage, and thus the latter must carry both picture and sync.) Video stages may be designed to provide either positive or negative picture pulses, and therefore the biasing may be arranged in different ways, but always it is necessary to take precautions so to arrange matters that the sync pulses are not clipped or distorted in any way, and thus all picture definition has to be somewhat of a compromise. By adopting the arrangement in Fig. 3, however, the video stage may be designed without any reference whatsoever to the sync pulses, all biasing, correction circuits, etc., being arranged to make the best of the picture which is passed on to the tube.

As mentioned earlier the question of phase has to be considered and if the sync pulses, taken from the cathode as shown in Fig. 3, are passed to the usual pentode separator they would be out of phase, so that an additional stage is called for. This has the added advantage that it may be designed on almost the same lines as the ordinary separator, thus giving two stages of separation, which gives complete elimination of the picture pulses, plus some additional amplification of the sync pulses, leaving a good strong, clean pulse available at the output of the second pentode for subsequent application to the timebases. It might be argued that the additional stage is introducing further possibilities of fault, and whilst it is true that each additional stage, with its additional components, introduces potential sources of trouble, the arrangements are fairly straightforward and the advantages outweigh the disadvantages. A further and very valuable advantage of this circuit is that it is possible to obtain a synchronised raster free from all picture detail, in order to adjust the linearity, etc. This is carried out by using the receiver during a transmission period, and clipping a short length of wire between chassis and the grid of the video stage. This should leave a perfectly clean synchronised raster, and any trace of picture detail will indicate that the two pentodes are not operating correctly, and any faults due to poor smoothing, interaction between frame and line pulses, etc., will readily be seen. This is probably the only circuit which possesses these advantages, and saves the amateur the expense of a pattern generator for obtaining perfect adjustment of the timebases.

TV Problems in Luxemburg

By G. de Brabander

IN mid-February, 1955, the Luxemburg television station will start its transmissions. It is expected that this station will make television available to more than two million potential viewers —a quarter of a million in the Grand Duchy and the rest in Belgium, France and Germany. The service area covers a series of important towns such as Luxemburg, Metz, Treves, Sarrebrück, Verdun and Arlon.

Both transmitter and aerial are situated near Dudelange on Mount Grinzebirg, in the southern part of the Duchy and near the French border. There the altitude goes up to 1,400ft. The antenna-tower, previously employed by Radio-Luxemburg, has a total height of 710ft. and shows two platforms ; the first one is at 200ft., the second one at 300ft. above the level of the road. On these platforms the relay equipment will be installed. The aerial itself measures 46ft. in length.

System

The Luxemburg television system is rather an odd one. Each picture is scanned horizontally in 819 lines. There are 25 pictures per second. The picture modulation is positive and the sound is amplitude-modulated. The channel width, according to the Stockholm plan, attains 7 Megacycles per second.

So far, this system corresponds to one of the Belgian systems, that is, the French one. The synchronisation signals are identical with those of the 819 lines-system used in France. Sets designed for the reception of the Luxemburg television programmes are thus more complicated than the British.

NEW SERIES

Servicing TELEVISION RECEIVERS

No. 8.—PHILIPS 1100W AND 1100U SERIES

By L. Lawry-Johns

THE Philips 1100W is a 12in. table model, with a console version (the 1200 W) employing the same chassis. It is a superhet receiver, and operates on the lower sideband of the vision carrier. As usual, the R.F. and frequency changer stages are common to both sound and vision. Channel selection is by plug-in coils and retuning the oscillator trimmer.

The aerial input should be 75 ohm screened balanced twin feeder. The use of other cable may result in ringing and increased interference. A 10-1 attenuator is built-in, and consists of a resistor network, a plug being provided for selection. The R.F. stage has a sensitivity control in its cathode circuit, employs an EF80 valve, which is also used as a frequency changer, and for the I.F. amplifiers ; that is valves V1, 2, 3, 7, 8, 10 are all EF80's. The final sound I.F. amp. is, however, one half of an ECL80, the triode section operating as the L.F. (audio) amplifier. V10 is the video amplifier.

The first vision I.F. amplifier, V7, has the contrast control in its cathode circuit. The I.F. is approximately 12 Mc/s. Sound rejection is by L17 in the anode circuit of V7, and L22 in the anode circuit of V8. Access to these cores is from beneath the chassis and their position is marked in Fig. 1.

A Common Fault

The vision detector is one diode of V9, the other being used as the limiter. The cathode of the limiter is taken to the junction of the two video amplifier anode circuit peaking coils. There are no peaking coils in the grid circuit of the video amplifier. It is in the circuit of V10 that trouble often arises. From the diagram (Fig. 2) it will be seen that its anode is decoupled by a 10 μF electrolytic, and this is returned to the top of the cathode by-pass, which is a 100μF condenser. If loss of line and frame hold is experienced, examination of the 10μF condenser is well worth while. If this component goes O/C, or partly so, it will cause an apparent increase in contrast, perhaps smudging, and a definite loss of frame hold, and often line hold as well.

If, however, and this is more usual, the top half of the raster is blacked out, again with erratic hold, the 100μF cathode bias condenser will almost certainly be at fault. This is a very common fault on these receivers, and others such as the 1236U. Turning to the sound channel, the sound I.F. at the anode of V2 is coupled by L7 L8 to the first I.F., V3. The grid of this valve is controlled by the A.V.C. from V5A sound detector. The I.F. signal from the anode of V3 is passed to the pentode grid of V4 (ECL80), which is the second I.F. amplifier. The signal is then detected by V5A (EB91) and thence through the second half of this valve which acts as a limiter. It then passes to the volume control and then to the L.F. amplifier, second half of V4, that is, the triode section. The amplified signal is then applied to the grid of the sound output valve V6 (PL82).

Poor Focus

Near the valve base of V6 will be found an anti-parasitic device which consists of a Ferrox-cube ring. The grid lead to V6 passes through this and its magnetic field damps out any R.F. oscillation. The focus control is in the cathode circuit of V6, and poor focus control can usually be traced to the 50μF bias condenser going O/C (Fig. 3). The cathode bias should vary from 5 to 11 volts upon rotating the focus control. The focus field itself is centre-tapped to the H.T. positive line. One end is the H.T. feed to the sound section, the other going via a resistor to the cathode circuit of V6.

Sync separation is by the pentode section of ECL80 V-14. Frame pulses are fed to a pentode frame clipper which is again the pentode section of an ECL80 V19. This valve operates with very low anode and screen voltages. Five volts on the anode and 15 on the screen are correct readings. The grid of this valve is biased positive from the screen network to give efficient grid damping. The anode is transformer-coupled to the triode section of V19, and this section operates as a grid blocking oscillator. Anode to grid back coupling is by the same transformer, FT1. Amplitude is controlled by varying the H.T. voltage to anode and grid, and hold by varying the grid voltage only. A 1.2MΩ resistor in series with the frame hold control and the grid, via one winding of FT1, often goes high and causes loss of frame hold. This resistor is one of three grouped together beneath the chassis just beneath the F.T.1 transformer referred to above. The location of this transformer is on the top of the left-hand chassis, looking from the rear of the set. It is midway up the chassis on the right-hand side. The other two resistors grouped with the 1.2MΩ are valued at 68K. and 22K. Frame output valve V20 is a PL82. A raster which finishes with a bright line half-way down the screen can often be attributed to a defective valve in this position.

Other Receivers

This also applies to many other receivers such as Pye, Ferguson and to the Bush TV22 and 24, where an ECL80 is used. Quite often the raster will become normal for a length of time before jumping up again. Attention is directed to the 10μF 200 volt electrolytic, which decouples the screen grid to cathode of this valve. The circuit, as far as electrolytic condensers is concerned, is very similar to the video amplifier, and the cathode of the frame output valve is again decoupled by a 100μF condenser. The voltage ratings differ, however, on these bias condensers, that of the video amplifier being 12-volt working and that of V20 being 25 volt.

The 10μF screen decoupler will cause a fold-over if it should go O/C, the raster, however, remaining tolerable. On the other hand, if the 100μF cathode bias condenser should fail, the raster will decrease with intolerable foldover and non-linearity.

The 1MΩ grid leak of the frame output valve can go " high," with consequent non-linearity, and this is often the cause of this type of fault.

Line Circuit

Line sync pulses from the sync separator are fed to the triode section of V14, that is, the pentode section of this valve is the sync separator and the triode is the line clipper. The pulses from the anode of this triode section are then fed to a further clipper stage V15, again the triode section of this ECL80. The pentode section of V15 functions as the line oscillator. This is of the grid blocking type, back coupling from anode to grid being by transformer L.T.1. Line hold is by a control from H.T. to oscillator, via L.T.1 secondary and a 270K resistor. This resistor can change its value and cause loss of hold, a good indication being that the control is at the end of its travel and gives the impression that if a little more travel were available lock could be achieved. This is the case, of course, when the resistor change of value has not been too drastic. The line scan pulse to the line output valve is taken from the screen of V15 pentode section through an R.C. coupling. The anode of the line output valve PL81, and referred to as V16, is taken to a tapping on the line output transformer, and is supplied from the cathode of the booster diode V18 (PY80). The other end of this winding feeds the EHT EY51 in the usual way. The other two windings on the line output transformer supply the scan coils through the line amplitude inductance and the anode of the PY80 booster diode. The EY51 heater is also supplied from an additional winding.

The faults to be expected from this part of the set are usually those of valve failure and resistor changes. If no oscillation is present on the grid of the PL81 the ECL80 V15 should be suspected. If this valve fails it will result in : no raster, no E.H.T., no line whistle, and the heater of the EY51 will not be visible. The indication that the line output PL81 is failing on emission is that the width is no longer enough to fill the tube mask. There are, of course, many other factors which could cause this lack of width. A drop in H.T. voltage due to the failure of one of the PY82 rectifiers (V12 and V13) could quite easily be responsible, as could a drop in the efficiency of the booster diode V18 (PY80).

A picture which varies in size, as the result of variation of E.H.T. voltage, is often due to the series resistor (220KΩ) which is the E.H.T. smoothing resistor between the EY51 and the tube anode. This resistor is mounted on the line output transformer frame behind the EY51. Also concerned in this part

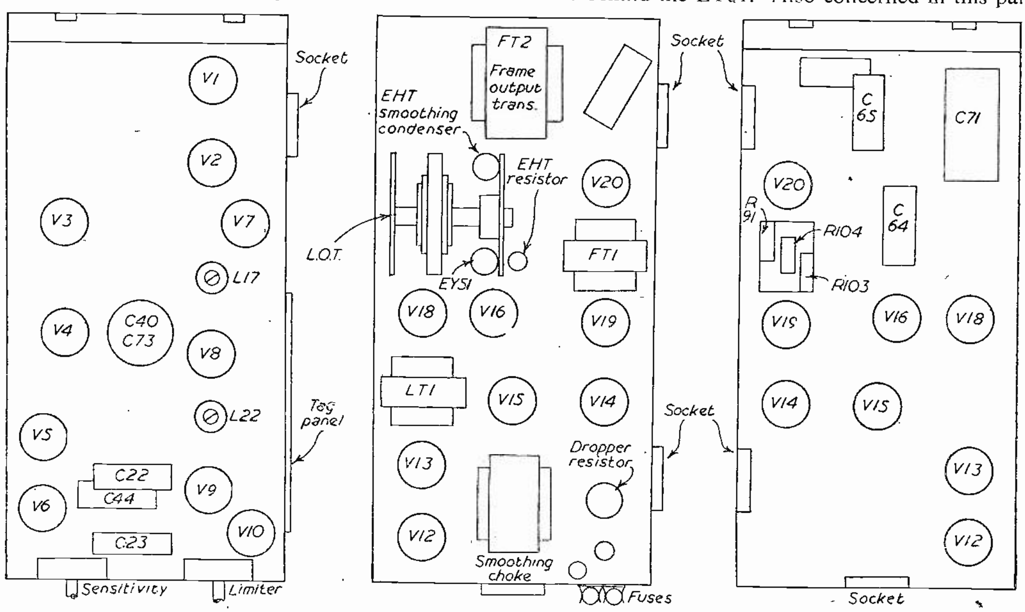


Fig. 1 (left).—Under-chassis view of R.F. unit. C22 and 23 are video amplifier electrolytics ; C40 and 73 are main smoothing condensers ; C44 is sound output bias condenser. (Centre).—Top view of timebase and power unit, and (right) underview of this unit in which C71 is reservoir condenser, C64 and 65 are frame-output electrolytics, and R103 is series framehold resistor.

of the circuit is the E.H.T. smoothing condenser which is a 500 pF 10 kV mounted as shown in the diagram. A leak in this condenser will cause either a serious drop in E.H.T. voltage, or if the condenser shorts completely a complete upset of the line time-

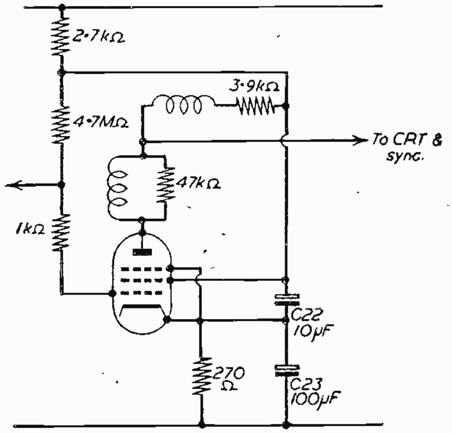


Fig. 2.—Video amplifier circuit showing the electrolytic condensers.

base operation. It may be disconnected to prove the point, as the graphite coating of the tube itself will carry out the necessary function of E.H.T. smoothing. However, a small drop in voltage will show on a suitable meter but the raster will be practically normal. The E.H.T. voltage should read approximately 9 kV when all is well. For the benefit of those readers who are not so well acquainted with TV servicing it is pointed out that a decrease in E.H.T. voltage results in a larger picture which is out of focus. An increase in E.H.T. decreases the size of the picture, which is the reason why an alteration to the width control may also alter the height to a lesser degree. If it is necessary to replace the above-mentioned E.H.T. smoothing condenser it should be noted that one end goes to the EY51 heater and the other to the booster diode cathode (PY80, V18), not to chassis or the H.T. line.

H.T. Supply

Turning now to the H.T. supply, as mentioned earlier, this is derived from V12 and V13 which are both PY82 valves. These usually have a reasonably long life, but if one of the 40Ω 5-watt limiting

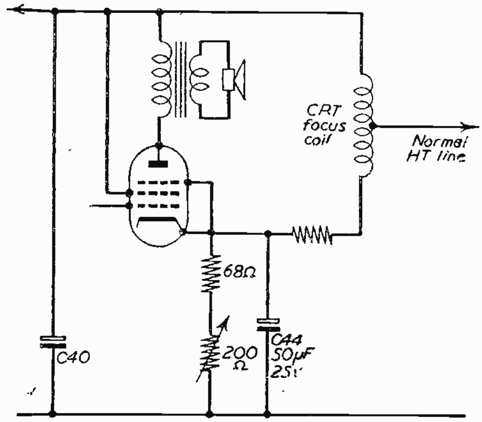


Fig. 3.—Showing the effect of the sound output stage on focusing.

resistors which are connected to the anode of each valve should be found burned out, the PY82 whose anode is wired to the defective resistor should be replaced.

A very loud hum on the sound, with low H.T. voltage, should direct attention to the large 100µF 275-volt working reservoir condenser which is located beneath the left-hand chassis. These condensers do tend to dry up after several years of use, due to the rather rigorous life and duty to which they are subjected. If, however, the H.T. voltage and line whistle is normal, a loud hum may indicate a heater-to-cathode leak in the ECL80, V4, or alternatively a similar fault in the sound output PL82, V6. If the volume control exercises an effect on the hum the sound detector-limiter EB91, V5, should be suspect.

FROM HERE AND THERE

Insurance For Aerials

TENANTS of Merton and Morden, Surrey, Council houses and flats who possess TV sets are being asked to pay a premium of five shillings towards having their aerials insured against accidents and damage.

Fire-Watching

A WELL-KNOWN brewery is to install television cameras in its new giant hop store following a fire last year which caused £800,000 worth of damage.

The cameras will be trained on the hops and at the first sign of fire, the cameras will automatically turn on carbon dioxide extinguishers.

Ice Foils Thieves

WHEN "smash-and-grab" thieves broke the window of a TV dealer's shop in Leytonstone High Road, London, recently, they were able to load five television sets on a lorry and drive off.

The icy condition of the road proved their undoing, however, and the lorry skidded and crashed into traffic lights. The receivers were not damaged.

TV Pays Its Way

WHEN Wales met the Army in a boxing contest at Sophia Gardens, Cardiff, in January, only 500 fight fans turned up. They were ushered into the first ten rows of the 3,000-capacity hall. The reason was that the event was being covered by BBC Television and spectators preferred a fireside seat to one at the ringside.

Fortunately for the Wales Amateur Boxing Association, the £150 fee paid by the BBC to televise the proceedings more than covered expenses.

The Price of Time

IT has been estimated that the cheapest advertising rate on commercial television when it begins will be £6 *a second.*

Board Appointments

DR. J. C. SIMMONDS and Mr. D. Prenn have both been appointed to the Board of the Radio and Television Trust.

Shift Controls for Magnetic Receivers

SOME DETAILS OF SHIFT NETWORKS FOR LINE AND FRAME COILS

By B. L. Morley

ELECTROSTATIC tube networks such as are used for the VCR97, etc., are usually equipped with some form of shift network, so that the raster and picture can be centralised. It is not necessary to provide a great deal of movement provided that the picture can be swung to the right or left and up or down, so that it is in its correct position.

The usual method of obtaining this shift is to apply bias to the deflector plates, the bias being made variable by a simple potentiometer connected in the E.H.T. network. The plates must be near the normal potential of the final anode or the electron beam will be diverted towards them and no picture will appear on the screen.

Where a magnetic tube is used the matter is not quite so simple. The usual method of centralising the screen is to alter the position of the focusing magnet or coil so that the beam is diverted. The magnet assembly is fitted with three screws which can be positioned so that necessary tilt of the beam can be obtained.

Ideally this is incorrect. The best position for the focusing magnet is such that the centre of the magnetic field coincides with the exact centre of the electron beam, so as to obtain a round spot and as even a focus as possible over the whole of the screen.

A further defect is that in the effort to make the picture central, the edge of the magnet may bear on the neck of the tube with consequent risk of fracture. It is much better to align the magnet assembly and scanning coils accurately and to adjust the centralising of the picture by other methods.

A Simple Method

One of the simplest methods of doing this is to pass a small value of direct current through the scanning coil. Supposing, for example, it is desired to move the picture up or down, then a small value of D.C. passed through the frame coil in one direction will cause the picture to move up, while if the current is passed through in the reverse direction the picture will move down.

Similarly, if a small direct current is passed through the line scanning coils in one direction the picture will move to the left, while if it is passed in the other direction the picture will move towards the right.

The basic circuit for this operation is shown in Fig. 1(a).

This shows a straight-forward line output circuit with a damping arrangement for suppression of the flyback. The bottom end of the scanning coil, instead of being connected to the other side of the secondary of the line output transformer, is taken to the slider of a variable potentiometer R. The bottom end of the secondary winding is taken to the outside connection of the potentiometer.

The remaining connection of the potentiometer is taken to H.T. negative, so that the H.T. current feeding the televisor must pass through it. C is a large capacity condenser used to decouple the potentiometer completely.

Current will flow via the slider through the line

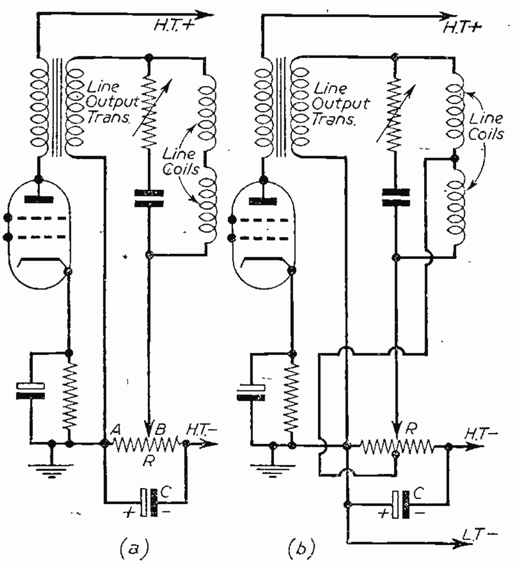


Fig. 1 (a) and (b).—Two methods of obtaining line shift.

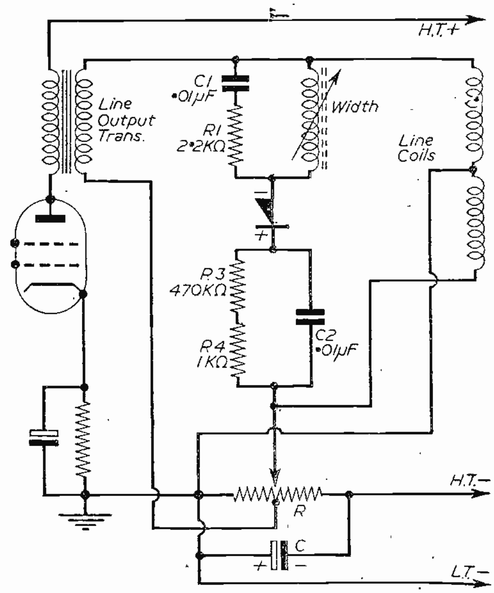


Fig. 2.—Method to be used when a damping diode is included.

coils and back to A which is connected to the chassis. The small voltage drop across R is sufficient to pass this current. The consequent magnetic field in the line coils will deflect the beam and hence the picture. R being variable allows the amount of shift to be controlled.

If the shift is required in the opposite direction then the current through the coils must be reversed

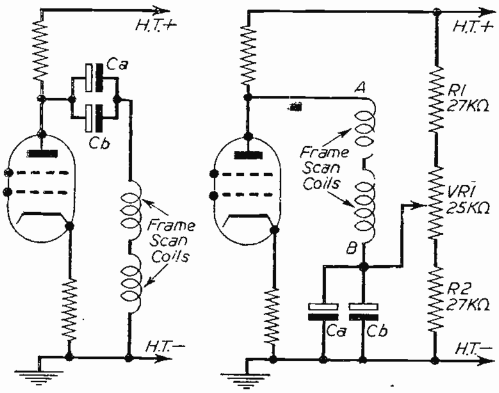


Fig. 3 (left).—Normal high impedance frame circuit. Fig. 4 (right).—Shift controls added to the Fig. 3 arrangement.

and all that is necessary is to reverse the connections A and B.

Important points are that R must be very low in value, and C very high and the H.T. negative must not be connected to chassis before it reaches the potentiometer.

Typical values are 10 ohms for R and 100 μF for C. (A good condenser to use here is the TCC Lectropack CE24A.)

An Improved Scheme

A rather more elegant way of doing the job is shown in Fig. 1(b). Here the potentiometer R is centre tapped and the connection from the line output transformer is taken to the tap. It will be clear that if the slider is on the right side of the tap the current through the coils will flow in one direction, while if it is on the other side (the left side), the current will flow in the opposite direction. By this method operation of R will cause the picture to move to the left or to the right as desired.

R should be about 10 ohms maximum, and C 100 μF minimum.

One difficulty with this circuit is that it is not always possible to obtain a centre-tapped control. However, it is a fairly simple matter to adapt a standard wire-wound potentiometer.

Potentiometers are made in different ways, and it is not possible to give detailed instructions for each type. The writer adapted one quite simply by inserting a spring clip between the wire form and the case at a point approximately midway between the two ends, a wire being soldered to the clip. It is essential that good contact be made.

Although the wire used in this type of potentiometer is of comparatively heavy gauge it is difficult to solder, and a spring contact has been found to give the best answer to the problem.

In Fig. 2 is shown the method applied to a line output circuit employing a damping diode. The circuit of the damping arrangements is quite standard and calls for no comment.

Vertical Shift

The frame circuit can be treated in a similar manner and the circuit given in Fig. 1 (b) can be employed.

Where high-impedance frame coils are used, a shift network can be fitted quite easily.

Fig. 3 shows a typical circuit where the frame coils are fed directly from the anode of the frame output valve via the high capacity condensers Ca and Cb. The bottom end of the frame scan coil is earthed.

Fig. 4 shows the circuit adapted to a shift network. The condensers are inserted at the "earthy" end of the coils and a connection is taken to a potential divider R1, VR1, R2. When the potential at B is exactly balanced by the potential at A then no current flows through the scanning coil. (This refers, of course, to direct current. The alternating currents produced from the frame output valve will flow without hindrance.)

If now the potential at B is made lower than that at A due to the slider of VR1 being set farther down the control, then current will flow from A to B and the picture will be moved up or down according to the direction of the coil winding.

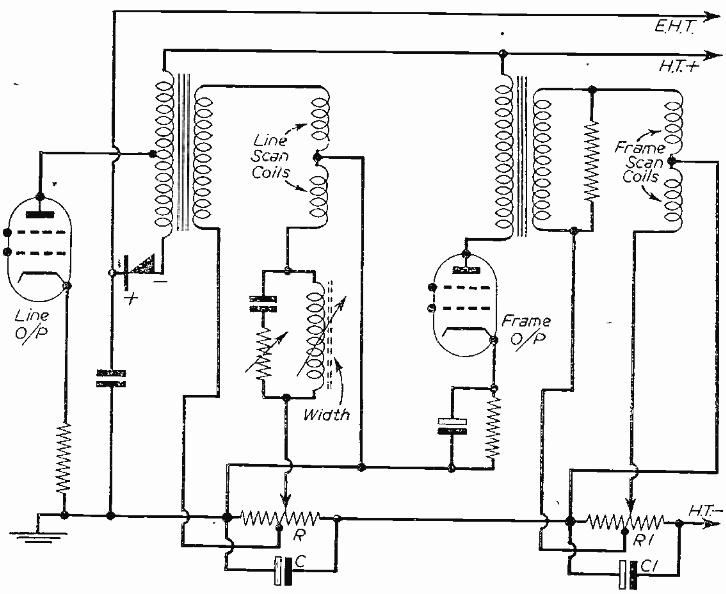


Fig. 5.—Circuit for two shift controls—frame and line.

Should VR1 be altered so that B is at a higher potential than A, then current will flow from B to A, that is in the reverse direction, and the movement of the picture will therefore be reversed.

By this method VR1 forms a shift control for the vertical scan.

Combined Vertical and Horizontal Shift

Fig. 5 shows the scheme where two methods of shift are combined. The line shift is similar to that in Fig. 1(b). The variation is merely the difference in the output circuit and not in the shift arrangements. R is of the same value previously given, and so is C.

The frame circuit is dealt with in a similar manner.

The H.T. negative comes directly from the power supply, and is *not* connected to chassis or earth. Instead it is connected to R1, and the H.T. current for the televisor will flow through this potentiometer. Decoupling is effected by C1.

From R1 the H.T. current flows through R, which is again decoupled by a large condenser C. From the far side of R the current finds its way to the chassis or common earth.

Tapping the Scan Coils

Scanning coils vary in their manufacture and may not have a centre-tap connection available. It is quite a simple matter to effect the centre tap, as two coils are used for line and two for the frame.

Examination of the coils will show the point where the two halves of the coils are joined. The joint is usually a soldered one covered by sleeving. The sleeving can be removed and a short length of wire soldered to the joint to form the centre-tap.

Efficiency Diodes

Where efficiency diodes are fitted, the H.T. positive supply is usually connected in the line scanning coil circuit. It is not possible to employ this form of shift network in these cases.

The best thing to do is to fit a shift control circuit to the frame scanning coils, and to rely upon the positioning of the focusing unit for the horizontal shift.

The Ed. Murrow Interviews

By "Q"

ED. MURROW is deservedly one of the most popular Americans known to this country. For several years before the war he represented an American radio company here, but it was not until war came that he became well known to the British public through his reporting from London. He flew on bombing raids over Germany and subsequently said that the incident which had impressed him most was when the English pilot asked him to open a window, so that metal foil could be dropped to confuse the enemy radar, and had remembered to say "please." When Murrow left for America after the war, he said that the only failure he could report was his complete inability to know when the British were being deliberately funny.

It was inevitable that a man of his calibre should eventually make his mark in American television. His exposure of Senator McCarthy will not be readily forgotten. It is also inevitable that viewers in this country are asking where our Ed. Murrows are and why we cannot achieve anything comparable to the series of interviews now being shown here.

What are the technical requirements for a typical Murrow interview in which he, sitting in a studio in New York, calls up a celebrity who first appears framed by his window and subsequently is our hostess in her own apartment, talking all the time to Ed. Murrow, who may be hundreds of miles away?

No Shackles

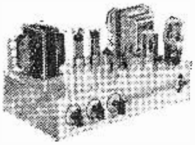
The first appearance in the window is easy for a studio equipped with *inlay*, as are some of the BBC studios. This is practised frequently, as when Terry Thomas replaces the oil painting previously seen in the gilded frame. The vision side of the interview is easily understandable; Murrow works to a monitor screen in his studio. Lily Pons and Eva Gabor cannot see him in return and must visualise him behind the lens of the camera, but they can hear his voice conveyed to them by loudspeakers. The exciting thing technically is the way the celebrity being interviewed is freed from the shackles of microphone and trailing lines. This is done by a combination microphone and short range transmitter concealed, in the case of a woman, in the corsage and, in a man, under the top of the waistcoat. The voice is transmitted a short distance only to the main equipment elsewhere in the apartment and thereafter voice and vision follow the normal routes to the studio.

There is a microphone transmitter being used in this country. Viewers saw it being used when the ice show from Earls Court was being televised one Sunday evening. Tommy Trinder used it. If this system becomes generally adopted it should prove of great benefit. For example, it should no longer be necessary for anybody such as Sir Gerald Kelly to walk through the galleries accompanied by a young lady whose sole function is to trail a microphone round and hold it in position when required.

The Interviewer

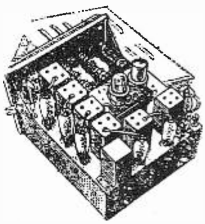
But all the technical equipment in the world will not make for entertainment unless the contents of the programme are good. Ed. Murrow is an excellent interviewer; but how he is helped by the Gabors and Pons he interviews! Have we anybody comparable in this country? Here, many of our celebrities give out answers with the same enthusiasm they would show in parting with their front teeth. There, a flood of bright chatter and a readiness to give out more than can be used. If proof were needed that the Americans and ourselves are fundamentally different, here it is. It ties up with the willingness and ability of some hitherto unknown person in a remote American town to make the most of a moment of notoriety by using grandiloquent statements to the world at large in a manner which would be unthinkable over here. Our British reserve is doubtless a fine thing, but it does not help the interviewer or make for an entertaining programme.

Doubtless in time the BBC will make available a version of the microphone transmitter. In the meantime, we should be grateful to America for demonstrating the potentialities of the system and to Ed. Murrow for showing what an excellent interviewer can do, when given the right support.



MULLARD AMPLIFIER "510"

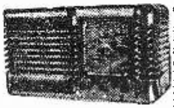
A High Quality Amplifier designed by Mullard engineers. Robust high fidelity, with a power output exceeding 10 watts and a harmonic distortion less than .4% at 10 watts. Its frequency response is extremely wide and level being almost flat from 10 to 20,000 C.P.S.—three controls are provided and the whole unit is very suitable for use with the Collaro Studio and most other good pickups. The price of the unit completely made up and ready to work is £12/10/- or 25/- deposit, plus 10/- carriage and insurance.



RESPONSER UNIT

Ideal for Commercial T.V. These contain 6 valves type SP61, and one each RL7, RL16 and EA50. Six IF transformers 12 Mc/s. band, and hundreds of other useful components. Price 39/6, plus carriage and packing 7/6. These receivers are unused.

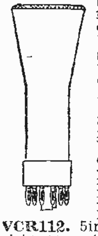
TERRIFIC NEW CIRCUIT



OCCASIONAL 55 — we have evolved a new T.R.F. circuit and have had really amazing results, equal, in fact, to many superhets. You really should try this circuit. All parts, including valves (6K7, 6J7, 6S96 and 6X5) and bakelite case with back, cost only £5/10/-, plus 2/6 post and insurance. Data included with the parts are also available separately, price 2/-.

GREATLY REDUCED CATHODE RAY TUBES

VCR97. Brand new and unused, "cut off type," ideal for 'scope, etc. Price 12/6. Carriage and insurance 5/- extra. Ditto but full picture type for T.V. 39/6, plus carriage 5/-.



VCR517. 6½in. guaranteed full picture. 29/6, plus 5/- carriage and insurance.

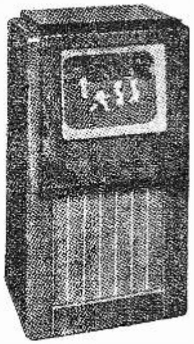
VCR139A. 2½in., 32/6, plus 2/6 carriage, etc.

VCR138. 3½in. electrostatic short persistence, suitable for T.V. and ideal for 'scope work, 37/6 plus 3/6 carriage, etc.

VCR112. 5in. electrostatic, persistence not known, 15/- each, plus 5/- carriage, etc.

CV996. 6in. electrostatic, persistence not known, 15/- each, plus 5/- carriage, etc.

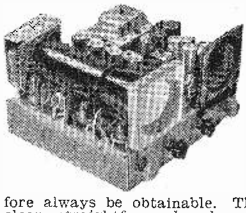
CV1140, CV1590, CV1546. All 12in. magnetic long persistence, £4/10/-, plus 10/- carriage.



A FEW REMAIN

This cabinet is offered below cost. It is suitable for a televisor using tube sizes varying from 12in. to 17in., its overall dimensions being 3ft. 5in. high, 1ft. 4in. deep, 1ft. 10in. wide. It is complete with plywood back and "Bowler Hat." Originally made for a very expensive televisor and really good quality. Unrepeatable. Offered at £6.19.6 carriage, packing, etc., 12/6. Note: These are cut for 12in. tubes, but the holes for the controls are not drilled.

TUBES ALL SIZES
All makes repaired at a little over half price—
SIX MONTHS' GUAR.

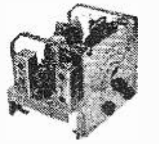


MINIATURE PORTABLE T.V.

The Elpreq Miniature Televisor uses standard conventional circuitry, employing a total of 13 valves and 2 crystal diodes. The cathode-ray tube used is a 2½in. Service type VCR139A, which has a standard equivalent and will therefore always be obtainable. The layout is extremely clean, straightforward and professional. The wiring, whilst naturally being a little more intricate due to miniaturisation, is nevertheless completely accessible. The total cost comes to £16-£17. Its size will be approximately 9½in. x 8in. x 6in.

Full construction data, layouts, diagrams, templates, etc., running into some 50 sheets are available, price 5/-, post free.

GENUINE HALF-PRICE OFFER
BEETHOVEN CHASSIS



Extremely well built on chassis size approx. 9½ x 7½ x 8¼, using only first-class components, fully aligned and tested, 110-240 volt A.C. mains operation. Three wave bands covering medium and two shorts. Complete with five valves, frequency changer, double diode triode, pentode output and full wave rectifier. Special cash-with-order price this month, £5/19/6, carriage and insurance 7/6.

COMMUNICATIONS RECEIVER R1155

YOURS FOR £1

R1155 is one of the finest communication receivers available; frequency range is 75 kc/s to 18 Mc/s. Complete with 10 valves in metal case. Made for the R.A.F. so obviously a robust job guaranteed in perfect working order. Price, Grade 2, £7/19/6; Grade 1, £9/19/6, or new and unused, £11/19/6, or will be sent on receipt of deposit of £1. Balance by 12 monthly payments. Carriage and Transit Case 15/- extra.

MAINS POWER PACK FOR R.1155

With Pentode output stage. Plugs into socket on receiver so no internal modifications are required. Price £5/10/- complete with speaker ready to work, carriage 3/6. If bought with receiver deposit is 11/-.

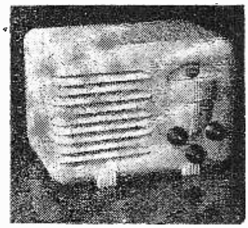
1in. MICROMETER

Exceptional purchase enables us to offer a 1in. precision micrometer at the very low price of 10/-. A micrometer is an essential part of an engineer's equipment. You, no doubt, will have found the need for one on many occasions in the past for measuring wire gauge, etc. If you act quickly you can acquire one now at the remarkably low price of 10/-, post free.

NOW A.C./D.C.

MULTI-METER KIT

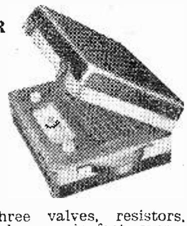
We can now offer a kit of parts suitable for making a multi-meter to measure A.C. volts as well as D.C. volts, milliamps and ohms. Price for kit containing all the essential items including moving-coil meter, metal rectifier, resistors, range selector, calibrated scale, etc., etc., is 19/6, plus 1/- post and packing. The D.C. only version is 15/- plus 9d. post and packing.



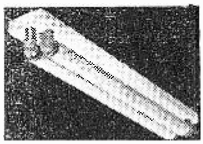
AMAZING LITTLE MAINS T.R.F.

Uses high-efficiency coils—covers long and medium wavebands and fits into the neat white or brown bakelite cabinet—limited quantity only. All the parts, including cabinet, valves, in fact, everything, £3/19/6, plus 2/- post. Constructional data free with the parts, or available separately 1/6.

BATTERY 3-VALVER
19/6



Employs modern circuit ensuring good reception on both medium and long waves. All parts including three valves, resistors, tuning condensers, in fact, everything except loudspeaker, cabinet and chassis (available if you haven't something suitable) costs only 19/6; data available separately, price 1/6.



THE TWIN 20

This is a complete fluorescent lighting fitting. It has built-in ballast and starters — stove enamelled white and ready to work. It is an ideal unit for the kitchen, over the work-bench, and in similar location. It uses two 20-watt lamps. Price, complete less tubes, 29/6, or with two tubes, 39/6. Post and insurance 2/6. Extra 20-watt tubes, 7/6 each.

ELECTRONIC PRECISION EQUIPMENT, LTD.

Post orders should be addressed to Dept. 5, RUISLIP.

Personal shoppers, however, can call at:

42-46 Windmill Hill, Ruislip, Middx. Phone: RUISLIP 5780 Half day, Wednesday.	**152-3, Fleet Street, E.C.4.** Phone: CENtral 2833 Half day, Saturday.	**29, Stroud Green Road, Finsbury Park, N.4.** Phone: ARCHWAY 1049 Half day, Thursday.	**249, High Road, Kilburn.** Phone: MAIda Vale 4921.

Volume Controls

Midget Ediswan type. Long spindles. Guaranteed 1 year. All values 10,000 ohms to 2 Megohms.

No Sw.	S.P.Sw.	D.P.Sw.
3/-	4/-	4/9

COAX PLUGS ... 1/2
SOCKETS ... 1/-
LINE CONNECTOR 1/2
OUTLET BOXES ... 4/6

80 ohm CABLE COAX

STANDARD ¼in. diam. Polythene insulated. GRADE "A" ONLY

8d. yd.

SPECIAL.—Semi-air spaced polythene, 80 ohm **Coax** ¼in. diam. Stranded core. Losses cut 50%. (just released) **9d. yd.**

BALANCED TWIN FEEDER per yd. **6d.** } 80
TWIN SCREENED COAX FEEDER per yd. **1/-** } ohms
50 OHM COAX CABLE, 8d. per yd.
TRIMMERS, Ceramic, 30, 70 pf., **9d.**; 100 pf., 150 pf., **1/3**; 250 pf., **1/6**; 600 pf., **1/9.**
RESISTORS.—All values: ¼ w., **4d.**; ½ w., **6d.**; 1 w., **8d.**; 2 w., **1/-**; ½ w. 1%, **2/-.**
WIRE-WOUND RESISTORS.—Best Makes Miniature Ceramic Type—5 w., 15 ohms to 4 K., **1/9**; 10 w., 20 ohms to 6 K., **2/3**; 15 w., 30 ohms to 10 K., **2/9**; 5 w. Vitreous, 12 K. to 25 K., **3/-.**
WIRE-WOUND POTS. 3 WATT. FAMOUS MAKES
Pre-Set Min. TV. Type. Knurled Slotted Knob. All values 25 ohms to 30 K., **3/-** ea. 50 K., **4/-.** Ditto Carbon Track 50K. to 2 Meg., **3/-.**
Standard Size Pots, 2¼in. Spindle. High Grade. All Values, 100 ohms to 50 K., **5/6**; 100 K., **6/6.** **W/W EXT. SPEAKER CONTROL** 10Ω. **3/-.**
O/P TRANSFORMERS.—Heavy duty 70 ma., **4/6.** Ditto, tapped pri., **4/9.** Tapped small pentode, **3/9.**
L.F. CHOKES 10 h. 65 ma., **5/-.** 20 h. 150 ma., **12/6.** 15 h. 100 ma., **10/6.** **SIMPLEX** 10 h. 150 ma., **10/6.**
MAINS TRANS.—Made in our own workshops to high grade specification. Fully interleaved and impregnated. Heater Trans., tapped prim., 0-200 v./250 v. 6.3 v. 1½ amp., **7/6.** 12 v. .75 amp., **7/6.** 6.3 v. 3 a., **10/6.** 350-0-350, 80 ma., 6.3 v. 4 a., 5 v. 2 a., ditto 300-0-300 ditto 250-0-250, **25/-.** Viewmaster, auto type, **35/-.** Teleking, **30/-.** Lynx, **30/-.** Coronet, **30/-.** Simplex (modified with 4 v. tap), **35/-.**
TV. AERIALS. Aerialite etc. full range all channels in stock. Indoor loft type Inv. T., **13/6** etc. etc.
TYANA.—Midget Soldering Iron. 200/220 v. or 230/250 v., **14/11.** Triple Three mod. with detachable bench stand, **19/6.** Solon Midget Iron, **19/6.**
TAG STRIPS.—2- or 3-way, **2d.**; 4- or 5-way, **3d.**; 6-way, **4d.**; 9- or 10-way, **6d.**; 28-way, **1/3.**
ENAMEL WIRE.—¼ lb. 14 to 20 s.w.g., **2/-**; 22 to 28 s.w.g., **2/6**; 30 to 40 s.w.g., **3/9.**
XTAL DIODE.—Sensitive G.E.C. type, **3/6.** H.R. Phones (S. G. Brown) or Hi-grade Amer., **15/6** pair.
PYE AE. Plugs and Sockets **1/6** pair.

SIMPLEX TELEVISION

Detailed price list available.

STAGE 1.—VISION AND SOUND.

7 Valves ...	30/-
12 Resistors ...	3/-
16 Condensers ...	9/-
2 Potentiometers	6/-
7 Coil formers with cores ...	4/6
7 Valveholders ...	3/6
Sundries (with undrilled chassis) ...	22/6

STAGE 2.—TIME BASE.

6 Valves ...	29/-
20 Resistors ...	8/6
15 Condensers ...	15/6
5 Potentiometers	12/6
6 Valveholders ...	2/6
Sundries ...	1/6

STAGE 3.—POWER SUPPLY.

2 Resistors ...	2/-
5 S.T.C. Rectifiers	27/6
5 Condensers ...	23/6
1 Choke ...	10/6
1 Mains Trans. Tapped 4 v. and 5 v. ...	35/-

STAGE 4.—C.R.T. NETWORK

9 Resistors ...	4/-
1 Condenser ...	6d.
4 Potentiometers ...	10/-
Sundries ...	3/6

COMPLETE SIMPLEX KIT (less tube) **12 gns.** Drilled Chassis, Screens etc., **17/6**, or **10/-** extra with **KIT** or **Sundries** (**Stage 1**).
VCR97 TUBE TESTED & GUAR., £2 (p. & p., 2/-).

NEW BOXED **VALVES** ALL GUARANTEED

1R5	8/-	6K8	9/-	6AC7	8/6	EF91	9/-
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3S4	8/-	6SL7	9/-	EA50	2/-	PY82	10/6
3V4	8/-	6SN7	11/-	EB91	7/6	SP61	8/6
2X2	5/6	6U5(Y63)	8/-	EBC33	9/6	U22	9/6
5U4	10/6	6V6	8/-	EF39	9/-	ECL80	12/6
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6J5	7/6	U25	12/6			EF55	12/6

Huge Stock B.V.A. Valves at 1951 low tax prices.

P. and P., 6d. £1 orders post free. Lists 3d. ALL TRANS. 1/- extra please.

T.R.S. RADIO COMPONENT SPECIALISTS

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are now operating from their NEW and MORE SPACIOUS PREMISES at—

70, Brigstock Rd., Thornton Heath, SURREY.

Buses 130a, 133, 159, 166, 190.
By Thornton Heath Railway Station.

C.R.T. HEATER ISOLATION TRANS. Ratio 1 : 1.25 Low leakage winding with 25% sec. boost. 2 v. **10/6**; 4 v., **10/6**; 6.3 v., **10/6**; 12 v., **10/6.**
BRIMISTORS.—CZ1 .3 a., **3/6.** CZ2 .15 a., **2/6.**
CONDENSERS.—New stock. .001 mfd. 6 kV. T.C.C., **5/6.** Ditto, 12.5 kV., **9/6**; 2 pf. to 500 pf. Micas, **6d.**; .001 Mica or Tub. T.C.C. 500 v., .01 Sprague 500 v., .02 N.S.F. 500 v. .1 mfd. 350 v. Micamould Tub., **9d.**; Hunts Moldseal 500 v., .005, .01, **9d.**; .05 mfd. and .1 mfd., **1/-**; .25 mfd., **1/6.** .5 mfd., 350 v., **1/9**; .1 mfd., 1,500 v. T.C.C., **3/6.**
SILVER MICA CONDENSERS.—10%, 5 pf. to 500 pf., **1/-**; 600 pf., to 3,000 pf., **1/3. DITTO** 1% ex Stock 1.5 pf. to 500 pf., **1/9**; 515 pf. to 1,000 pf., **2/-.**

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends		Can Type, Clips. 3d. ea.	
2/450 v. B.E.C.	2/3	8+8/500 v. T.C.C.	4/6
4/500 v. Hunts	2/-	16/450 v. T.C.C.	3/6
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8/450 v. T.C.C.	2/9	250/350 v. B.E.C.	8/6
8/500 v. Dubilier	2/9	8+16/450 v. B.E.C.	5/-
16/500 v. Dubilier	4/-	8+16/500 v. Dubilier	5/6
8+8/500 v. Dubilier	4/6	16+16/450 v. B.E.C.	5/6
16+16/500 v. Dub.	6/-	16+16/500 v. T.C.C.	6/-
32/500 v. Dubilier	5/-	32+32/275 v. B.E.C.	4/6
32+32/350 v. Dub.	5/6	32+32/450 v. B.E.C.	6/6
25/25 v. Hunts.	1/9	32/350 v. Dubilier	4/-
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SPECIALS.—500 mfd. 12 v., **3/-**, 1,500 mfd. 6 v., **4/6**, 6,000 mfd. 6 v., **5/6**, 1,000+1,000 mfd. 6 v., **6/6.**
SENTERCEL RECTIFIERS.—EHT Type. Flyback Voltage.—K3/25 2 kV., **4/3**; K3/40 3.2 kV. **6/-**; K3/45 3.6 kV., **6/6**; K3/50 4 kV., **7/3**; K3/100 8 kV., **12/6**; K3/160 14 kV., **18/-.** **MAINS TYPE.**—RM1, 125 v., 60 ma., **4/-**; RM2, 100 ma., **4/9**; RM3, 120 ma., **5/9**; RM4, 250 v., 275 ma., **16/-.**
KNOBS, GOLD ENGRAVED.—Walnut or Ivory. 1½in. diam., **1/6** each. Not engraved, **1/-** each.
LOUDSPEAKERS P.M., 3 OHM.—Goodmans, 4in. square, **15/6**; 6½in., **16/-**; 7in. Elliptical, **18/6**; 10in. R. Plessey, **25/-**; 6½in. with transf., **19/6.**
SLEEVING.—Various colours, 1, 2 mm., **2d.**; 3, 4 mm., **3d.** yd.; 6 mm., **5d.** yd. **TOGGLE SWITCHES. EX-GOVT.** "On-Off," **9d.** Ersin M'core solder, 60/40, 16 g. or 18 g., **4d.** yd., **5/6** ½ lb.; PVC Connecting wire, 10 colours. Single or Stranded, **2d.** yd.
V'HOLDERS.—Pax: IO, **4d.**; EF50, EA50, **6d.**; B12A, CRT, **1/3.** **Moulded**: IO, **6d.**; B7G, **9d.**; with screening can, **1/6**; B8A, B8G, B9A, **1/-**; **Ceramic**: EF50, B7G, **1/-. All English,** 5, 7, 9 pin and U.S.A. UX types, **1/-.** VCR97 moulded holders, **2/6.**
ALADDIN FORMERS and core, ¼in., **8d.**; ⅜in., **10d.**
INT. OCTAL CABLE PLUG (8-pin), with cover, **1/3.**
4 or 6 BA. Nuts, Bolts and Washers **1/-** per doz.

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(Regd.) B. H. MORRIS & CO. (RADIO) LTD.

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OPEN TILL 6 P.M. SATURDAYS

Telephone: AMBASSADOR 4033 PADDINGTON 3271

MAY BE BUILT FOR £30-0-0 including all valves (plus cost of CRT)

THE COMPLETE TELEVISOR IS SAFE TO HANDLE, BEING COMPLETELY ISOLATED FROM THE MAINS BY A DOUBLE WOUND MAINS TRANSFORMER. ALL PRESET CONTROLS CAN BE ADJUSTED FROM THE FRONT, MAKING SETTING UP VERY SIMPLE.

The NEW PREMIER TELEVISOR

SUITABLE FOR USE WITH THE ENGLISH ELECTRIC CATHODE RAY TUBE T901 OR ANY POPULAR WIDE ANGLE TUBE

20 valves (plus tube) Superhet Receiver, tunable from 40-68 Mc/s without coil or core changing. Wide angle scanning Flyback EHT giving 14 kV. Duomag Focaliser, permanent magnet focussing with simple picture centring adjustments, suitable for any wide angle Tube, may also be used with a 12 in. Tube with very minor modifications.

VISION CIRCUIT. Common RF Amplifier, single valve frequency changer, two IF stages, Video Detector and Noise Limiter followed by special type of Video Output Valve. ALL COILS PRE-TUNED ASSURING ACCURATE ALIGNMENT AND EXCELLENT BANDWIDTH.

SOUND CIRCUIT. Coupling from anode of frequency changer, two IF stages, Double Diode Triode detector and first LF Amplifier, Diode Noise Limiter and Beam type Output Valve, feeding a 10in. Speaker. ALL COILS PRE-TUNED.

TIME BASES. 2 valve sync. Separator, giving very firm lock and excellent interlace.

LINE TIME BASE. Blocking Oscillator using a pentode driving a high efficiency output stage comprising Ferroxcube Cored Output Transformer with Booster Diode.

FRAME TIME BASE. Blocking Oscillator driving a Beam Output Valve coupled through a Transformer to the high efficiency FERROXCUBE Cored Scanning Coils.

POWER PACK. Double wound Mains Transformer supplying all L.T. and H.T. using two full-wave Rectifiers.

The Televisor may be constructed in 5 easy stages: **(1) Vision, (2) Time Base, (3) Sound, (4) Power Pack, (5) Final Assembly.** Each stage is fully covered in the Instruction Book, which includes layout, circuit diagrams and **point-to-point** wiring instructions. The Instruction Book also includes full details for converting existing Premier Magnetic Televisors for use with modern wide angle tubes. All components are individually priced.

Instruction book 3/6, Post Free. *Send Stamp For Latest Catalogue*

Console Cabinets in figured walnut can be supplied for the above receiver at a cost of £13/10/-, plus 21/- pkg. & carr. H.P. Terms for cabinet on request.

THE I.T.A. LONDON STATION

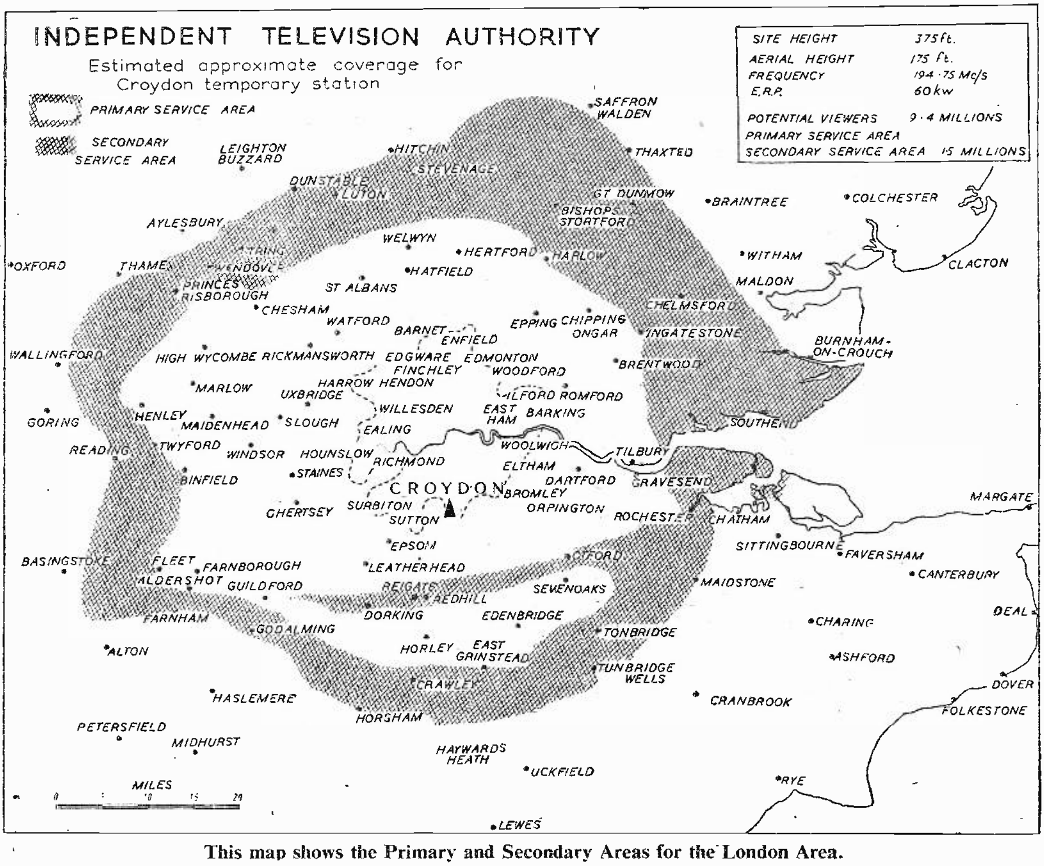
SOME DETAILS OF THE PROBABLE COVERAGE, AND HOW YOUR RECEIVER WILL HAVE TO BE ADAPTED

DETAILS of the proposed new London transmitter operated by the I.T.A. were recently released, and the map below shows the anticipated area which will be covered. The site which has been chosen for the transmitter is at Beulah Hill, Croydon, but it should be emphasised now that this is a temporary transmitter and aerial, and that no actual transmissions have yet been carried out. The map is, therefore, purely theoretical, and some areas may actually prove to be in or out of the areas shown. The central clear area is known as the Primary Service Area and, provided that a correct type of aerial is used, viewers in that area should receive a perfectly satisfactory picture. The shaded area is known as the Secondary Service area, and in this area there will be some viewers who will have difficulty in obtaining good reception. It should, of course, be understood as with all television or VHF transmissions, that screening by metal buildings, hills, etc., will affect reception.

Outside the shaded area some viewers may receive good reception, but this will depend upon the height of the situation and of the surrounding country.

The map shows that the estimated Primary Service area extends from the transmitter out to some 40 miles to the west (near Henley) and for about 35 miles to the north (near Hertford), but rather less to the east and south. The Secondary Service Area extends out to nearly 50 miles to the north, west and east. To the south, however, because of the screening effect of the North Downs, the Secondary Service Area extends out to only about 25 miles.

The present plan is that the temporary Croydon station should operate for about 18 months, by which time the I.T.A. hopes that its permanent transmitting station for the London area should be ready for operation. The permanent station will have a much higher mast and an effective radiated power of about three to four times that of the temporary station. This will extend both the Primary and Secondary Service Areas and give generally improved reception conditions. In short, no one receiving the transmission from the temporary station should be worse off and many people will be better off.



This map shows the Primary and Secondary Areas for the London Area.

World's Largest Station

Measured by its audience potential it is stated that this will be the largest independent station in the world. At the end of 1954 the G.P.O. figures for the number of licences issued in the Primary Service Area was 1,160,000, with 140,000 in the Secondary Area. The BBC usually assume an audience of approximately four viewers per set, and this will leave two transmitters to cover an audience of over 4,000,000. New York, of course, has a much denser population than London, but there are no fewer than seven transmitters to cover this population.

There are a number of points connected with the forthcoming transmissions which will interest every viewer. Firstly, the question of adapting the receiver. The trade will adopt the principle that *most* commercial models not more than four years old can be adapted. Models older than that *may* be adaptable, but each will have to be considered on its merits. It can be stated almost definitely that older London receivers utilising straight circuits will not be adaptable, or at least will not be economically adaptable. Even some superhets may be of such a type that the economy will have to be seriously considered. Adapters will become available and will be described in this periodical for use with superhet circuits, but most will employ an I.F of round about 34 Mc/s, and therefore if the existing receiver employs that I.F. it will merely be necessary to add the converter and a suitable aerial. If, however, the I.F. is considerably lower as it is in many receivers it will be necessary either to replace the I.F. transformers in the receiver or obtain a special adapter designed to provide an output at the I.F. which is employed. Alternatively, the adapter will have to convert the Band III station to that of the Band I station and feed this into the original aerial socket, but this arrangement may lead to very inefficient working, with a marked pattern across the screen.

No definite information on this score can yet be given, but in April one of the leading companies starts very low power transmission on Band III for industrial purposes only from the site where the I.T.A. temporary transmitter will open in September, and more will be revealed when the two transmitters are operating together.

Interference

The question of interference has been raised and some viewers think that interference will be very much worse on Band III. The trade have carried out tests in this connection at Welwyn, and these showed that car interference was no worse than on Band I. The strength of the car radiations was actually greater, but as the aerial is smaller and in the particular locality had to be of a directional nature, the time during which a car was picked up was shorter, so that the interference took the form of brighter spots but for very much less time. Hair dryers, vacuum cleaners and other interfering apparatus does produce more marked interference on Band III, but the suppressors are much cheaper than those used for Band I, but the labour costs for installation will be greater as they are more tricky to fit.

On the question of aerials, those viewers close to the transmitter will theoretically be able to fit a simple indoor aerial and obtain good results, but where the BBC transmitter is strongly received it may be necessary to fit a good outdoor aerial for the new station and also to use a separate feeder. According to the location of the receiving site it may be necessary to fit the aerial at opposite ends of the roof utilising two chimney stacks. In other areas a new aerial will be required, but it may be possible to make use of the existing feeder, without any switching devices. We were informed that aerial adapters will be available for about 4s. 6d., converters for about £5 to £10, but actual conversion costs will vary, as already stated, according to the types of receiver.

New Phosphor for Radar Tubes

THE recent development of short-range navigational radar for use in estuaries and crowded shipping lanes has called for cathode-ray tubes with unusual screen characteristics. In these systems, signals reflected from ships or coastlines are used to "paint" a picture of the area round the vessel within a radius of, say, a quarter of a mile, on a tube screen. Tubes such as are already in use for long-range radar are unsatisfactory, because their afterglow persists for about 30 seconds. The picture of the sea some 30 or 40 miles away does not change very much in this period, but at quarter-mile range it may change a great deal, owing to the greater relative speeds of movement.

Furthermore, if a ship fitted with short-range radar "yaws," pictures received on successive rotations of the aerial (that is, every two or three seconds) would, with a normal tube, be superimposed on one another in a confused jumble which would not clear up until the vessel got back on to a straight course and an even keel.

For short-range radar, tubes are, therefore, needed which give a picture which persists brightly for two or three seconds and then fades out rapidly before the next picture is painted. A further requirement is that the picture should be as sharp and clear as possible.

One device which has been used for obtaining the required afterglow characteristics is the double layer screen. The electron beam of the radar tube strikes the first layer of such a screen to produce ultra-violet or near ultra-violet light, which in turn excites the front screen to produce the visible picture. Unfortunately, since the light originates at a point a few millimetres behind the actual viewing screen, it is scattered to some extent by the time it reaches the screen. This makes the picture "cotton-woolly" and lacking in definition.

In some recently introduced radar tubes, Mullard Ltd., have employed a single layer screen made of a special grade of magnesium fluoride. This has the required afterglow characteristics and at the same time gives the sharply defined picture necessary for short-range work. In addition, the new tubes, types AL22-10 (9in.) and AL31-10 (12in., flat faced) have a special low voltage electrostatic focus lens which makes the realisation of maximum definition much easier than with magnetic focus.

The new phosphor has the advantage that the initial brightness is greater than that of double layer screens. After the first few seconds, however, the light decays very rapidly.

The new tubes may also be used in long-range radar systems where plotters are provided.

front it appears yellow. The blue screen is activated by the electron beam and by re-radiation (usually in the ultra-violet region) it activates the slower phosphors of the yellow screen.

American tubes of this type are usually suffixed with "P7" and are not suitable for TV.

In Great Britain there is, at present, no definite classification of screens as in America. The suffixes of the American tubes give an indication of the screen material. "P1" for example indicates a green screen of medium persistence; the 5CP1 is a 5in. diameter tube suitable for use on TV experimental work and is a typical example. The 3BP1 is a similar tube with a 3in. screen.

The G.E.C. has a method of classification which is quite useful. Type "B" is equivalent to the "P1"; type "M" is very similar to the American "P7," the tube having a very long afterglow which can be up to several minutes.

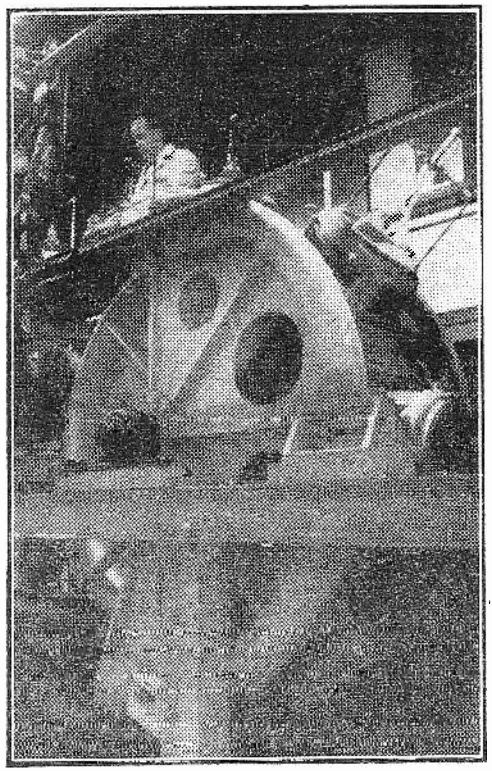
Another long afterglow (persistent) type is the G.E.C. type "C," American type P2, which has an afterglow of about five seconds.

A tube with short afterglow is the G.E.C. type "E," American equivalent P5 and P11. An interesting tube is the G.E.C. type "T," which has an orange screen and a rather long afterglow, suitable for certain radar applications.

The Skiatron

This interesting C.R.T. has been used in certain radar applications to provide a large screen trace. It works in "reverse," so to speak, as the screen is darkened by the electron stream.

The screen is coated with a white substance which is normally of a white appearance but turns a magenta colour when bombarded by electrons. The tube is illuminated from an external light source which is reflected by the screen and by a system of projection lenses the resultant picture is thrown on to a large screen.



One of the most intricate operations in the manufacturing of cathode ray tubes is depositing or settling the fluorescent screen on to the glass face. This picture shows one of the three giant automatic screen settling conveyors—each about 60ft. long and 15ft. high installed in the E.M.I. cathode-ray tube plant. They are the only machines of their type in the country.

One bad feature is that it suffers from staining, and repeated scanning of a stationary object causes a prolonged stain which becomes difficult to remove, persisting as it does up to 15 minutes.

The Image Convertor (Infra-Red)

While on the subject of wartime radar apparatus it is interesting to recall the image convertor tube which has been available in the ex-Government market. It is not a C.R.T. in the truest sense, but has many points in common with it.

The tube is equipped with a photo-cathode which emits electrons when activated by light-waves. At the far end of the tube is a screen comprised of a coating of fluorescent material (usually ortho-silicate), which has a long persistence giving a green trace: some screens have a blue trace using zinc-sulphide with a trace of nickel to kill the afterglow.

The illustration on page 506 gives a general schematic of the tube.

The screen is at the anode potential of the final anode which is in the region of 5-6 Kv.

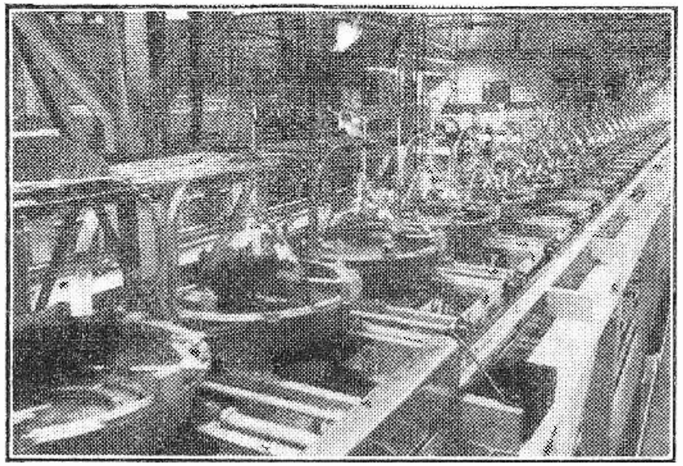
Now the electrons emitted by the photo-cathode will be drawn to the screen and will therefore activate it.

The cathode is sensitive to light and will therefore emit electrons from its surface according to the amount of light falling on that surface. If an image is thrown on the photo-cathode, the cathode will emit electrons from various portions of its surface according to the light produced by the image, and by a focusing system any point on the cathode can be reproduced on the screen. The result is a second image on the screen which is a duplicate of the first.

If a substance which is sensitive to infra-red radiation is used (such as cæsium-oxygen-silver), then the screen can produce a visible image of an object which is not normally visible to the human eye.

Screens for TV.

The television screen must give an image which is near white. This is mainly due to custom brought about by photography, the cinema and probably the printed word. It is not necessarily the best colour for viewing, as many of the ex-Service tubes giving a green trace provide a picture which is much less tiring to the eyes.



A view along the top of one of the E.M.I. automatic screen settling conveyors.

To obtain the white trace it is necessary to mix two or even three basic colours; if the screen of some tubes is examined closely when no picture is being transmitted, and the trace is slightly defocused, the actual individual colour of blue and yellow particles can be observed. At normal viewing distances the screen appears quite white.

There are two general types of screen available, the one producing what might be termed a cold white and the other a warmer tone. In normal daylight conditions the former has a slightly blueish tinge, while the latter a slightly yellow one.

To the photographer the screens may be likened to a print on normal bromide paper compared with one on chloro-bromide paper. Which gives the more pleasing picture is merely a matter of taste.

The materials chosen for the screens of TV tubes have to be carefully chosen so as to cater for long life, brilliance and tone of the picture, but the difficulties do not end at this point. To obtain an even luminance the phosphors must be correctly mixed and deposited in an even layer on the screen. Further, the larger the size of the individual particles of the phosphors the greater will be the brilliance, but if the particles are too large then the quality of definition of the picture will be impaired; the picture will appear "grainy" like an over-enlarged photographic print.

The materials used must be of exceptional purity; we have seen how even slight traces of other elements modify the performance of the phosphors, so it is obvious how important it is to ensure that the materials are really pure.

Another important point is the actual thickness of the screen materials; if the deposit is too thick then the frontal brilliance will be reduced, while if it is too thin the life of the screen will be impaired, as it will not be able to withstand the bombardment of the electron beam.

Coating the Tube

There are three methods in general use for applying the phosphors to the screen end of the tube; they are by dusting, spraying, settling. With each method the inside of the screen must be thoroughly cleansed; for this purpose washes of hydrofluoric acid are often employed, finishing with a prolonged wash in distilled water.

With the dusting method the materials are used in their powdered form, the tube being covered with some form of binding material such as phosphoric acid solution, the powder being then poured down the neck of the tube and then made to roll over the binding medium, the surplus being afterwards tipped out.

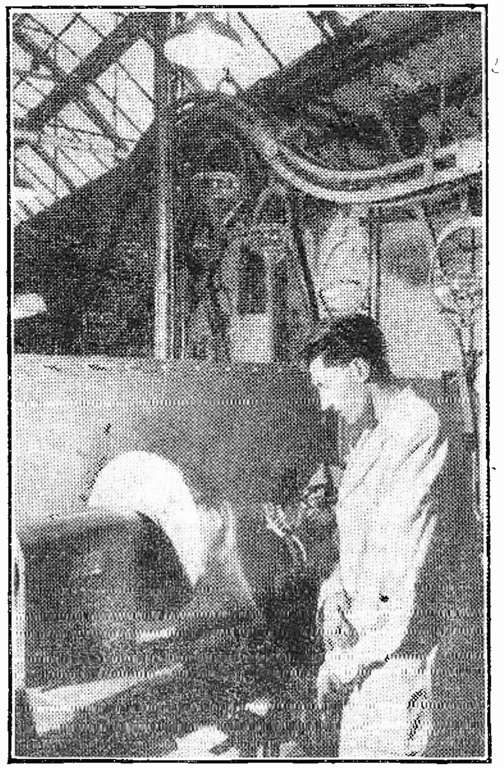
The spraying process employs a different techn que because in this case the binding material is mixed with the powdered phosphors before being sprayed evenly on the glass end of the tube. Modern methods employ synthetic resins of the poly-vinyl-acetate type.

In the settling method the phosphors are mixed with a liquid which is then poured into the tube and the phosphors allowed to settle as sediment. The surplus fluid is poured off when settling has been completed.

Aluminising

Many modern tubes have an additional coating of aluminium particles on the screens. The reasons are two-fold, first the particles are arranged so that the luminance produced by the electron beam is thrown forward resulting in an increase in screen brilliance, and, secondly, the layer provides an effective safeguard against ion bombardment which destroys the active material of the screen.

Aluminising methods vary, but the general procedure is to apply a nitro-cellulose layer to the layer of phosphors as a binding medium, and then to deposit the aluminium particles by settlement process. A period of baking follows which destroys the nitro-cellulose layer leaving the layer of aluminium particles on the screen.



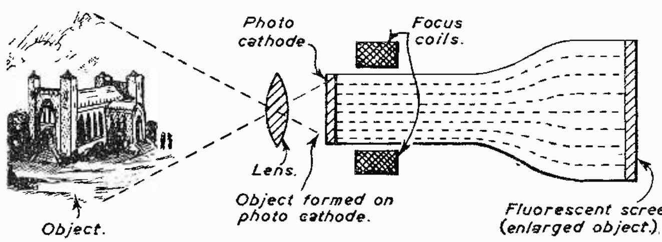
A close-up of a glass welding lathe, showing the operator joining the cylindrical neck on to the bulb.

After the screen has been coated it is usual to provide a coating of graphite solution to the inside of the tube to provide a return path for the electrons. This is done with both aluminised tubes and those which are not aluminised.

The Electrode System

Specifications for the metals used for construction of the electrodes are rather stringent. Purity is the most essential point, and to ensure that any residual molecules of gas within the metal are eliminated the electrodes are baked in vacuum furnaces and are then washed in a degreasing agent to remove all traces of grease. From this point the electrodes are not touched by hand.

Cleanliness is essential at all stages. Mica supports and ceramic spacers are treated in a similar manner, and are vacuum baked, being afterwards untouched



General schematic view of a cathode-ray tube.

by hand. Should any grease get on to the assembly it will be converted to carbon at a later stage in manufacture.

Assembly of the components is made either in a jig, when they are spot-welded after completion in the jig, or by the cylindrical method where each item is spot-welded as it is placed in position. In the first method there is some danger of distortion when the jig is removed, while in the latter the individual components must be made to a very high degree of accuracy as the parts have to be assembled to very close tolerances.

The C.R.T. Cathode

The cathode is a most important part of the tube, and the life of the tube and the quality of the definition depend very much on the accuracy of its manufacture.

It is made of nickel in the form of a cylinder, but this in itself will not provide a sufficiency of electrons, and the cylinder is therefore coated with a material which is richly electron emitting. A commonly used coating is a barium-strontium carbonate mixture with a trace of calcium bound with a nitro-cellulose medium in lacquer form, so that it can be sprayed on to the surface of the nickel.

The thickness of the deposit is most important and the evenness of the layer must be carefully controlled.

The carbonate combination will not be an efficient electron emitter and it has to be converted to an oxide form after the elements are mounted within the bulb.

Assembly

It is common for the screen and the tube envelope to be manufactured separately and then to be welded together in the factory. At this point the screen is coated, and then the electrode assembly inserted. Evacuation of air and gases is now commenced, the final vacuum being in the region of 10^{-6} mm. Hg.

The tube is baked while evacuation is in process, so as to draw off all surplus gases, and to assist this process the electrodes are heated to a high temperature by an external source of H.F. radiation, which produces eddy currents within the metal. At the same time the heating "fires" the getters and the resultant silvery deposit not only acts as a final absorbent of unwanted gases, but also it absorbs gases produced by the tube during its working life.

An examination of the getters will give an indication of the condition of the C.R.T. A C.R.T. which is becoming "soft" will show the condition in the milky appearance of the getters.

Before the tube is finally sealed the cathode is heated to a temperature which is much higher than that obtained during normal working life. This process converts the carbonate coating into an oxide form, and as it is done during the last process of evacuation, the resultant gases are drawn off. Cathode temperatures in the region of 1,500 deg. absolute are used, which are one-third above normal working temperatures.

Ageing

After sealing the tube must be "aged" before it is ready. The control at this stage is very important as the barium layer of the cathode can be completely destroyed if the cathode is overheated.

The process involves the heating of the cathode to a point above its normal working temperature and drawing from it a rather large current for a space of a few minutes. The temperature is then lowered by lowering the current through the heater and the tube is then run for a period to "settle" in.

After ageing, each tube is individually tested before being packed.

Rejuvenation

It is possible to rejuvenate a C.R.T. by employing a method somewhat similar to the manufacturer's ageing process.

When the brilliance fails, due to loss of emission, the surface layer of the barium oxide coating can be "boiled off" so to speak by overheating and a drawing-off process. It is thought that this exposes a fresh layer of barium oxide with original electron emitting properties.

Provided the process is carefully controlled the tube can be given a new lease of life—a worthwile consideration in these days, especially with the large screen tubes now becoming so popular.

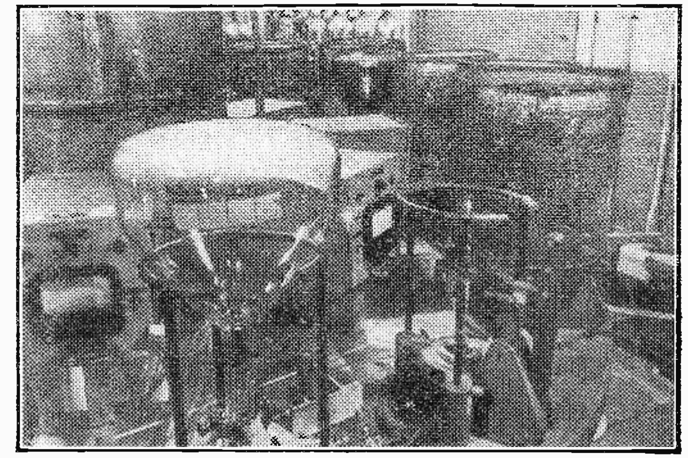
It is possible to operate the rejuvenating process in the average amateur's workshop with quite successful results.

Details have been given in previous issues of this periodical.

THE CATHODE RAY TUBE

SOME INTERESTING DETAILS OF ITS CONSTRUCTION

By "Alpha"


Close-up view of a rotary aluminiser. The filament, which carried the aluminium pellet, evaporated under vacuum conditions in the tube to produce the aluminising film, can be seen in the foreground tube.

THE cathode-ray tube (CRT) is the most expensive single item in a television receiver; not only is it expensive in the first instance but, being an expendable item the thought of its renewal is naturally always in the mind of the viewer.

Modern CRTs have evolved comparatively slowly after a considerable amount of research. So many conflicting characteristics are required that the construction of both electrode assemblies and the screens must be made with great precision, yet the methods must be adaptable to mass-production in order to keep the costs within reasonable bounds.

The Screen

The screen of the CRT is of the greatest importance and a great deal of care has been undertaken to produce suitable material for use in radar, oscilloscopes and television.

Each branch has its own particular requirements. For radar, brightness and short, medium or long persistence of the trace is required while generally the colour of the screen is immaterial. Where pulse techniques are employed medium or short persistence is needed, while for P.P.I. (plan position indicator) systems where the trace must be kept in synchronisation with the aerial system, prolonged afterglow properties of screen materials are necessary. (Note that by persistence of the ~~trace~~, or afterglow as it is sometimes termed, we mean the ability of the screen material to retain the image after the activating electron beam has been removed.)

With oscilloscopes the colour of the screen is immaterial, though if it is desired to photograph the traces, preference is given to blue phosphors which have a high actinic content and are more readily effective on a photographic plate.

Where transient phenomena is to be observed, short afterglow is generally desirable and it is practical to employ screen phosphors which have an afterglow of less than five micro-seconds.

Television requirements are much more stringent. The screen material must be sensitive, have a long life, produce a white trace with a minimum afterglow (but not too short!) and to this is now added the burden of colour where the colours of the phosphors must be exact shades of red, green and blue to enable faithful reproduction to be obtained.

Chemistry

The chemistry of the materials used for screens has been dealt with before in the pages of this journal but it would not be out of place perhaps, to run briefly over the main details.

There are many substances which will fluoresce when bombarded with an electron stream. Their reactions are many and varied but substances in general use must be inexpensive and of high efficiency in the conversion of electron bombardment into light.

Phosphates, silicates and sulphides of zinc are in general use and it is usual to employ one of these as a base with a trace of another material termed an "activator" which will modify its response to the stimulus.

Activators are added in amounts which may be varied from 0.01-2 per cent. according to the effect desired and this effect often seems to be out of all proportion to the minute amount added.

Activators modify the fluorescence mainly in two ways; they can modify the colour and the afterglow. Where activators are used to reduce afterglow effects they are often termed "killers."

Some examples of the action of activators follow. Zinc sulphide activated by silver will give a deep blue glow; a copper activator will give a green trace; a tin activator will give an orange-red trace; a manganese activator will give a red trace

The combination of a phosphor with an activator may produce the required colour of the trace, but may also affect the afterglow. In this case the "killer" is added. For example a zinc sulphide screen used with a silver activator will produce a blue trace which is quite suitable for photography so far as the colour goes, but it has an afterglow of several milliseconds. If a short afterglow is required a small trace of nickel "killer" is added which reduces the afterglow from milliseconds to microseconds.

Screens which require very long afterglows are usually of the double-layer type, the primary layer being activated by the electron beam which "fires" the slower acting secondary screen.

There are a number of magnetic tubes on the market which were used in radar and which have this property. If the activated screen is viewed from the rear it appears blue, while if viewed from the

TELENEWS

400 Saved

THE lives of 400 men were saved recently when a nitro-glycerine mixture exploded in a Turin factory.

An engineer was watching the mixture on the factory's remote-control television system and noticed that all was not well in the mixing plant. The alarm was given and all except 10 were able to reach the safety of the shelters in time. The remaining ten were injured by flying glass. The TV system was installed last November.

Irak Buys British Equipment

IT is reported that the Government of Irak is to pay £64,000 for the British television equipment exhibited at last year's British Trade Fair in Baghdad.

Television Licences

THE following statement shows the approximate number of television licences issued during the year ended January, 1955. The grand total of sound and television licences was 13,903,950.

Region	*Number*
London Postal ...	1,096,908
Home Counties ...	462,936
Midland	799,538
North Eastern... ...	619,011
North Western ...	621,412
South Western ...	225,935
Wales and Border Counties	232,414
Total England and Wales	4,058,154
Scotland	228,054
Northern Ireland ...	21,564
Grand total	4,307,772

North Hessary Tor

THE BBC has placed a contract for building work at the North Hessary Tor television transmitting station with John Garrett and Son, Ltd., Embankment House, Prince Rock, Plymouth. The contract covers site levelling work, the construction of the new transmitting station building, installation of water supply and drainage and the laying of the paved area and fencing surrounding the building.

TV in The States

THERE are 124 television stations in operation in America at present and each covers about 100,000 receivers.

Since 1953, 31 ultra high-frequency transmitters have ceased to operate and have closed down.

Pictures Across the Ocean

SPEAKING of the success of "Eurovision," the exchange of TV programmes with the Continent, Mr. C. G. White, retiring chairman of the Radio Communication and Electronic Engineering Association, has stated that "*trans-atlantic* television will develop from a technical possibility to an accomplished commercial project in the foreseeable future."

A Set for £30

IT is forecast that receivers in this country will cost as little as £30 in a few years, provided standardisation of components and design can be effected.

City Hall for Outside Broadcasts

THE BBC has asked the Norwich City Council for permission to use Norwich City Hall tower for television outside broadcasts from Norfolk and East Anglia.

Jugoslavia to Begin TV

ZAGREB radio reports reveal that Jugoslavia is to erect her own television transmitting station for experimental purposes.

Operation is anticipated to commence either at the end of the year or early in 1956.

Colour TV on Tape

MR. DAVID SARNOFF, chairman of the Radio Corporation of America, has stated that the company has produced a magnetic tape capable of recording colour and black-and-white television programmes.

This would mean that TV programmes of importance could be taken on tape and filed away for later use as are sound-recorded programmes.

Northern Station

THE date of the opening of the Independent Television Authority's northern station depends on interference tests being conducted 30 miles from London.

December is the probable time, provided all goes well.

Four Stations in France

TELEVISION in France is available to only 17 million of the population of 43 million and approximately 150,000 licences are current.

Rene Strange (left) and Mary Parker who took the place of Katherine Boyle recently in the television show "Quite Contrary." The series has now ended.

Programmes are transmitted for 42 hours a week from stations at Paris, Lyons, Lille, Strasbourg and Marseilles.

Strike Threat

IT is learned that although the Canadian Broadcasting Corporation were faced with a possible strike by technicians, there was very little chance that pictures would cease to be transmitted to Canadian viewers.

Supervisors who are not union members can man the station controls and programmes can always be continued for an indefinite period with the stacks of film available in the C.B.C. Television Library.

Commercial TV for Estate

TENANTS living in Abercorn Place housing estate, London, are to be provided with a master television aerial by the Marylebone council so that they can receive commercial programmes when transmitted, as well as BBC programmes.

A council official has said: "We feel that the borough should march with the times and give tenants the choice of commercial and non-commercial television."

Progress in Japan

TWO years after the first public telecast in Japan, comes the announcement that Japan now has two television networks in full operation.

By the time Britain has her second programme working, Japan will have three.

Factory Extension

THORN ELECTRICAL INDUSTRIES LTD. have bought nine acres of land near the company's exisiting factory at Enfield, Middlesex, for the erection of an 80,000 sq. ft. building, including a four-storey warehouse.

Some of the stacks of film kept at the Canadian Broadcasting Corporation Television library in Toronto. (See "Strike threat.")

Home Strengthener

TELEVISION is strengthening the home and keeping the man of the house away from the "local," according to Doreen Stephens, Editor of Women's TV programmes. She told a London audience recently that about 60 per cent. of the sets in this country were owned by families where the chief wage earner was bringing in an average of £11 a week.

"Television means a great deal," she said, "but it means a great deal in particular to the married woman who is tied to her home."

Aidan Crawley

AIDAN CRAWLEY, 46, former Labour Parliamentary Under-Secretary for Air, well known to television enthusiasts for his investigations in the "Viewfinder" programme, has left the BBC and joined the I.T.A. as editor-in-chief of the news service.

Religious Services

MR. NORMAN COLLINS, director of the Associated Broadcasting Development Company, forecasts the regular televising of religious services on the new commercial wavelength. He has said that any good television service must have a substantial element of religious broadcasting on a Sunday.

Norwich Station

THE BBC has placed a contract for building work at the Norwich Television and V.H.F. Sound Transmitting Station with J. Youngs & Son Ltd., City Road Works, Norwich.

The contract covers site clearance work, the construction of the transmitting station building, installation of water supply and drainage, and the provision of the access and service roads.

"War In The Air"

EACH episode of the BBC's "War In The Air" film series was watched by an average audience of 6 million on Monday evenings and 4½ million more when repeated on Saturday evenings.

This grand total of 10½ million is nearly the whole viewing population of Great Britain.

Hire-purchase Restrictions

UNDER the new hire-purchase restrictions Order imposed by the Chancellor of the Exchequer recently, the new minimum initial deposit is 15 per cent. of the cash price and the maximum period for payment of the cash balance is 24 months for radio and television sets and gramophones as well as other goods.

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

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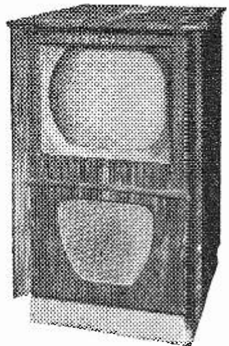

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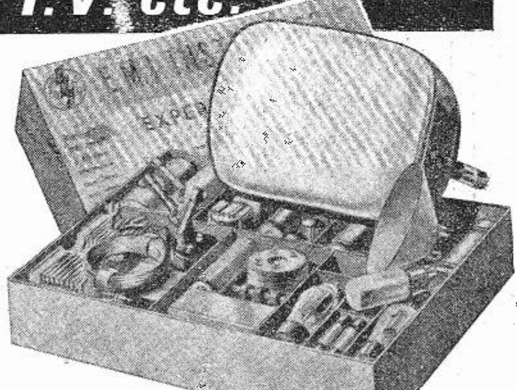

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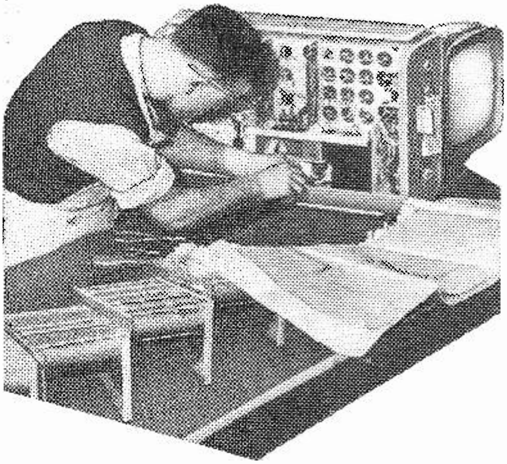
PAGES FROM A TELEVISION ENGINEER'S NOTEBOOK



27.—BLOCKING OSCILLATORS

THE blocking oscillator is a very common form of timebase generator in television receivers, but the theory of its action is not so generally well known. A typical circuit is shown in Fig. 1, where feedback between the anode and grid is provided through an iron-cored transformer (which may or may not have damping resistances across the windings), and the grid components of C and R have a time-constant bearing a relationship to the period of the natural frequency of the grid winding. A simple explanation of this sort of oscillation can be given by considering conditions as the circuit is switched on. Anode current begins to flow through the valve, and in passing through the anode winding of the transformer induces a voltage in the grid winding. The polarity of this latter is arranged so that the grid is carried positive with respect to cathode; this effect is cumulative and the valve is rapidly carried into saturation. The flow of grid current, however, which results from the positive grid potential, charges C negatively and the grid begins to run negative.

The period of saturation is very short as the stored energy in the transformer windings causes a reversal of phase of anode and grid potentials; that is, the first positive half-cycle of an oscillation whose frequency is determined by the grid-tuned circuit Lg and C occurs. As the second half-cycle begins, the grid is carried negative and the charge, then existing on C, prevents the recurrence of the conduction period until such time as the charge has leaked away through R sufficiently to permit it to return. The losses in the transformer windings and any shunting resistances are arranged to ensure that the second half-cycle does not carry the valve above cut-off, and the oscillation thus quickly dies away.

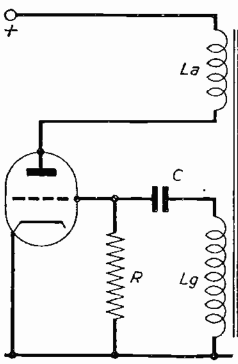


Fig. 1.—A typical circuit of a blocking oscillator.

The grid potential consequently rises towards cut-off as shown in Fig. 2, exponentially, and in a time determined by the values of C and R. As soon as cut-off is reached, the valve begins to conduct again and the cycle repeats. It should be noted that the conduction period between A and B depends upon the natural frequency of the circuit considered as a transformer-coupled oscillator, but that the cut-off period from B to C is determined by the time-constant CR. In the television receiver these periods are chosen to match the flyback period and active scanning time of the desired sawtooth output, and for this reason R is generally made variable.

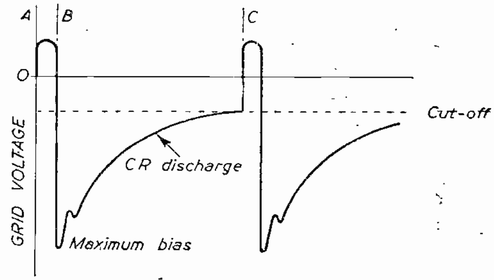


Fig. 2.—Waveform across the condenser C of Fig. 1.

Sawtooth Wave

The sawtooth wave is generated across a condenser wired between anode and chassis of the blocking oscillator, the conduction period discharging this condenser periodically. The amplitude of the generated sawtooth is determined by R1 (Fig. 3), which is usually referred to as a height or width control; this has some small effect on the frequency of operation of the oscillator, but if the circuit is synchronised properly this will be very small. The grid leak R is, of course, the Hold Control.

Positive synchronising pulses are required to trigger the blocking oscillator and these are applied to the grid of the valve. If the hold-control R is now adjusted so that the total free-running period of the circuit is slightly greater than the period of the sync pulses, the condition of working is modified as shown in Fig. 4. The valve is triggered into its period of conduction by the sync pulse just before it would do so if running free, and the oscillation generated (and hence the sawtooth) is kept in step with the synchronisation.

The blocking oscillator is not so dependent upon valve constants as is the multivibrator dealt with in a previous article, and the additional cost of the transformer is more than offset by its stable working.

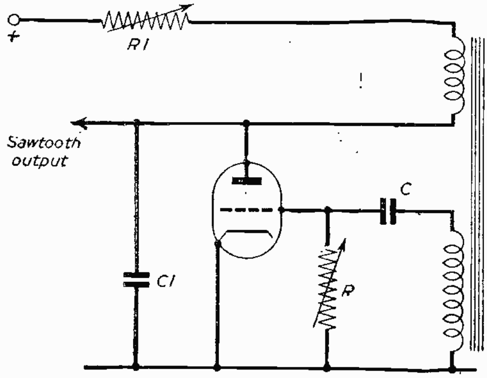


Fig. 3.—The variable resistor, R1, affects the amplitude and also the linearity of the waveform.

Faults in Blocking Oscillators

Faults in blocking oscillators as used in televisors are by no means uncommon, and as this type of circuit is nearly always confined to frame frequency working, a fault in this section will show itself up as a whole or partial failure of the vertical scan.

Obviously, a gross fault such as a complete break in either winding of the transformer will bring about a complete failure of the frame-scan, particularly when the anode coil is open-circuited, but a simple continuity check will reveal the trouble quickly enough. A break in the feed resistor (R1 in Fig. 3, for example) will also lead to a complete failure, as will a short-circuit of C1.

More curious results appear when changes of value occur in either C or R in the grid circuit of this type of oscillator. The change is most likely to occur in R (which may be partly variable and part fixed), but a slight leak in C can lead to similar symptoms. The frequency of free-running is changed, but if the change in value of either C or R is small, a readjustment of R (as the hold control) will generally correct the condition. If, however, the change is large, the free-running frequency is so far removed from the normal sync period that the latter exercises no control at all, and the raster becomes completely jumbled. In general, the sync pulses will be operative at some points and the effect is then one of several pictures, all very narrow, stepped one above the other on the screen. The hold-control may vary the number of these, but will not resolve a single pattern.

Similar effects can result from a change in C1 (a slight leak), or an actual valve failure, although a partial short between the transformer windings can also be responsible.

When checking over a blocking circuit for faults of this sort, it should be remembered that the grid components are often placed in the earthy end of the grid winding as a parallel CR, and in other cases C may be omitted as an actual component, the grid winding capacity being sufficient. Again, a pentode may be used, and the feed resistance R1 may be a

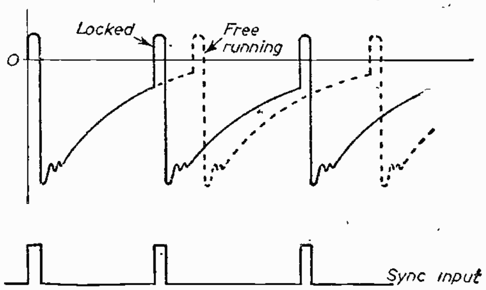


Fig. 4.—This diagram shows how the free-running condition is taken charge of by the Hold setting.

control wired between H.T. and chassis instead of a series arrangement as shown. It is instructive to check a few commercial circuits of this kind to note these differences of detail.

Damping resistances when fitted across the transformer windings are usually critical and should be replaced only by the proper values. Usually, a failure of one of these, if used, causes an "overshoot" of the initial oscillation into conduction for a second (or more) time, with a result that a stepped sawtooth is generated and the upper part of the picture is compressed into "layers" and folds, although no double sections appear.

Books Received

"A Guide To Amateur Radio." — Sixth Edition. Published by Radio Society of Great Britain. Price 2s. 6d. (2s. 9d. by post).

Prior to the last war many thousands of copies of "The Guide," running into five editions, were sold. The sixth edition is completely new and right up to date.

THE Guide is intended chiefly for the newcomer to amateur radio, who should find within its pages all that he needs to know about learning the Morse Code, studying for the Amateur Radio Certificate and obtaining an Amateur Radio Licence. He will also learn how to identify amateur call-signs and amateur transmissions.

The Guide lists the International Amateur Prefixes, the Q Code and Amateur Abbreviations. There is an extensive section on practical designs of transmitters and receivers.

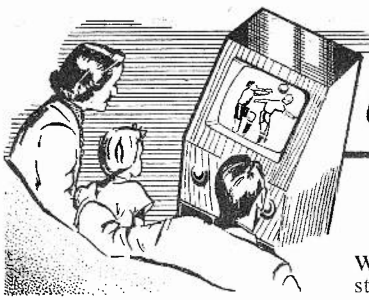
It is the only book of its kind published in the United Kingdom.

TELEVISION VIEWERS' HANDBOOK by A. C. Armstrong. 191 pp. Published by The English Universities Press Ltd., price 6s.

THIS is a further addition to the Teach Yourself series, and gives advice on the choice of a receiver, alternative programme reception, and similar information of use to the actual viewer. A glossary completes the book.

RADAR POCKET BOOK, by R. S. H. Boulding, O.B.E., B.Sc., etc. 176 pages. Published by George Newnes, Ltd., price 15s.

A COMPENDIUM of useful data for engineers and operators concerned in the construction, installation and use of radar equipment.



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

"C" DAY

AS "C" day approaches for commercial television, preparations begin to take a practical shape. Grandiose schemes for building large ten-stage studios are now in the air, but in the meantime no less than twenty sound stages formerly devoted to films for the cinema have been ear-marked for use by commercial television organisations, advertising contractors or TV film companies. The emphasis seems to be upon making filmed programmes rather than live transmissions. Already geared up for intensive production are: Highbury Studios (two stages, 8,580 sq. ft.) and National Studios, Elstree (four stages, 33,556 sq. ft.), which have been making first-class programme films for American TV for some time. Recent acquisitions of sound stage space, either by lease or by purchase have been Southall Studios (two stages, 7,500 sq. ft.), which are now being operated by Pearl and Dean, Ltd.; Twickenham Studios (one stage, 7,192 sq. ft.), taken over by S. Presbury and Company, and Wembley Studios (two stages, 9,040 sq. ft.), bought by Associated Rediffusion, Ltd.

Brighton Studios, a small but well-equipped plant with two stages (5,400 sq. ft.) is to be used extensively for TV films by McCann-Erickson Advertising and the Walton-on-Thames Studios (three stages, 21,064 sq. ft.) are now controlled by Hyams Brothers, who are associated with the Incorporated Television Programme Company, whose chairman is Mr. Prince Littler, the famous impresario. Other studios which will be partly devoted to TV films will be Merton Park (two stages, 5,772 sq. ft.), and Viking Studios, Kensington (two stages, 1,950 sq. ft.). Some of these studios are to have additional stages built immediately, such as Twickenham, where three more stages are already planned, and Wembley, where one burned-out stage is being reconstructed and a very large stage divided into two. The only entirely new TV studio I have heard of in the London area is at Rotherhithe, where former factory premises are being converted into soundproofed stages with the usual workshops, offices, cutting rooms and theatres.

LIVE TV STUDIOS

NOT many of the commercial TV organisations have yet announced firm plans for live transmissions, but it is known that Associated Rediffusion have already placed large orders for electronic equipment for Wembley, and Highbury Studios is already filming by electronic methods, which presumably can also be used for live transmissions.

The Granada commercial television organisation has almost completed negotiations for a large warehouse in the centre of Manchester which can be quickly converted into studios and from which it is planned to transmit a high proportion of live shows. Here will also be the headquarters of a number of mobile TV units which, it is said, will "interrupt programmes with spot visual reports of the most exciting events of the day." Already the Granada organisation has arranged a tie-up with Ed Murrow, the ace TV journalist of the Columbia Broadcasting System of America. The prospects of the viewer next autumn seem to be exciting, when the results of all this activity reaches the screens of their sets, together with highly competitive programmes from the BBC. Even the (former) greatest opponents of commercial television, the extremist-led Association of Ciné Technicians, may benefit from all these developments, because there will scarcely be enough experienced technicians to work the equipment. It will be a daring political party which will seek to repeal the Act which has made commercial television in this country possible.

ACOUSTICS FOR TV

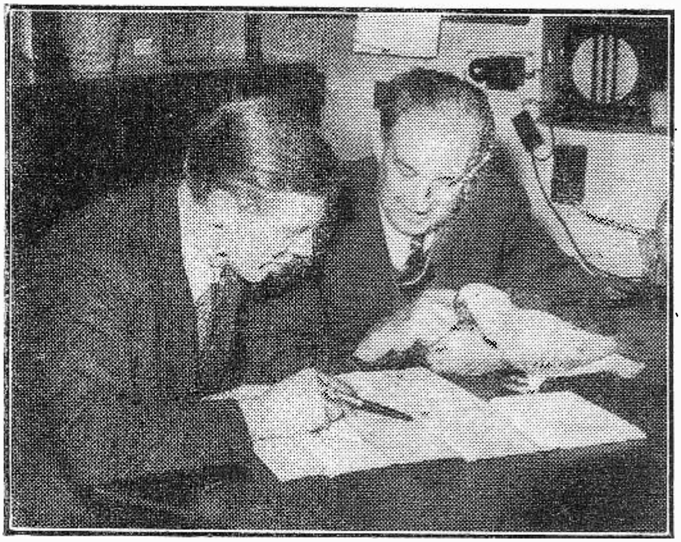
WHEN the BBC began to operate the Lime Grove Studios, they quickly discovered that the acoustics of the old film studios were much too dead for musical transmissions. Designed for recording dialogue for cinema films, the stages were all highly damped with slabs of slag-wool two inches or more thick, which reduced reverberation to less than half a second. This has been essential for the recording of dialogue intended for reproduction in large auditoria. Longer reverberation time would have reduced the intelligibility of speech, especially when long-shot photography prevented the microphones being placed close to the actors. This short reverberation gave musicians the impression that they were playing in the open air, causing them discomfort and making them "force" their instruments. Some vocalists (not crooners!) used to the sound of their voices coming back from friendly walls and ceilings of an auditorium, were caused acute distress. Older BBC engineers likened this reaction to the agonies of the celebrated sopranos in the small and highly damped studios 1 and 2 at Savoy Hill in 1924. In Savoy Hill days the gentle roundness which reverberation gave to the original "Grand Hotel" transmissions from Eastbourne, were investigated and, for the benefit of listeners, a system of artificial echo was developed, which reduced the deadness of orchestral transmission from the original Savoy Hill studios. The studios themselves were far too small for the heavy wall damping to be removed. The artificial echo was produced by feeding the sound from the dead studio to a loudspeaker in a highly-reverberant cellar, picking up the resulting echoes on a microphone and adding it, according to taste, to the direct sounds from the studio. Since that time, this simple device has been copied all over the world and the echo room, with non-parallel walls and ceilings, has become an essential facility of all well-equipped broadcasting or film studios. Echo can now be added by the use of a magnetic disc, with multiple magnetic pick-ups giving acoustic delays of the required amount. Opinions as to the relative merits of the two systems vary, but the musicians are quite unanimous: they prefer to hear a bit of reverberation in the room where they are playing. It is possible to re-introduce a fair amount of reverberation into damped studios by fitting wood panels or other reflecting devices around the walls, and this is what has now been done at Lime Grove.

USTINOV AT HOME

SMALL, undamped rooms are not always successful for TV transmission. Fortunately, when the BBC's mobile unit, under Keith Rogers, visited Peter Ustinov at his home, the room from which the transmission was made was packed with highly sound-absorbing books! The idea of visiting well-known people in their own homes was a good one and, as might be expected, the Ustinov trip was richly diverting. Into what seemed to be a very short half-hour, Peter Ustinov and Peter Jones packed a series of highly amusing satirical impressions of some of the everyday characters they have met in world-wide wanderings. This is the half-hour kind of entertainment we might possibly get on commercial TV, but it is quite possible that these irrepressible impressionists might guy the produce they were plugging! I thought that Ustinov and Jones were at their best when they satirised well-known TV characters in BBC parlour games.

BENNY HILL

PARLOUR games were also burlesqued by Benny Hill, whose second "Benny Hill Show" was a decided improvement upon the first, and fully justified both the allocation of a regular star feature under his name and the National Television award of "Personality of the Year." His lightning impersonations of the stars of "Find the Link" was a *tour de force* of quick-fire craziness. The whole production was slick and well produced and finished before time —which allowed Benny to indulge in some amusing ad-libbing as an alternative to the goldfish bowl interlude. The dancing interludes in the "Benny Hill Show" are excellent, Jack Billings demonstrating that he can arrange dances in a manner which really "gets over" on small TV screens. Beryl Reid, Alma Cogan, Jeremy Hawk and others all gave splendid support to make this one of the highspots of the month.



Assisted by "Gregory," the parrot brought back from the expedition to Uganda, two of the team responsible for the television series *Zoo Quest* are seen going over their route for their next exciting trip to British Guiana, in the offices of the Reptile House at the London Zoo. On the left is producer David Attenborough and on the right Jack Lester, Curator of the Reptile House.

SUNDAY NIGHT GLOOM

THE Sunday night horror plays have lightened—but only to a small extent. Rudolf Cartier continues to grip us with themes that make Monday morning more difficult to contemplate, and the ugly features of five abominable snowmen apes were only slightly preferable to the hypnotic menace of Big Brother. For all his smooth production technique, "The Creature" left me as cold as the snows on which he walked. Here were used all the artifices—back-projection, inlay, overlay and other magic of the Lime Grove Studios, to broaden the canvas of the TV play. If only Rudolf Cartier could tear himself away from the eerie, the macabre and the Grand Guignol. Scarcely more cheerful was "Go Fall in Love," a bitter little play of words, by Ted Allan, which was saved by the artistry of Bernard Braden in a straight part as a night-club pianist and by the catchy little tunes of Malcolm Lockyer. Notable technical achievements in the presentation of this play were the "dubbed" piano music, brilliantly mimed by Braden, and the very fine low-key lighting effects of the camera engineers.

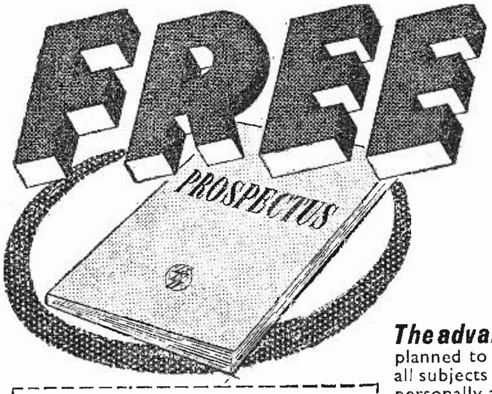
"QUITE CONTRARY"

THE recent series of "Quite Contrary" proved to be a pleasing one and ended with a very good edition, in which Raymond, the hairdresser, Ruby Murray, and all the favourites connected with the programme took part.

It is amazing to think of the number of stars that have emerged from this show, having entered it almost completely unknown. Joan Regan, Ruby Murray, Raymond himself, Catherine Boyle have all found over-night fame and have now become household words. All praise to producer Richard Afton for this.

Conductor Norrie Paramor made an interesting television debut with his orchestra in the last show, and, when he has had more experience before the cameras, will develop into a very pleasing TV personality. Mary Parker, too, can be satisfied with her handling of the role of introducer and her smooth linking up of the items.

Let us hope that it is not too long before this programme makes a welcome return to our screens for here is a show that offers a quiet form of entertainment instead of the all-too-common forceful style of others.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CORRESPONDENCE

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

LONG DISTANCE RECEPTION

SIR,—I have been making an effort during the past few days to pick up TV from the Continent at this address, with the undershown results.

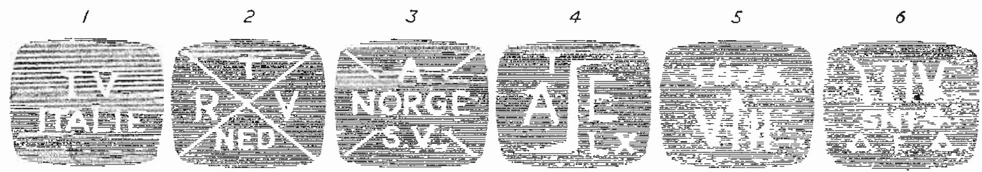
If any readers could identify these TV stations for me I should be most thankful.

I have been 30 years TV experimenter and am now in my 80th year.

I picked up 6 TV stations in two days.—H. C. TAYLOR (Lancaster).

CANNED SOUND

SIR,—I was interested in two letters on "canned sound" (B. Cook, Charlton, Jan. P.T. and R. J. Beal, Coulsdon, Feb. P.T.).



The various test signals which have been picked up at Lancaster by Mr. Taylor, whose letter appears above. Who can identify these transmitters ?

I certainly agree with Mr. B. Cook. "Canned sound" on film is far from perfect, there is no comparison with "live" sound. I thought that would be obvious to anyone.

I also have misgivings with regard to commercial TV. We certainly will not get with "canned vision" the same picture quality as we get with a "live" transmission.

I know how very nice and convenient it would be for top line artists, but to have everything filmed or telerecorded wouldn't be true TV. We would surely lose the intimacy and reality of television. This is where commercial TV will blunder.—G. GOODWIN (Wirral).

E.H.T. SUPPLIES

SIR,—The first TV receiver I built was with a kit that you used to advertise. This set worked really well until the E.H.T. supply failed. On examination I found that the E.H.T. winding which had developed an internal flashover in the windings, was an extension of one side of the H.T. winding. I took off this winding down to the point where the extension started, and found the rest of the windings O.K. I had a lot of trouble trying to replace this winding, and at the finish I wound another transformer. I have often wondered why a firm has not made a R.F. unit for this type of set. Regulation is very much better than with E.H.T. obtained from flyback and, with me, defocusing on whites is a thing of the past. What we want is a R.F. unit giving a variable output of 2 Kv. to 3 Kv. It would be just the thing for an oscilloscope too. I wonder what other readers think about it.—W. A. STEELE (Smethwick).

THE CV118

SIR,—I expect many other readers of your journal are big users of the VR65. The main trouble in using this in Surplus I.F. strips, etc., is that it doesn't seem to last. Maybe it is because many of the strips like the 196 run them a bit hard. Recently a few strips have been seen with CV118s instead of VR65s. This is a direct replacement but a higher anode dissipation. I would advise other readers to use the CV118 as it is a far better valve and lasts longer.—L. JENKINS.

PICTURE INTERFERENCE

SIR,—Your first "Problems" inquiry of the January copy dealt with picture interference in Whitehaven (per Mr. W. A. Henderson). If your readers gave it a thought or looked at the map, they would be puzzled how this chap came to be seeing pictures at all !

When one considers this question of folk in the Outer Hebrides of TV, it seems a little shocking that alternative programmes are even thought of as yet.

W. A. H. must have had a channel 2 multi aerial array, and pole, to get anything from Holme Moss. He has now a four element channel 5 aerial focused on the Isle of Man. The transmitter in the Isle of Man has an E.R.P. of nearly 200 watts (not kW.), and his receiver must be 50 miles away ! Doubtless, in June, when Divos Hill (Belfast) opens, he will be having a crack at that.

W. A. H. wanted to know the cause of horizontal lines ¼in. apart right through his picture.

Your reply was dead right (I think, anyway).

"Almost certainly external spurious signals adjacent to the vision frequency of the Isle of Man transmitter."

You have one word wrong here, though. The interference is not "adjacent." It is right on the same frequency. Our friend in Whitehaven must be picking up a pulverised, inverted and integrated signal from Wenvoe also.

This particular "venetian blind" will probably become quite fashionable in some parts of the country, when the low-power transmitters are all up !

The BBC must be in a position to confirm this or otherwise, but, in any case, the thick horizontal bars do show up in certain localities, and when seen loud and clear, it can be observed that the blind effect does not carry right through the picture ; but that a vertical strip about 1in. wide and a couple of inches from the right of the screen, carries rows of dots, to cause a break in the even rows of the interference.—H. KELLY (Douglas, Isle of Man).

R.F. UNITS

SIR,—For the benefit of other readers, I would like to point out that the R.F.26 units mentioned in the February and March issues are not suitable for direct connection to a dipole aerial without modification.

The input circuit is of high impedance and was meant to work with an external aerial unit.

However, the modification to low-impedance input is quite simple and well worth the bother.

First, the double-wound aerial coil, complete with C33, C34 and R15, should be taken out.

Then a 1½ turn coil of insulated wire wound on top of the grid coil of the first valve, with one end connected to chassis and the other to the Pye socket. Next a 100,000 resistor is connected across C3 to prevent the grid of the first valve being " in the air." This condenser is the trimmer above the first tuning condenser.—R. HALL (Consett).

HOME-CONSTRUCTED RECEIVERS

SIR,—Mr. F. D. Simpkins, of Rugby, in a letter published in the March issue of PRACTICAL TELEVISION, makes the sweeping allegation that home construction of television receivers is not worth while. This is a point which I would like to challenge.

This issue depends largely on what one considers to be worth while. Construction of television receivers by the amateur is not undertaken always with the idea of saving money but is treated as a hobby.

From the financial point of view, it is quite true that the construction of a televisor is a fairly costly business, and £40 is a fair estimate of the likely cost of components if everything has to be bought. To offset this it will be found that a large majority of constructors drift into the television field from the radio side and possess a useful spares box.

Still viewing the matter from the mercenary angle, the home constructor knows his televisor and services it himself, thereby saving normal servicing charges. Further, as new techniques are discovered, he can adapt his circuit to take advantage of them, and does not have to face the possibility of abandonment of a commercial receiver which cannot be repaired because it is too old and parts are not obtainable.

Because of these reasons I think it is fair to say that a home constructed television receiver costs much less in the long run.

Of course, televisors using ex-Government tubes *can* be built for much less than the cost of a commercial receiver. The PRACTICAL TELEVISION " Simplex," which can definitely be constructed for less than £16, is a typical example. There are very many constructors who have had their first introduction to television via sponsored circuits such as this and have thereby not only learned a great deal about the technique of the job but have had some very enjoyable hours spent in building the instrument.

Quite often a novice who would hesitate to invest a fairly large sum in an adventure such as this is quite happy to " have a go " with the simpler type of receiver and then, having obtained the necessary knowledge and confidence, proceeds to build the more costly type.

This brings me to the other main advantage in the home construction of televisors. We have the home constructor who is also a hobbyist and television is his hobby. It is not every hobby which can be made to pay for itself—television is one of the few. We also have the advantage which cannot be reckoned in pounds, shillings and pence ; this is the knowledge gained in the course of home construction, especially when we come to the teething troubles of a newly-constructed televisor.

A service engineer who has constructed his own receiver usually has a rather wider outlook than one who has not had such practical experience; knowledge gained during constructional work can assist him in his job.

The last paragraph of Mr. Simpkins' letter has my full support. The price of components is much too high, but perhaps we shall see again the same trend which occurred after the 1920's, which he mentions, for in the 1930's components were very inexpensive.

However, in spite of the cost of the various parts I still consider home construction is well worth while, and am sure that there are very many people who will agree with me.—B. L. MORLEY (Bristol).

BOOSTING E.H.T. SUPPLIES

SIR,—I have read with interest the article on this subject in the March issue, and am rather doubtful concerning the circuits in Figs. 1, 3 and 5. Surely, the depicted method of connecting the rectifier valve across a full mains winding is not orthodox. Perhaps the author has some comments he could offer concerning these particular arrangements.—H. THORNEYCROFT (Croydon).

[*It is true that in the circuits given I have inadvertently shown the rectifier in shunt with the supply instead of the more usual series arrangement. This would be rather hard on the transformer and the series connection is the recommended method.*

The connection between the top end of the E.H.T. winding and the heater winding of the rectifier should be broken and the connection taken instead to the anode of the rectifier valve. The bottom end of the E.H.T. winding should be taken to chassis instead of to the rectifier anode. This applies to Figs. 1 and 5.

In the case of Fig. 3 the same method should be applied, the top end of the E.H.T. winding of T2 going to the anode of V2 instead of the heater, and the bottom end to the heater of V1 instead of the anode of V2. The top end of T1 E.H.T. winding should go to the anode of V1 instead of the heater, and the bottom end to chassis instead of the anode of V1.

I am sorry if this has caused anyone any inconvenience ; the shunt method would work and provide a rectified E.H.T., but a practical circuit should employ the series method.—" ERG."]

AFTERNOON PROGRAMMES

SIR,—I had occasion recently to remain at home for several days through illness and was given the opportunity of seeing some of the TV programmes available to the housewives and children during the afternoon and early evening.

All I can say is this. Why cannot the cream features of the programmes be repeated in the evenings when a much larger audience is tuned in ? I saw an admirable American half-hour drama film entitled " The Tiger." It knocked most of the long Sunday plays into a cocked hat. It was not over-long—30 minutes was ample—and the action constantly changed from the Riviera to New York and back again. How different from the same old studio sets in the plays normally offered us.

Also, I looked in to one edition of the " Cisco Kid " series for children. Admitted, it mainly catered for youngsters with its gunfighting and horse-chases, but then, are we not all youngsters at heart ? It did not last very long and at least it was different.—R. JOSEPH (Cardiff).

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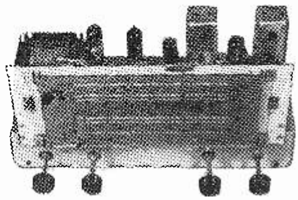

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FERGUSON 988T

Would you be so kind as to help me trace the fault in my Ferguson TV Model 988T "Twelve Plus"?

My set is about 20 months old and has given good service to date except for this, its first fault. For one or two evenings the brilliance became erratic—there appeared sudden flashes on the screen and then uncontrollable brilliance. The picture is now very bright with flyback lines very plainly visible.

Sound still perfect.

On reading up some of the "Practical Television" magazines I looked to see what I could do with the little experience I have.

1. First I suspected heater-cathode short in C.R.T. but was not sure if I would still have a "good" picture on screen (which I have). However, on wiring up separate heater transformer results were the same except picture even more pale.

2. V.F. amp. (EF80) changed over. *No effect.*

3. Resistors in brilliance control circuit *appear* in order, also those of V.F. amp., but not substituted. The main difference between now and when working properly is that the picture lights up suddenly all over the screen much too bright, which I cannot turn down.

Before, it was a slow five-minute job "warming up" before the picture was good all over the screen.

When switching off the light goes off very quickly now, whereas when working properly there is a light in the centre of the screen for several seconds after switching off.—M. Gibson (London).

In view of your remarks we feel that the insulation in the picture tube between anode 1 and grid may have collapsed. You can prove this possibility and, incidentally, sometimes correct the fault, by shorting the grid of the tube direct to chassis—you will find that at present it is loaded to chassis, even when the brightness control is turned right down, via a 1 megohm resistor included in series with the slider contact of the control. If, on shorting the grid to chassis, the screen blacks out, the effect is almost certainly caused by inter-electrode insulation breakdown in the tube. You may be lucky, however and find that the fault is cured on making the short.

VIEW MASTER—SUPPRESSOR

Will you please tell me if it is possible to use a D77 valve in place of MR5 in spot suppressor circuit of View Master and, if so, can you tell me what modification is required in connecting it between V5 and the tube? I have replaced MR5 and C52 many times, but it does not seem to have much effect, if any, in the district where I live because of severe ignition interference and feel, therefore, that a valve in the suppressor circuit would be more efficient.—G. Preston (Seacombe, Wallasey).

A D77 valve may certainly be used in place of MR5 and, if so, then the cathode of the valve should be connected to the anode of V5 and the anode of the D77 connected to C52.

At the same time a 1-megohm resistor should be connected between anode and cathode of the D77.

GRIFFIN DU10

My Griffin DU10 console model has developed a fault. It has a Mullard 12in. tube and a 15 Mullard valve superhet receiver. The picture is too long and adjustment of the height control has no effect, except suddenly to produce a ¼in. bright horizontal line right across the screen. The set is almost two years old and has never given the slightest trouble until now.—J. Stuart (Prescot).

We have no data of any kind on your receiver. Your remarks, however, would indicate that the picture width control (assuming by "too long" you mean that the picture is too wide) is in need of adjustment.

The fact that the picture disappears to a horizontal bright line when adjusting the height control almost certainly indicates that the control itself is faulty——probably open-circuit—and is in urgent need of replacement.

SIMPLEX

I have completed the "Simplex" television receiver and added the extra R.F. stage.

I can obtain a clear raster and all controls appear in working order, but no sound or vision signals.

I have tried, as suggested, with a pair of 'phones in series with R6 and the anode of V5, but without result.

Can you suggest any further test points of this manner to trace the fault?—F. Watkins (Surrey).

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

Check the operation of the R.F. circuits when listening for the vision signal by tapping each grid with the blade of a screwdriver. A distinct click should be received from each stage right through to the aerial. Non-receipt of a click at any point indicates that that stage is not working.

Clean the pins of the EF50 valves and use valve retaining clips.

H.M.V. 1803

I bought this set, with faults, about a year ago. I saw my local dealer about it, but he wasn't very keen so I had a go myself. My hobby is radio, but I know very little about TV. Anyway, I found the trouble. I fitted a new TA15J tube and carried out a small modification and also fitted all new Z66 valves and renewed the two E.H.T. condensers, etc.

After a lot of luck and trimming, etc., I got a picture after fitting a preamplifier, a really good one. The line hold is very unstable when first switching on ; I have to adjust the line hold and after 20 minutes or so a thick line pops out from the left side of the screen and the line has to be adjusted again. It does not matter how long you leave it, the line won't go back on its own. This trouble goes on all evening and the next day when switching on I have to start all over again.—L. French (Hants.).

In your receiver the line sync pulses are taken from the anode of the KTZ63 sync separator valve, through an 0.33 megohm resistor and 100 pF capacitor, to the primary winding (terminal number 4) on the line blocking oscillator transformer. Examination of this circuit will show that the 0.33 megohm resistor can be easily shorted out (by means of a screw type switch). With the resistor shorted a much more solid line hold is generally achieved. If you find that the resistor is in circuit, the effect you describe is frequently aggravated by its value increasing.

STELLA M5946

I would be most grateful if you could help me with my Stella set, No. M5946. I cannot get a full width of picture. I think it is the width control coil which has a moving iron core. This control does not alter picture either way.—W. V. Hickman (Hurst Hill).

This coil can be obtained only from the manufacturer, via a Stella agent—it is not a standard component. It is very rare that this component fails ; however, the general cause of the symptom you describe is low H.T. voltage, as the result of ageing of the H.T. rectifier. You should test this possibility.

REGENTONE BIG 12

Would you please assist me in tracing a fault in my Regentone Big 12 TV Plessey Mark 2 which I have had for the past two years ? The picture is breaking up and then going completely away. A faint hiss is heard when this takes place. The tube was replaced a year ago. I have replaced the EL38 valve, also 6L18 and EY51 rectifier which has made no improvement. The picture is very good when on, but only lasts for a second or two. The tube face is still bright and the E.H.T. is O.K. — Peter Middleton (Midlothian).

If the sound is unaffected when this symptom occurs the trouble lies somewhere in the vision I.F. amplifier, vision detector, video output sections. It is often caused by a poor connection between the pins of one of the related valves and the valve holder socket. This can generally be proved by wriggling in turn each valve in its holder while observing the effect on the picture. The valve which, when so disturbed, blacks out and restores the picture should be examined and cleaned if the pins show signs of oxidisation ; the associated valve-holder should also be replaced if necessary. We would also point out that poor inter-electrode insulation in the picture-tube has been known to cause the symptom on your type receiver.

" ARGUS "

I have built the " Argus " receiver, and cannot get any results at all. However, the A.F. portion seems O.K. when coupled to the output lead of an ordinary BBC receiver.

The raster appears to be satisfactory, but when I switch on there is a loud plip-plop from the loudspeaker, and on placing an Avo Minor across its main feed from the power transformer the voltage jumps twice at the same time as these plops. All other voltage checks appear O.K. Does this suggest anything ? — John R. Currie (Eastleigh).

You do not give us sufficient information on which we can help you. What is the raster like ? Have you tried the listening method for tuning in the vision signal ? Are you using an aerial of the type normally in use in your locality ? Have you tested the R.F. stages ? These are typical of the questions which need answering. It is not clear from your letter if you have managed to get the sound at all.

The voltage surge can be due to a variety of causes, the most likely being the electrolytics. Try connecting a 100 ohm 3 watt resistor in series with the first two.

PYE FVI

In an attempt to improve the focus of my Pye FVI I removed the P.M. unit, slackened the clamp screws and rotated the ring magnet slightly. However, on replacing unit matters were worse than ever. I made several more attempts, using the same method and being careful not to knock magnet but still with the same result.

I did find, though, that on tilting the adjustment collar I got perfect focus. I feel, however, that by using this method I am interfering with the work of the ion trap magnet. I would be very grateful if you could offer any suggestions or advice.—I. Ward (Yorks).

It is possible that loss of magnetism in the focus unit is responsible for the symptom you describe ; this, unfortunately, is often aggravated by dismantling the focusing unit as you have done. To restore an even focus we feel that it may be necessary to replace the unit. It should also be remembered, however, that low E.H.T. and impaired picture-tube vacuum are other factors that frequently cause the symptom.

STELLA 1480U

I have been experiencing fading on the whole of the picture on my Stella Type 1480U.

The set is about two and a half years old now, and for some considerable time the picture on being switched on, comes on over-contrasted, and of no detail, but after five or eight minutes this fades and I have a reasonable picture. But during the evening it continually darkens and only by using more contrast can I hold a reasonable picture. As I have to be continually adjusting the contrast am I right in assuming that perhaps one or more of the UF42's are losing their emission ?

I should be grateful to hear your remarks ; no loss of sound has been experienced.—E. Millington (Oldbury).

This effect is often symptomatic of an ageing picture-tube. It can also be caused, however, by components and valves altering in characteristics as they increase in temperature. In the first place, therefore, we would advise you to have the valves, which are related to the vision I.F. and video sections, tested for emission over a period of time, the valves which have a tendency to alter in emission as they get hot should be replaced. If the valves seem all right, the picture-tube and smaller components associated with the vision channel, brightness control network and tube first anode supply should come under suspicion.

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1T4	7/3	6V6GT	7/6	CL33	12/6	N78	14/6
3Q5GT	11/6	6X4	7/6	D77	6/9	Pen45	15/-
3S4	7/3	6X5GT	6/9	DAC32	11/6	PCF80	10/6
3V4	8/6	7B7	7/6	DF33	11/6	PCC84	11/6
5U4G	8 6	7C5	8/6	DH77	8/6	PL81	11/6
5Y3GT	7/9	7C6	8/6	DK32	11/6	PL82	9/6
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6AM5	6/6	7Y4	8/6	DL35	11/6	PY81	10/-
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6AT6	8/6	10F1	10/-	EB91	6/9	PZ30	17/-
6BA6	7/6	10LD11	10/-	EBC33	7/6	T41	13/-
6BE6	6/6	10P13	10/-	EBC41	10/-	U14	8/6
6BH6	6/6	10P14	13/6	EBF80	10/6	U22	7/6
6BJ6	6/6	12AH8	10/6	EC91	7/6	U24	17/6
6BW6	7/6	12AT7	9/-	ECC81	9/-	U25	12/-
6BW7	9/6	12AU6	7/6	ECH35	11/9	U50	7/9
6C4	7/6	12AU7	10/6	ECH42	10/-	U78	8/6
6C9	8/6	12J7GT	10/6	ECL80	9/6	U404	9/-
6F1	12/6	12K7GT	9/-	EF37A	14/6	U801	14/6
6F6G	7/6	12K8GT	10/6	EF39	6/6	UBC41	9/-
6F12	7/6	12Q7GT	9/6	EF41	9/-	UBF80	10/6
6F13	13/6	12SK7	6/-	EF50 (Sylvania)	8/6	UCH42	9/9
6F14	13 6	20F2	11/6	EF80	10/-	UF41	8/6
6J7GT	7/6	20P1	15/-	EF91	7/6	UF42	13/6
6K7G	6/-	25Z4G	9/-	EF92	5/6	UL41	9/9
6K7GT	6/-	25Z5	8/6	EL41	11/6	UU8	17/-
6K8G	8/6					UY41	9/-
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6K25	11/9					Y63	7/6
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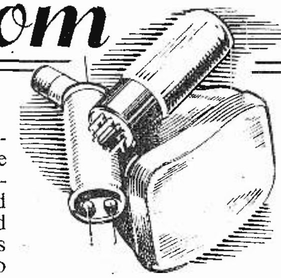
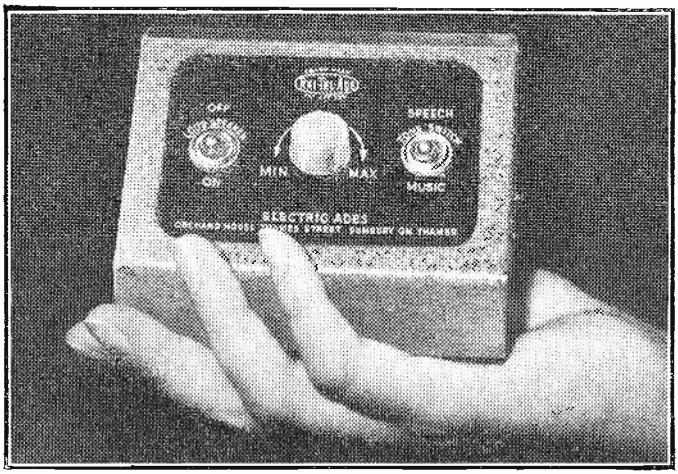
News From the Trade



"RAI-TEL-ADE"

WHEN using the conventional hearing aid the listener receives the output of a radio set, TV set or radiogram at secondhand, because the aid picks up the set-speaker's output and reproduces it again. The user receives much-distorted sounds for two reasons. First, the conventional hearing aid is designed to aid conversation between two or more persons conversing in comparatively close proximity; therefore, at normal distance from a radio set and at comfortable viewing distance from a TV set, the aid must be at full volume, which seriously distorts its output. Secondly, even at maximum volume, the aid does not pick up satisfactorily unless the sound output of the radio, TV or radiogram is uncomfortably high for those with normal hearing, thus increasing the distortion of the original sound output and also greatly amplifying the normal environmental noises, thereby further adding to the distortion babel. The aid user can, of course, sit right over a radio set, which is usually physically uncomfortable or up at a TV set, which causes eyestrain and imperfect viewing, with the sets giving normal output.



The neat unit for the hard of hearing reviewed above.

The Solution of the Problem

The obvious answer to this problem is an instrument which does not depend on reproducing sound secondhand. Instead, it should plug into the output circuit of the radio, TV set or radiogram and itself receive the signals, which actuate the loudspeaker. The instrument turns these signals into sound, which the user receives directly from his ear-piece.

After two years of research and development such an instrument has been devised. It utilises neither valves nor batteries yet completely solves the problem. It is the "Rai-Tel-Ade." It utilises the same type of miniature insert ear-piece as is used in the conventional hearing aid. This is connected to the small "Rai-Tel-Ade" by a thin, plastic-covered flex.

The "Rai-Tel-Ade" being only 3in. by 3in. by 4½in., sits comfortably on a side-table or the arm of an easy chair. It is connected by a long lead to the radio, TV set or radiogram to which connection is easily made without harming the most expensive or delicate set. Thus the user may may sit in any part of the room and as far away from the sound source as desired.

Extraneous noises are entirely eliminated and the user has a personal volume and tone control for speech or music on the instrument itself. Their use does not affect the loudspeaker output. Indeed, it gives the person who is hard of hearing greater independence than the unafflicted, because he, or she, can listen-in and view with the loudspeaker switched off. This property makes the instrument useful for those with normal hearing, since parents may listen-in without disturbing their children doing homework, for example.

The "Rai-Tel-Ade" is tested to withstand 2,000 volts D.C., and is guaranteed completely safe under all conditions. The windings of its specially matched transformer, through which the signals pass, are electrostatically insulated and earthed for further safety. The "Rai-Tel-Ade" is guaranteed for two years.

It may be used in conjunction with a car radio. It may be used for individual listening by hospital patients from their own radios without disturbing anyone, and in the nursery and sickroom. The instrument has an attractive silver-grey finish.

The retail price, complete with plug and socket connecting lead, miniature insert type receiver, which accepts the personal ear mould, is £4 15s.—Electric Aids, Orchard House, Sunbury-on-Thames, Middx.

QUERIES COUPON

This coupon is available until April 21st, 1955, and must accompany all Queries.

PRACTICAL TELEVISION, APRIL, 1955.

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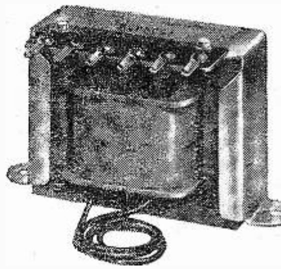

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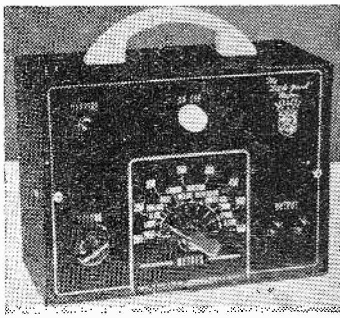

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