

PRACTICAL TELEVISION MARCH 1951

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EDITOR  
F. J. CAMM

# TELEVISION

& "TELEVISION TIMES"

Vol. 1 No. 10

MARCH 1951

A NEWNES PUBLICATION



*Television Applications*

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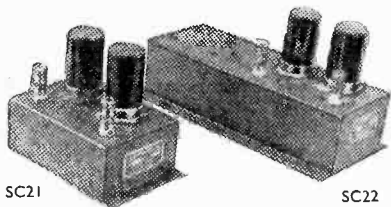
"Surplus" Sound and Vision Rx  
A Simple Converter  
On the Fringe



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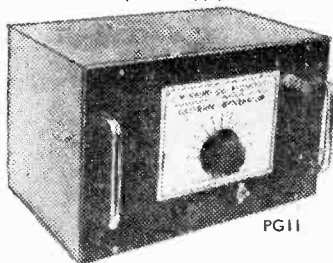
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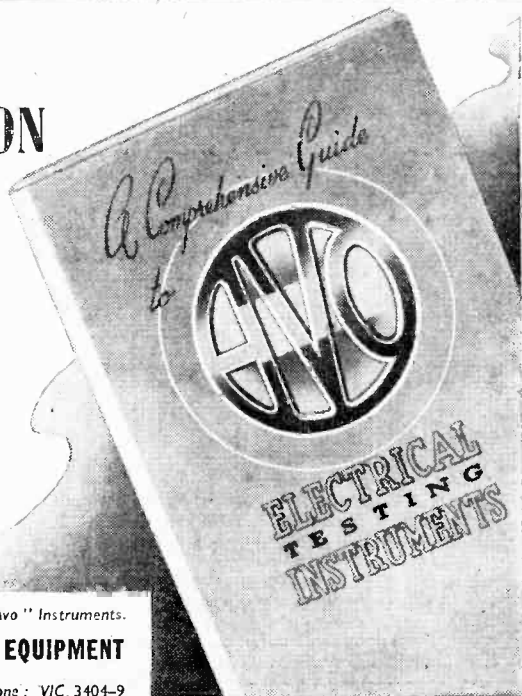
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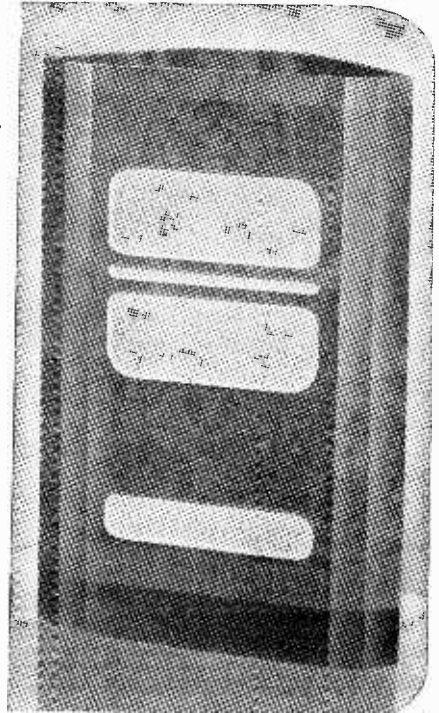
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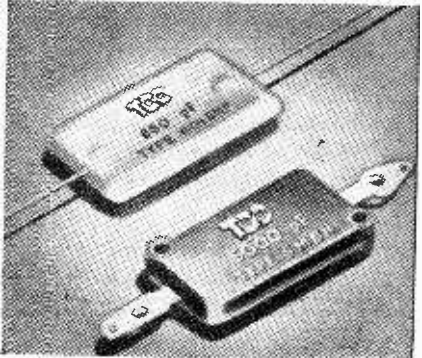
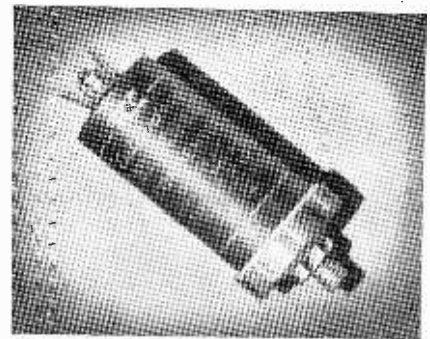
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# PRACTICAL TELEVISION

## & "TELEVISION TIMES"

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EVERY MONTH

MARCH, 1951

### Televiews

## The Beveridge Report

**T**HE Report issued by the Beveridge Committee on the B.B.C. (two volumes of 583 and 327 pages respectively) is an exhaustive document. It is true that the recommendations are summarised in 11 pages, but there is little differentiation between sound-radio and television, and the reader is left to sort out the scintilla of television considerations from the quagmire of tangled and contradictory evidence which constitutes the bulk of the Report. There is a large amount of evidence from interested bodies, and a small amount from disinterested bodies.

Elsewhere in this issue we summarise the chief recommendations as they affect television, although the recommendations are not unanimous, and are somewhat damped by the minority reports. One of these minority reports, for example, suggests that in due course one or more other companies or corporations could be licensed to provide the alternative television programmes which sooner or later the public will certainly demand, and which are now technically possible. When that has taken place it might be desirable to follow the same pattern as with sound broadcasting—a public service of non-commercial programmes, financed by a licence-fee, and alongside it one or more other agencies financed commercially.

According to this minority report, which was submitted by Mr. Selwyn Lloyd, a British Television Corporation could be licensed to put on television programmes with the power, as an interim measure, to accept advertisements for sponsored items. He thinks that the support from sponsors would be sufficient to enable the licence fee to be reduced.

The Radio Industry Council, in the memorandum it submitted to the Committee, states that the most important problem facing broadcasting to-day is the extension of television. It thinks that the use of caption scanners, cold lighting, film recordings, and more modern studio cameras are cases where the B.B.C. could have shown considerably more initiative and drive. Many reasons have been submitted by the B.B.C. in an effort to explain why two small studios are still the only ones available.

These arguments are somewhat invalidated by the fact that the complete television studio (with auxiliary rooms) was constructed at Radiolympia in 1947 and 1949 in less than two weeks.

The industry further thinks that the operation of a television broadcasting monopoly since 1936 has discouraged the radio trade from producing the equipment which is wanted for television studios and transmitting stations. There have been no radio firms with sufficient resources to undertake the design, development and manufacture, when there is only a single purchaser who may not buy the equipment when it is made. Under similar conditions in other industries, such as civil aviation, development contracts have been placed. If the B.B.C. had been more determined to improve the standard of their television service to the utmost, a portion of their unexpended balance of £2,348,172 might have been usefully employed in improving technical facilities.

Many countries are watching closely the development of television, and our prospects of selling British equipment overseas are seriously handicapped by the slowness of expansion of service in this country. A rapid expansion of the service here would induce far greater confidence overseas in our equipment.

The Radio Industry Council believe that we should have a national station as well as a commercial station in each centre of the population; or a single transmitting station in each centre, and feed it alternately with programmes from national and sponsored studios or outside broadcast sources; or have a single national service radiating concert programmes created in the national studios or from outside broadcast sources. One of these plans they think, if adopted, would appeal to the public and, at the same time, help the national economy.

Many of those who gave evidence before the Committee endeavoured to obtain cheap advertisement for their particular firms or associations; there seems little other reason for their evidence, since it does not contain anything of value. Such evidence should have been rejected out of hand by the Committee so that a more compact volume could have been produced.

There can be no doubt, however, that the Report has brought into the limelight all those matters which have been the subject of so much criticism during the past 25 years. Much of this criticism is really the criticism of Lord Reith, who created the system which has given rise to it.—F. J. C.

# Simple Superhet Converter

An Accessory for Use with ex-Service I.F. Strips

By B. L. MORLEY

**A** USEFUL convertor unit for use with a 7 Mc I.F. strip such as the 1355 can be made quite easily with spare parts from the junk box.

The one described in this article was designed for the Birmingham transmitter and is similar in design to the RF26 unit. It works very successfully 80 miles from the transmitter using only three stages of I.F. amplification.

The circuit diagram is shown in Fig. 1. An EF54 is used for the R.F. stage, another EF54 for the mixer, and the oscillator circuit employs a VR65 (SP61) valve. This arrangement enables a useful gain to be obtained from the unit.

Four coils will be needed; these are wound on Aladdin standard coil forms.

Coil winding data :

L1—Primary,  $1\frac{1}{2}$  turns; secondary,  $4\frac{1}{2}$  turns. (Wind secondary on first, 22 S.W.G.)

L2—Four turns (22 S.W.G.)

L3—Three turns (22 S.W.G.)

L4—50 turns (34 S.W.G. enamelled s.s.c. wire).

Screening is most important and great care must be

taken to screen the oscillator thoroughly. Screens should be erected across the valveholders, and Fig. 2 shows one method of mounting the screens and associated components.

The oscillator valve and associated components should be screened separately, and a screening cap used on the grid of the valve.

The output from the mixer, and the connection between the oscillator and the mixer should be made with coaxial cable, the outer braiding being earthed.

## Alignment

Alignment is not difficult and an ordinary broadcast receiver can be used. Connect the output from the unit to the aerial socket on a broadcast receiver, using coaxial cable, and connect the television aerial to the input. Tune the receiver to 7.5 Mc/s, then by adjusting C22 the vision (or sound if required) signal should be heard on the receiver.

It should be noted that the condenser tunes fairly sharply. L1, L2 and L4 are then adjusted for maximum

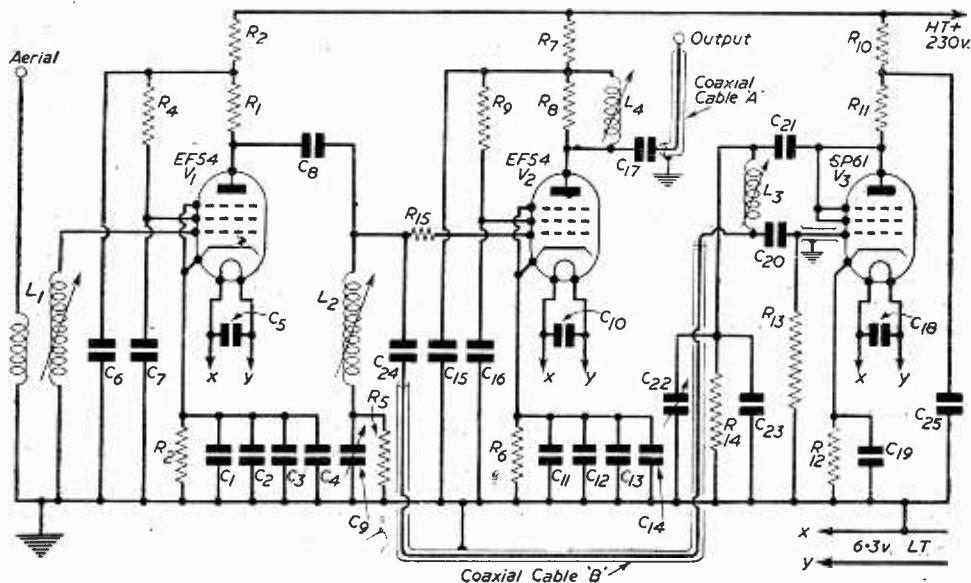


Fig. 1.—Theoretical circuit of the converter.

## LIST OF COMPONENTS

C8, C21—100 pF.  
C9, C22—0.21 pF.  
C17, C20—10 pF.  
C23—50 pF.  
C24—5 pF.

Remaining condensers  
all 500 pF.  
R1, R11—5.6 K $\Omega$ .  
R2, R7—2.2 K $\Omega$ .

R3—150  $\Omega$ .  
R4, R8, R13—10 K $\Omega$ .  
R5—47 K $\Omega$ .  
R6—1 K $\Omega$ .

R9, R14—100 K $\Omega$ .  
R10—470  $\Omega$ .  
R12—180  $\Omega$ .  
R15—10  $\Omega$ .

volume, in that order. The iron core of L3 acts as a vernier control and enables the oscillator to be set correctly.

Should the signal not be heard, try adding a 20 pF.

tube, L4 should be adjusted for maximum quality. It will be found that screwing the core down produces "plastic" effect, but care must be taken not to include the sound channel.

Chassis Dimensions  $3\frac{1}{2} \times 8 \times 1\frac{1}{2}$ "

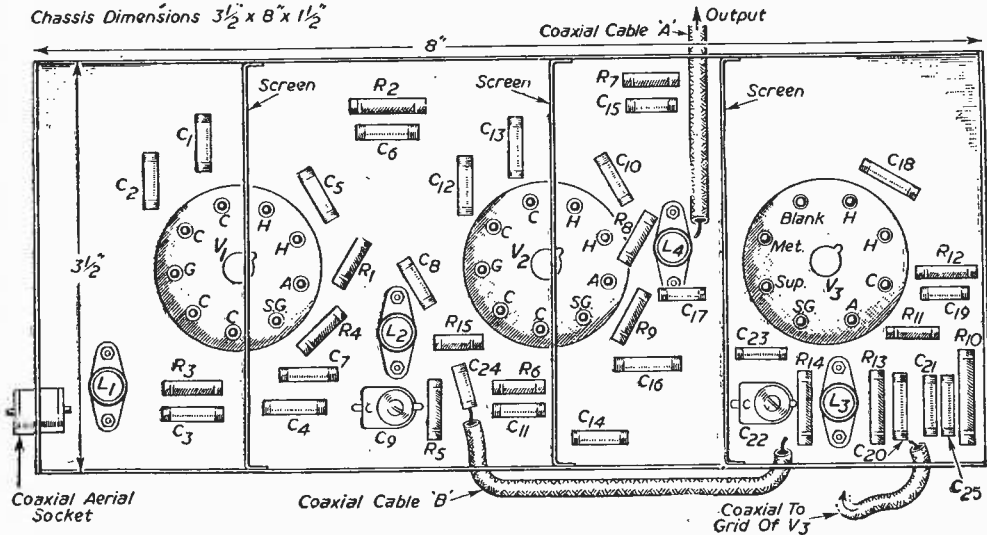


Fig. 2.—Chassis layout showing location of main items. The valve-base screens are 3 1/4 in. by 1 1/4 in.

condenser across C22, or should the oscillator frequency be too low, take off a half turn from L3.

When making final adjustments, using the picture

For extreme ranges a further R.F. stage (a duplicate of the one in the unit) can be added, either in a separate unit as a pre-amplifier, or attached to the existing unit.

# D.C. Receivers—2

## The Problems of Operating Television Receivers from D.C. Mains

By W. J. DELANEY (G2FMY)

LAST month we discussed the first problem of operating a television receiver from D.C. mains. This is the simplest part of the problem and follows normal radio D.C. technique and, of course, may be applied to the A.C./D.C. receiver also. The next point to be considered, however, is a much more important one and is the main reason for the fact that until fairly recently receivers have not been obtainable for operation from D.C. supplies. As most readers will know, the line scan is the circuit in which most power is required, and especially when an aluminised tube is used with its consequent high value of E.H.T. It may be thought that E.H.T. is also a problem on D.C. supplies, but the use of an R.F. unit with the standard D.C. heater connection may be used, although this part of the apparatus will be dealt with later. In addition to the need for a powerful line scan amplifier, there is also the question of the use of the tetrode type of C.R. tube which requires a voltage on the first anode of up to 400 volts.

First, then, let us deal with the line scan amplifier. If this is operated at a low anode voltage, the usual way to obtain power in the anode circuit is to use a pentode type of valve operated in such a manner that there is a high anode current, but there are many cases where the mains supply is at 200 volts or lower, and after decoupling or smoothing circuits the anode voltage will

only be of the order of 150 to 170 volts. Very few valves will provide the necessary power at this voltage. In addition, if the H.T. line is only as high as 200 volts, the efficient use of a tetrode tube is impossible. It should be remembered here, that the higher the first anode voltage the smaller the spot and the less is the risk of ion burn.

### "Booster" Diode

It will be remembered that in the line scan amplifier there are present high voltages due to the fly-back. These range up to nearly 4,000 volts in some circuits, but are generally round the 2,000 volt mark, and are one of the main reasons why a simple voltmeter should never be used to measure the voltage on the anode of the valve. It is usual to dissipate these excess voltages after means have been applied to develop the required E.H.T. This is carried out by using a special transformer to couple the line scanning coils to the valve and this will be dealt with later. Some of these excess voltages may, however, be tapped off and then become available to feed the first anode of the tube, or to "boost" the normal H.T. available on the H.T. line—especially for the line scan amplifier. The term "boost" has been used, and as a result there has been developed a special type of valve known as a "booster" valve. This is a special type of diode, designed to provide half-



wave rectification, but from what has previously been said about the high voltages in this part of the circuit, it will be obvious that the valve must be of a type designed to withstand such voltages and consequently it will be found that the heater-to-cathode insulation is specially designed to withstand them.

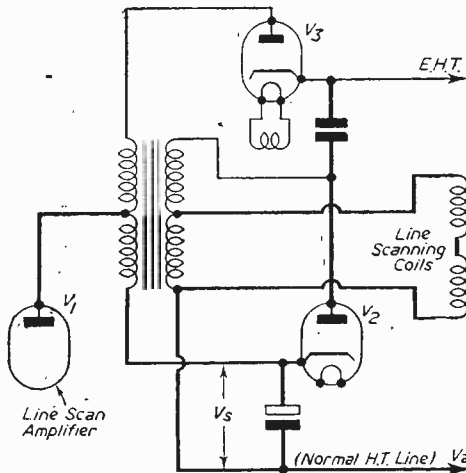


Fig. 1.—Line scan amplifier showing booster and E.H.T. rectifier.

#### "Booster" Circuit

Fig. 1 shows a line scan amplifier with both the E.H.T. rectifier and the "booster" diode connections, the former being shown lightly as they are not needed for this description of the workings of the "booster." It will be seen that the line-coil feed transformer has both a tapped primary and a tapped secondary. Across the secondary windings the current and voltage assume the form indicated in Fig. 2, from which it will be seen that the saw-tooth waveform results in the anode of the diode going positive with respect to the H.T. supply line  $V_a$  during the scan-period ( $V_s$ ). When this occurs, as with any ordinary diode, the valve becomes conductive, and the additional voltage is thus added to that present on the supply line  $V_a$ . Instead of a diode some manufacturers utilise a specially-made half-wave metal rectifier to achieve the same result.

#### E.H.T. Circuit

On the line output transformer there is also usually another winding designed to provide a low voltage for the heater of the E.H.T. half-wave rectifier. (The heater of the "booster" diode is, of course, connected in the normal heater chain.) The E.H.T. rectifier, however, deals with the very high voltage peaks and is so designed that it requires no valveholder. Wires are led out at the base for connection to the winding on the transformer, and the valve is often mounted actually on the transformer itself. The rectifier simply rectifies the peaks which are applied, without smoothing to the anode of the tube, and provide a potential of the order of 7,000 volts or more.

There are, of course, various modifications of the basic arrangements above described, different designers having their own ideas as to how the circuits are best arranged for each individual design, but the basic idea remains, and it will be seen that there is really no great difficulty in designing a receiver for a low-

voltage mains supply at D.C. and obtaining the various high voltage supplies in spite of the absence of a mains transformer.

#### Transformerless Receivers

The effectiveness of the mains scheme outlined may be judged from the fact that an increasing number of manufacturers are now building receivers of the A.C./D.C. type—not because there are so many viewers on D.C. mains but in an endeavour to reduce the initial cost of construction. The mains transformer is, of course, not only a very bulky component (if properly designed), but is also very expensive, and by doing away with it quite a big saving is recorded. In some cases of this type of receiver difficulties associated with the heater supplies are avoided by using an auto-transformer or a small step-down transformer to feed the heater, but such receivers can, of course, only be used on A.C. supplies, but a marked saving is effected and a more compact receiver may be built.

On the other hand, some manufacturers are turning their attention to the production of special valves to

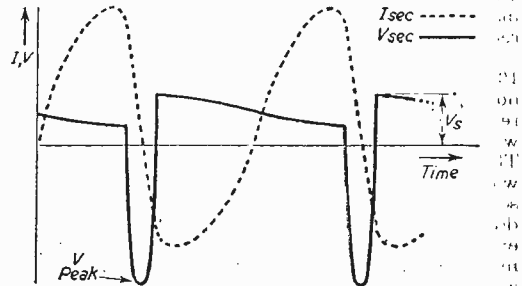


Fig. 2.—The voltage and current pulses present in the secondary of the line output transformer.

facilitate the construction of the transformerless receiver (either for D.C. only or for A.C./D.C. operation) and in addition to being of a very compact nature these have heaters designed to operate at from 15 to 20 volts and this reduces the value of any series resistance required in the heater chain, as well as providing a more robust valve. Coupled with the high heater rating is a low anode rating, from 150 volts upwards.

One other point must be considered now and that is the fact that the remainder of the transmitters to be opened will be working at higher frequencies than that used by London, and, therefore, greater care will be necessary in design to provide stability. Some of the valves used for London receivers will be found inefficient at the higher frequencies, and, therefore, these newly introduced valves will replace them and provide more efficient receivers.

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By F. J. CAMM

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Radio was but ten years old in 1932, but radio experimenters had not up to that time any source of reference comparable to that which was available for other industries.

The production of a volume, as planned, which would encompass all of the various branches of radio science, all the formulæ and the constructional details necessary to the technician, the service engineer, the constructor, the student, the radio mechanic, the operators, the laboratory assistants, and the designers, was indeed a heavy task.

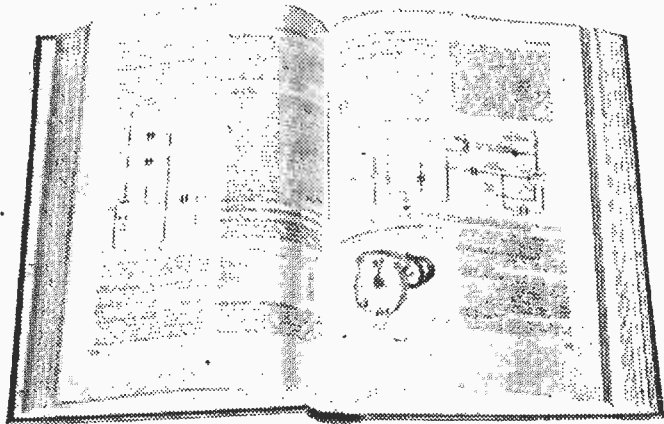
The success of the effort can be measured by the fact that the market has already absorbed twelve editions, comprising a total of over 300,000 copies in 18 years.

Copies have journeyed all over the world. They may be found aboard ship, in radio laboratories, in experimenters' dens, in workshops, in the remotest countries of the world, in libraries, in colleges, and in the reading rooms of scientific institutions.

In a new industry such as radio changes are rapid. New branches of the science are introduced, new methods and circuits are discovered, and the nomenclature expands in consequence. The task of revising each edition so that it reflected these changes in order that the readers' knowledge should be kept up to date was a heavy one, but as edition succeeded edition the author, Mr. F. J. Camm, made great efforts faithfully to record every fact, every figure, every new term, and every change in technique which had arisen after the previous edition had gone to press.

There is a practical limit to which expansion can go without unduly condensing standing matter and entirely upsetting the pagination and resetting the whole book. That limit was reached with the eleventh edition, and it was on the publisher's request for a twelfth that it was decided to reset, to re-illustrate, and to prepare an entirely new volume, but with the same underlying idea which had prompted publication of the first edition.

Since the eleventh edition went to press in 1946, a great deal has happened in the world of radio, and



in this twelfth edition, upon which the author has been engaged during the past four years, the reader will find information on all of these new aspects.

The unchanging data such as definitions, standard terms, and formulæ such as Ohm's Law have, of course, been retained, and all of the matter which in the course of the years has become obsolete has been deleted. It was not found possible further to compress the previous volume to include the mass of new matter which it was the duty of the author to include. As he says in his Preface, "a book, like a boot, should comfortably accommodate what it is intended to contain," without undue compression.

The new volume contains a large number of new sections on radar, television, remote control, oscillators, Kirchoff's Law, photo-electric cells, automatic station selection, car radio, electron multipliers, quartz crystals, amateur transmission, international call-signs, fault finding, building a television receiver, the colour code, aeriels, meters, table of short-wave stations, valve data, official service terms, a complete series of modern radio circuits for receivers and amplifiers, etc., etc.

The practical information on the making of various components has been retained. The constructor, for example, will find in this twelfth edition information on the building of I.F. transformers, oscillator coils, mains transformers, coils and chokes, aeriels, testmeters, etc., etc.

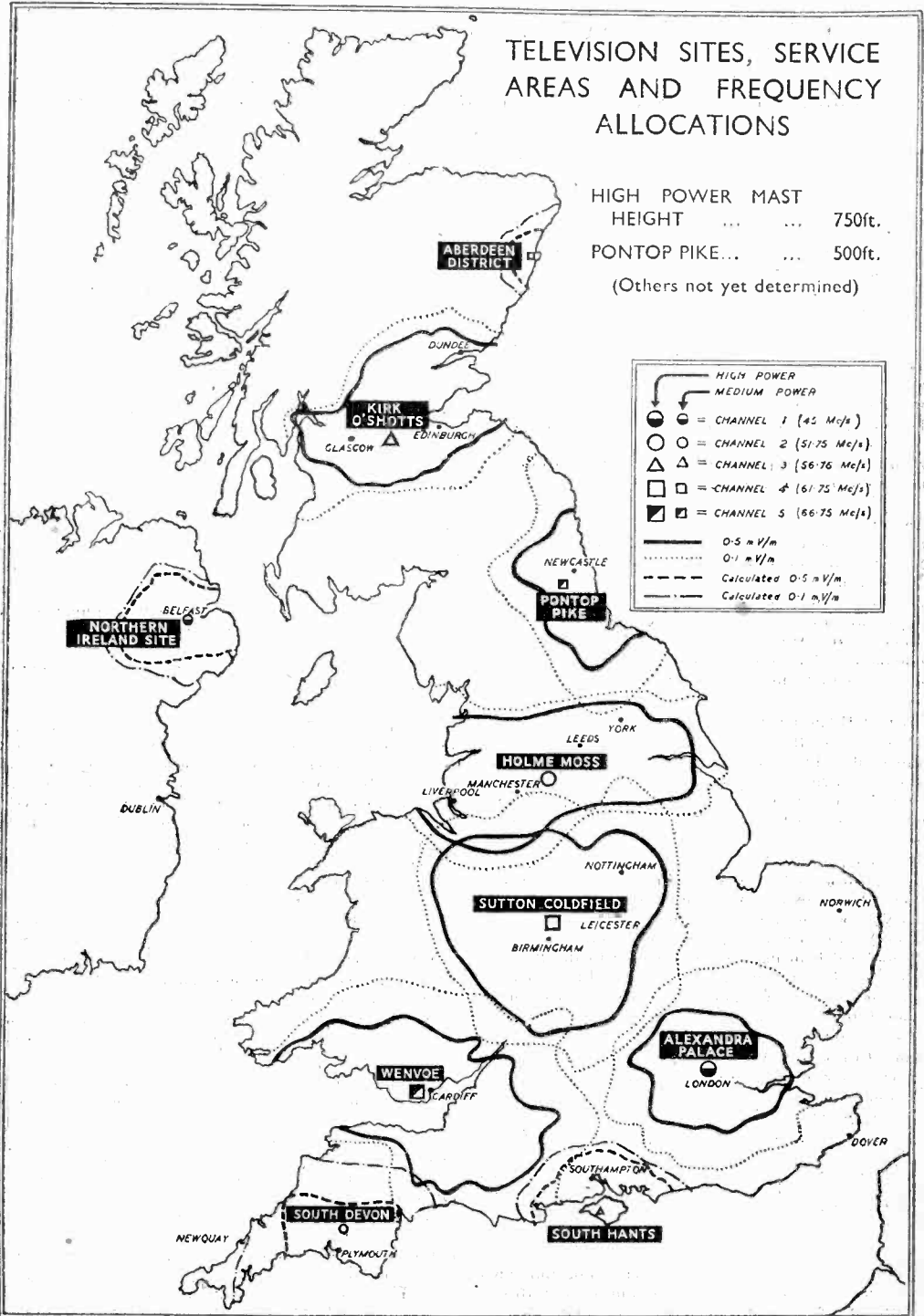
Because of the alphabetical arrangement of the contents and the careful cross-referencing throughout the text, the reader is quickly able to consult the information he requires, and is guided to information which is germane to it.

There are no fewer than 554 illustrations in this 384-page volume, which costs 21s. from bookshops, or 21s. 10d. by post from the Book Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

# TELEVISION SITES, SERVICE AREAS AND FREQUENCY ALLOCATIONS

HIGH POWER MAST HEIGHT ... 750ft.  
 PONTOP PIKE... 500ft.  
 (Others not yet determined)

HIGH POWER	
MEDIUM POWER	
●	= CHANNEL 1 (45 Mc/s)
○	= CHANNEL 2 (51.75 Mc/s)
△	= CHANNEL 3 (56.75 Mc/s)
□	= CHANNEL 4 (61.75 Mc/s)
■	= CHANNEL 5 (66.75 Mc/s)
— 0.5 mV/m	
⋯ 0.1 mV/m	
- - - Calculated 0.5 mV/m	
- - - Calculated 0.1 mV/m	



# The Beveridge Report

## Summary of the Main Television Recommendations of the Beveridge Committee

By THE EDITOR

**A**FTER making the recommendation that after the expiry of its current Charter the B.B.C. should be continued as the authority responsible for all broadcasting in the United Kingdom, including Television and the Overseas Services, the following provisos were added: (1) such renewals should be subject to express reservation by the Government of power to license a body or bodies approved by them to conduct on specified conditions television for public showing, and (2) that there should be certain changes in the constitution and powers of the B.B.C.

The Charter should *inter alia* require the Corporation to take such steps as may appear to be necessary to develop television as part of the work of the Corporation but with due regard to its special problems.

### Licence Fee

For meeting the costs of home broadcasting the licence fee system should be continued substantially as at present.

The rate of licence fees for sound broadcasting and for television, the percentage of net licence revenue to be allotted to the B.B.C., and other financial questions involving the Corporation should be reviewed in the light of the first Quinquennial Report.

### Sponsored Programme

Clause 3 of the current Licence, prohibiting any commercial advertisement or sponsored programme without the written consent of the Postmaster-General, should be repeated, except that the "appropriate Minister" should be substituted for the "Postmaster-General."

Within its own sphere the B.B.C. should in respect of television be in the same position as it is in respect of sound broadcasting, of independence subject only to defined vetoes and specific requirements. Clause 5 of the current Licence and Agreement should be repeated in a modified form in any new Licence to the B.B.C.; the Postmaster-General should be enabled to give instructions needed for technical purposes and in order to adjust B.B.C. television for the home to television licensed for public showing.

Subject to being-satisfied that wavelengths not needed for home television or other prior purposes can be used for public-showing television, the Postmaster-General should be prepared to license their use by a responsible organisation or organisations established for the purpose. He should require the resulting pictures to be available to the B.B.C. and to others on financial and other terms approved by himself, and he should impose conditions preventing the new licensees from introducing commercially controlled television indirectly into the sphere of viewers at home.

A Television Advisory Committee should be appointed to advise the Government in relation to the B.B.C. Its Terms of Reference should be wider than those of the present Television Advisory Committee.

### V.H.F.

Development of very high frequency broadcasting should be regarded as important and urgent.

The Terms of Reference of the Television Advisory Committee should be enlarged to cover higher frequency broadcasting as well as television.

The B.B.C. on its technical side should be asked to report whether there are in fact any areas of bad reception which can be covered better by relays than by direct radio, and which it might cover in this way in pursuance of the general duty of providing complete service.

Broadcasting should not be governed automatically by regard to what will please the listeners.

### Audience Research

Audience Research should continue and its results should be made more widely known, certainly to Regional Advisory Councils. The main results should be included in the Annual Reports of the Corporation.

The Corporation should take into immediate consideration the possibility of establishing supplementary television studios outside London, and till this can be done should adopt special measures to correct the weighting of studio television programmes by London.

### Dividing Line

Administrative distinction between sound broadcasting and television should be greater than between other parts of the broadcasting organisation. The Director of Television should have the fullest possible authority to deal with staff and performers and over other aspects of administration, including accommodation, finance and establishment matters.

Separate accounts should be kept for sound broadcasting and for television, and each of these main divisions of the Corporation's work should stand on its own feet financially. Surplus revenue from either sound or television licences should be used to meet expenses of the other service on a repayment basis.

The ten year financial plan submitted by the B.B.C. to the Committee should be revised in the light of the proposals made by the Committee for making television and sound broadcasting stand on their own feet and for increase of borrowing powers.

The question of raising the television licence fee should be considered when the B.B.C.'s present financial plan is being revised.

Television in schools should be the subject of experiment.

A special Television Programme Advisory Committee might be set up.

Aliens should be eligible for establishment.

Where restrictions damaging to the public are being imposed by organisations other than those of performers,—as in relation to use of films for television, televising of stage plays or televising of sporting events—and are not already the subject of negotiation, the Corporation should take whatever steps appear likely to secure

removal of these restrictions on terms securing the legitimate interests of these organisations.

**The Five Year Plan**

The B.B.C. has a five year plan for a nation-wide service of television which has been approved by the Government and was announced by the Postmaster-General in November, 1949. This plan provides for the erection of ten transmitting stations distributed over the country, so as to cover the main centres of population. The B.B.C. has planned also to build on a 13 acre site in Shepherd's Bush a set of studios and accompanying accommodation which will, it is hoped, be "the best television centre in the world."

The ten transmitting stations include five of high power and five of medium power to supplement them, distributed as follows:—

<i>High-power Stations</i>	<i>District Served</i>
Alexandra Palace ..	London and Home Counties.
Sutton Coldfield ..	Midlands.
Holme Moss ..	North of England.
Kirk o'Shotts ..	Central Scotland.
In Glamorganshire ..	Bristol Channel Area.

<i>Medium-power Stations</i>	<i>District Served</i>
Near Newcastle ..	North East England.
Near Southampton ..	South Coast (part).
Near Belfast ..	Northern Ireland (part).
Near Aberdeen ..	North East Scotland (part).
Near Plymouth ..	South West England (part).

The first two of these stations, at Alexandra Palace and Sutton Coldfield (opened December, 1949), are already in operation; the third at Holme Moss is under construction with expectation of beginning operations by the middle of 1951; the fourth, at Kirk o'Shotts, is also under construction and is expected to begin operating about the end of 1951; the fifth, in Glamorganshire, will, it is hoped, be open by the end of 1952, and will complete the five major stations, each with a range of 50 miles or more. The five medium-power stations which it is hoped to complete by the end of 1954 are supplementary, having a reliable range of about 25 miles.

The map on page 440 shows the position of the ten transmitting stations and the areas covered by them according to two distinct standards of reception, specified as "good" with a field strength of 0.5 millivolts per metre, and "secondary" with a field strength of 0.1 mV/m. On the higher of these two standards about 78 per cent. and on the lower standard 88 per cent. of the total population will have television physically within range when the plan is in full operation, that is to say by the end of 1954 if the progress aimed at is maintained. The map, it will be seen, leaves considerable areas outside even its outer lines; North and West Scotland, the Scottish Borders and part of North-west England, the northern half of Wales, Norfolk and other parts of the Eastern Counties, and some smaller areas elsewhere. Extension to some at least of these areas—particularly where there are substantial populations—will, it is hoped, follow on the completion of the main plan, though coverage for television is not likely to

become as complete as that for sound broadcasting. But even beyond the outer lines in the map, based on the standard of secondary reception, viewing will to some extent still be possible; to-day there are some 30,000 television sets licensed beyond this range from the two transmitting stations already in operation.

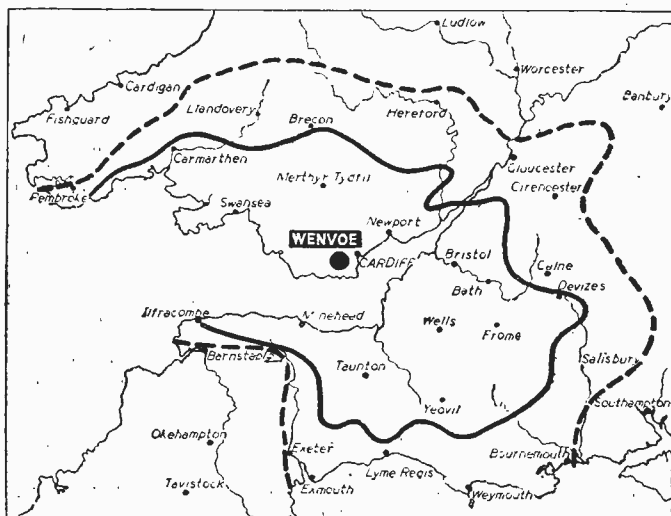
**Paired Working**

Establishment of ten transmitting stations with only five wave-bands available means that each of the five wave-bands will be used by two stations. In each case a high- and a medium-powered station, well separated from one another to avoid interference, have been paired: London with Belfast; Birmingham with Aberdeen; Holme Moss with Plymouth; Glamorganshire with Newcastle; Kirk o'Shotts with Southampton. This pairing does not mean that the programmes of the paired stations must be identical. They may transmit simultaneously different outside broadcasts, arising out of their localities: Kirk o'Shotts may be presenting a match between Scotland and Ireland at Murrayfield while its pair at Southampton is showing a sailing or an arrival of an Atlantic liner. The kind of studio programmes that will go out for viewing is affected by other factors considered in the next paragraph.

While the transmitting stations for television, with their limited physical range, must be distributed widely, the studio production of programmes under the present plan will all be concentrated in London. This policy, in the view of the B.B.C., is the only way of getting ahead rapidly with television:

"Within the limits of expenditure allowed by the Government, the B.B.C. plan for a single national network and for the concentration of studio building in London is not only the most economical but indeed the only practicable plan to secure within five years the maximum national coverage and the best possible studio accommodation."

Practical steps for this studio concentration in London have been taken already by the purchase of a site at Shepherd's Bush and the commissioning of an architect to design the building. In the meantime the B.B.C. has acquired and is using Lime Grove Studios.



The proposed new transmitter site at Wenvoe and the area it covers. See also page 446.

# PROJECTION TELEVISION—4

Report of a Lecture Given to the Institute of Practical Radio Engineers to Honour the Memory of the late Mr. D. F. Harrison

By EMLYN JONES, B.Sc., A.M.I.E.E.

**B**ESIDES the three important characteristics which we have mentioned—polar diagrams, gain and reflectivity, there are others which must be considered, such as uniformity of brightness over the screen area, the effect of the screen on definition, its colour, uniformity, stiffness, permanence, ease of cleaning, so-called Moiré patterns, and so on. It will be of more interest, however, to consider some typical screens, and show how the most modern designs achieve a very high standard of performance in all these factors. Because of their greater applicability to home viewing, we shall concentrate on screens for back projection.

### The Simple Etched Glass Surface

This is the simplest diffusing surface, and can be very uniform in texture. It is cheap to produce, robust and easily cleaned, but it has some serious disadvantages. Its polar curve starts falling off quite close to the axis, but there is no rapid cut-off outside the normal viewing angle. Since etching is non-directional, one cannot make the horizontal and vertical polar diagrams different from each other. The most serious disadvantage of this surface is, however, its high reflectivity, as it can hardly be said to possess any "optical polish." Finally, the brightness is not uniform over the surface of the screen, and the reason for this leads us to a very important principle.

Fig. 21 shows the light source (the "optical unit") illuminating the viewing screen from behind. Whereas the light strikes the screen perpendicular to its surface at the centre, it falls on the screen obliquely at the edges. As a result, the polar diagrams for the edges of

the screen are tilted away from the axis as shown. To a viewer at A the picture is brightly illuminated at the centre (corresponding to line Oa) and darker at the edges (Pa and Qa). A viewer at B finds point P the brightest (line Pb), O darker, and Q much darker (Ob and Qb). Similarly C finds Q bright, O darker, and P much darker. In other words, if one moves from C to A and then to B a bright area follows one from Q to O and then to P. This is called a "flare spot," and the main reason for it is the tilting of the outer

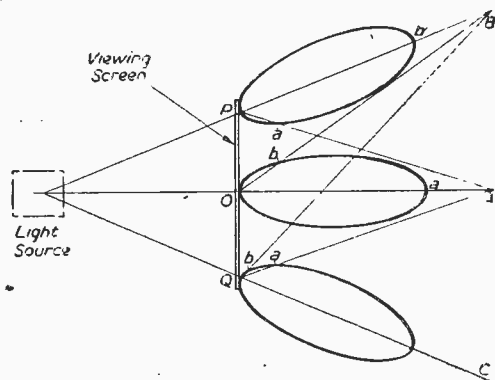


Fig. 21.—Illustrating the cause of a "flare spot" in a simple type of screen.

polar-diagrams in line with the direction of the incident light.

Ordinary Converging Lens  
Fresnel Converging Lens  
(There are many more Lenticules in an actual screen)

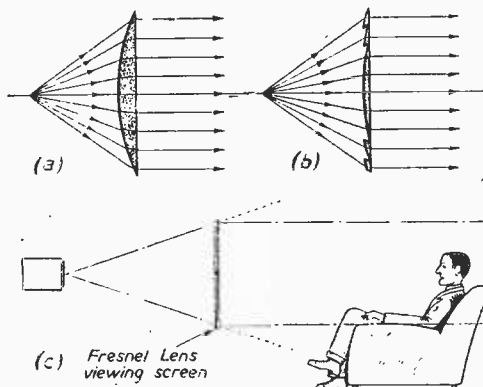


Fig. 22.—(a) A large lens could make the rays parallel but is too bulky. (b) The same effect can be obtained from a thin sheet, if suitably moulded, as shown. (c) This shows how wastage of light is avoided by the use of such a screen.

### The Fresnel Lens

Now if the rays of light from the optical box could be bent parallel to the axis just prior to entering the viewing screen, the polar diagrams would also be bent back parallel to the axis and the flare spot would be removed. If a large lens is placed between the optical box and the viewing screen such that the optical box is at the focus of the lens, this can be done. This is shown in Fig. 22 (a). This lens is, unfortunately, very expensive and bulky. However, an ingenious modification enables its exact equivalent to be pressed from a plastic sheet in much the same manner as a gramophone record is pressed. This is called a "Fresnel lens," and is formed as shown in Fig. 22 (b) by dividing the sheet into circular zones, each zone having its surface parallel to the corresponding surface of the simple lens. The result of this modification is not only to remove the flare-spot but to provide a valuable narrowing of the vertical polar-diagram as shown in Fig. 22 (c) the light which would be wasted on ceiling and floor, as shown dotted, being bent into the useful region parallel to the axis.

The viewing screen itself is not usually a separate item, but is formed on the front surface of the same plastic sheet either by etching or by pressing a suitable fine pattern into it.

**Vertical Front Rulings**

One very useful device is to form the front surface of the screen into a large number of very fine vertical grooves, which act as diverging lenses and spread the light out horizontally but not vertically. By a choice of depth and curvature this effect can be controlled to give the horizontal polar diagram a suitable form with a rapid cut-off outside the required viewing angle.

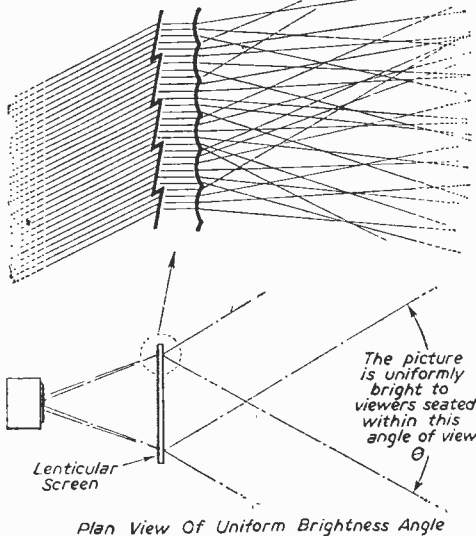


Fig. 23.—Spreading of the light in the horizontal plane only, by means of vertical rulings.

Fig. 23 illustrates this action. The lower portion of the figure represents a plan view and shows two beams of light from the optical unit reaching the screen near its edge. One of these, the one enclosed in a dotted circle, is shown enlarged in the upper part of the diagram. It first reaches the Fresnel lens at the rear of the screen, and is therefore bent parallel to the axis. On reaching the front surface, the rays are scattered over a definite angle as shown. This angle is the same for every part of the screen, and, taking the two extreme edges, we can draw a region,  $\theta$  in the lower diagram, within which the picture is uniformly bright over its whole surface. Moreover, as a viewer moves about within the angle  $\theta$ , the picture brightness remains constant.

The vertical grooves must be closer together than the width of a picture element or the accuracy of definition will be impaired.

A screen made in this manner acts in the same way as a lens and allows light to pass freely through it. It has, therefore, much lower reflectivity than the etched glass screen. Fig. 24 shows the three cases clearly and is self-explanatory.

**The Cabinet**

Before leaving the optical system it may be well to

mention one or two things about the layout of the equipment in the cabinet.

Obviously the light-path must be unobstructed. It is a point that must be watched, however, because an obstruction very near to the optical unit will not throw a clear shadow on the screen but will reduce the brightness over the whole surface quite uniformly. It might, therefore, remain unnoticed.

If a lid-mirror is used this must be surface-silvered. Such mirrors must be treated with respect. Nowadays a silicone varnish is used to protect the delicate surface,

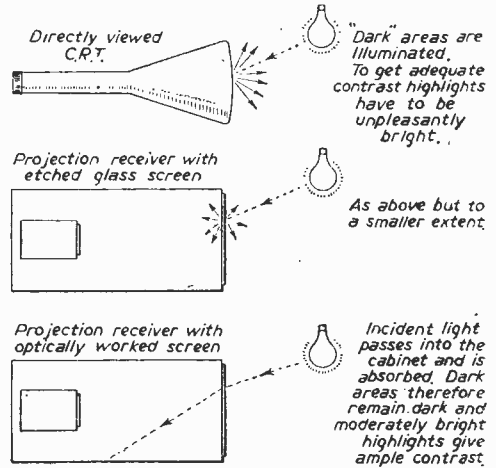


Fig. 24.—The effect of ambient light on directly viewed and projection television pictures.

and it is permissible to clean it with warm water applied gently with a clean chamois leather. Vigorous rubbing will, however, completely ruin the surface and is never necessary.

Care must be taken to see that the viewing-screen is mounted accurately in the focal plane of the system and at the correct distance from the optical box. This distance in millimetres is marked on the centre of the corrector-plate.

It is an advantage to have access to the optical unit through the front of the cabinet—for example, via a

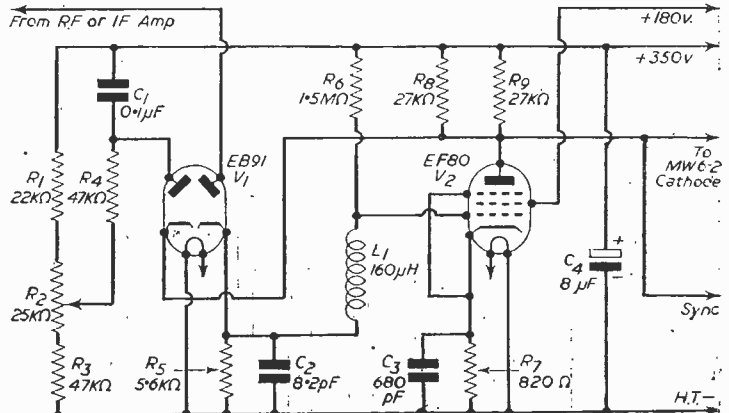


Fig. 25.—The video output circuit for projection receivers.

removable speaker baffle—in order to facilitate optical setting-up should this ever become necessary.

Centring of the picture on the screen must be done by sliding the optical unit sideways, never by tilting it. This is because tilting the unit tilts the optical axis of the whole system, and unless the screen is also tilted it is no longer perpendicular to the axis, so that it cannot be in focus over its whole surface. Slots should be provided in the mounting of the optical unit to enable a slight sideways adjustment to be made.

**The Receiver**

It will be apparent to the reader that this equipment is practically self-contained and one might think it possible to tack it on to the end of any ordinary direct-viewing receiver and so convert it into a projection model.

This is nearly, but not quite, true.

Some modifications will be necessary, depending on the receiver in question. The most important requirements are the following:

- (1) H.T. and L.T. supply for the E.H.T. unit.
- (2) Increased video drive to the tube.
- (3) Possibly a slightly increased scanning power.
- (4) A protection circuit to protect the C.R. tube against failure of the scanning circuits.

Let us take these in turn.

The E.H.T. unit requires a 6.3 volt heater supply, and a 350 volt H.T. supply capable of delivering up to 55 mA.

The C.R. tube requires about 85 volts of combined picture-plus-synchronising signal and it is recommended that the video stage be capable of delivering 100 volts peak-peak to allow a margin of safety. This may seem a

rather large signal, but with a suitable circuit it can be obtained from quite a small output valve as shown in Fig. 25.

The choke  $L_1$  is wavewound  $\frac{1}{2}$  in. wide on a  $\frac{1}{4}$  in. former from 155 turns of 42 s.w.g., d.s.c. copper. The leads to the MW6-2 cathode and synchronising separator should be as short as possible.

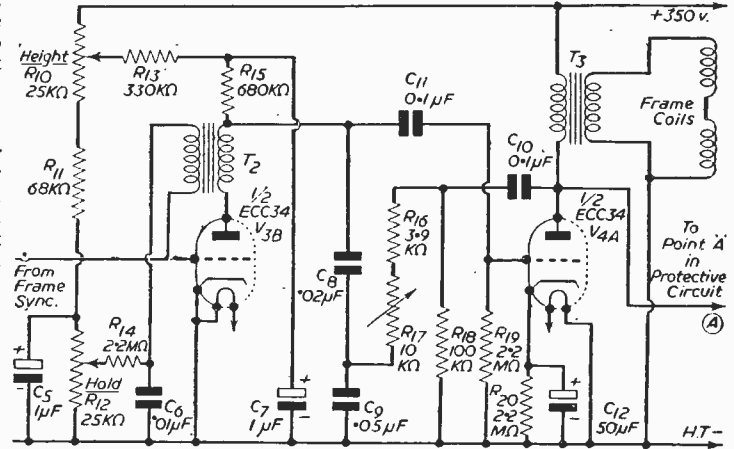


Fig. 26.—The frame time-base circuit. A is the connection to the protective circuit of Fig. 28.

The circuits for the frame and line time-base generators are shown in Figs. 26 and 27, respectively. These are of considerable interest, quite apart from projection television, because of their economical use of valves. By using the ECC34 double triode (V4) as combined frame output valve and line blocking oscillator two functions are combined in one envelope. Half of another ECC34 (V3) serves as frame blocking oscillator and leaves a spare triode for use elsewhere in the circuit (e.g., in the synchronising circuits).

The main interest of these two circuits for our present purpose is, however, to illustrate the manner in which protection is obtained for the C.R. tube. It will be remembered that the inside surface of the C.R. tube-screen is coated with a very thin aluminium layer. As long as the power in the beam (about 5 watts) is spread uniformly over this coating it is quite capable of dissipating the heat, but if one of the time-bases should fail the beam would be concentrated in a fine line and the aluminium would be vaporised, so producing a permanent black line across the picture. The function of the protective circuit is to prevent this from happening.

At point A, in Fig. 26, there is present a 50 c.p.s. waveform of the order of 200 volts peak to peak when the circuit is scanning normally. Similarly, across points B and C in Fig. 27, a somewhat larger voltage is found when the line circuit is scanning normally. Both these potentials fall to zero

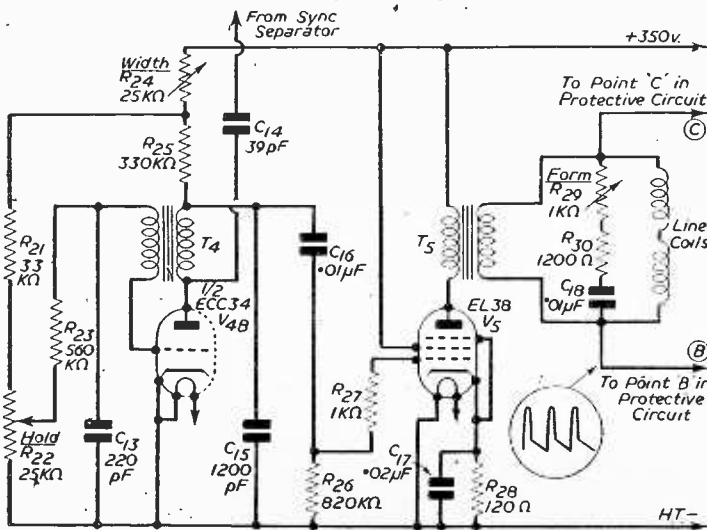


Fig. 27.—The line time-base circuit. B and C are taken to the corresponding points in Fig. 28.



if the scanning should fail, for example, due to a power supply failure, or merely someone switching off the set.

Fig. 28 shows the protective circuit which utilises these two waveforms. Point A is coupled as shown to diode V6A and as a result of the rectifying action of this diode a steady potential of 90 volts is built up across R35. In a similar way the potential from the line time-base across B and C enables the diode V6B to produce about 150 volts D.C. across resistors R33 and R34. Thus the upper end of R33 is 240 volts positive with respect to the earth line when both scanning circuits are functioning normally, but at earth potential if they should both fail. Actually, resistor R33 is used as the brightness control, and the grid of the C.R. tube will normally be set about half-way along its travel so that the potential on the grid will be made up of 90 volts from the frame time-base, and approximately the same amount from the line time-base. In the event of failure of either time-base alone, the potential will fall by about 90 volts and the C.R. tube will be biased off before any damage is done.

#### Availability

While this equipment is at present being incorporated in commercial designs by many manufacturers, it is not at the moment available to amateurs. When this will be possible will depend on many factors and no forecast can be made at present, but PRACTICAL TELEVISION will, of course, keep its readers informed.

#### Acknowledgments

The basic material for the descriptions of the E.H.T. unit, optical unit, and C.R. tube was taken from the following articles, to which the reader is referred for a more advanced treatment of the subject.

Proc. I.R.E. Vol. 36, No. 3, pages 375-411.

Philips Technical Review, Vol. 10, Nos. 3, 4 and 5.  
The author is indebted to The Mullard Radio Valve Co., Ltd., and in particular to Dr. C. F. Bareford, Manager of their Electronic Research Laboratory, for generous help and encouragement in the preparation of these details, and for permission to publish this

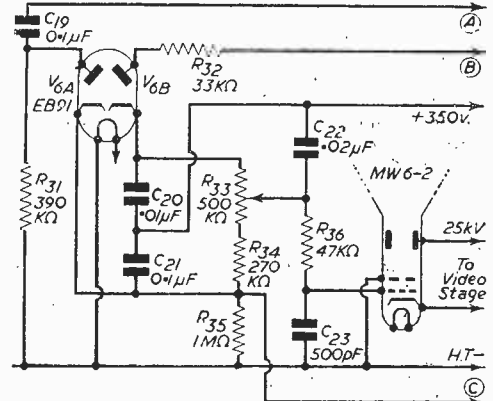


Fig. 28.—The Protective Circuit. This prevents damage to the C.R. tube when switching off, or under faulty conditions.

material, also to the staff of the Television Research Group for their loyal and enthusiastic co-operation.

Finally, thanks are due to Mr. F. J. Camm, for providing the funds for this memorial lecture to the late Mr. D. F. Harrison, so long a well-known and respected member of the Mullard Company.

## Bristol Channel Station

AFTER negotiations for a site for the high-power television transmitting station to serve the Bristol Channel area, the B.B.C. has now agreed to buy land on St. Lythan's Downs, near Wenvoe, about five miles to the west of Cardiff. This site has been approved by the Postmaster-General, and the station will be known as the Wenvoe Television Transmitting Station.

B.B.C. engineers investigated the possibilities of twelve sites that looked promising, some of them in Wales and some on the Somerset Hills. Nine of these were eventually turned down for one reason or another, leaving only one district in South Wales and two in Somerset to be investigated in more detail. Field-strength tests were then made by the B.B.C. Engineering Research Department from these three places. A mobile 1-kilowatt transmitter was set up at each of them in turn, with an aerial suspended from a balloon 600ft. above the ground, and one of the B.B.C.'s field-strength measuring vans toured the surrounding country, making a record of the received signal strength. From these records the engineers prepared field-strength contour maps showing the probable service area of a high-power transmitter at each site.

The Wenvoe site is 400ft. above sea-level and covers an area of about 25 acres near the Cardiff-Swansea road in the parish of St. Lythan's. On it will be constructed a building for the transmitters, a sub-station, and a 750-ft. mast similar to the one at Sutton Coldfield. The contract for the mast has been awarded to British

Insulated Callenders Construction Co. Ltd., and for the buildings to Gee, Walker and Slater, Ltd.

The vision and sound transmitters were ordered in January, 1950. The vision transmitter, which is being designed and manufactured by Electric and Musical Industries, Ltd., is to have a power of 50 kilowatts, and the sound transmitter, which Standard Telephones and Cables, Ltd., are making, will have a power of 12 kilowatts. A novel feature of the vision transmitter is that the carrier wave will be modulated by the vision signal in a low-power stage instead of in the output stage, as has been customary in previous television transmitters.

It is expected that the boundary of the service area of the Wenvoe station will be approximately along a line through Barnstaple, Teignmouth, Swanage, Marlborough, Chepstow and, slightly to the north of Brecon, Carmarthen and Tenby. This area has a population of 3,500,000, and among the principal towns within it are Tenby, Carmarthen, Llanelli, Swansea, Cardiff, Bristol, Bath, Dorchester and Taunton. Some parts of the country within this area are mountainous, and in those parts the quality of reception may vary considerably between places that are quite close together.

Whether or not reception will be satisfactory at any particular place near the boundary of the expected service area cannot be predicted, because the answer depends upon several local factors, including the height of the receiving aerial and the strength of electrical interference in the vicinity.

# On the Fringe

Hints on Improved Reception at Long Range By B. BARNARD

**W**ITHOUT making a virtue of necessity, I can honestly say that I am glad that I live in the fringe area of the Sutton Coldfield transmitter. There is a special satisfaction in designing and constructing a receiver that gives first-class results under far-from-good conditions and there is always plenty of scope for experiment and modification; indeed, it is difficult at times to avoid a slightly superior attitude towards those enthusiasts who live in districts where field strength is measured in millivolts, and aerials are invisible things of wire tape and camouflage!

In my own district—some 85 miles from Sutton Coldfield—field strength is officially quoted at 100 microvolts and, as there seems to be no promise of improvement even when the present transmitter plan is completed, we have to look upon that meagre amount of energy as our permanent ration and we therefore must scheme, plan and design accordingly. Even this "ration" cannot be counted upon, however; the actual field strength varies from as low as 20 microvolts per metre to as high as 300, according to the street level and local screening of any particular aerial, and as the town is built on a steep hillside, results cannot be forecast with certainty for any particular house. Of course, those who are fortunate enough to be living at the top of the hill are fairly sure of consistent results, especially as this part is also a purely residential area and therefore reasonably free from both interference and screening.

One trouble, however, is equally shared by all residents and that is periodic fading, and this will remain the most serious drawback to long-range reception until some technical genius gives us a system of A.V.C. Until that time comes, the only satisfactory answer is to have a very large amount of R.F. or I.F. gain in hand that can be brought in manually when the signal falls off.

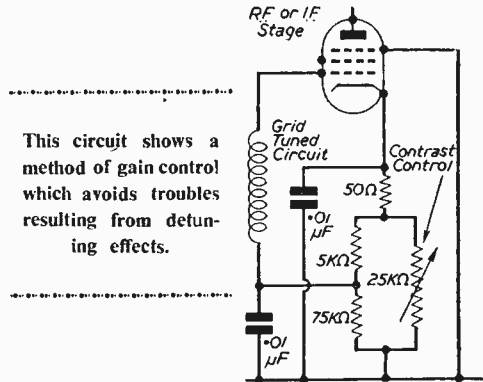
## Full Gain

In this connection it is interesting to study the performance of the various cheaper commercial receivers out here in the fringe area. In every case that I have seen, these sets work *normally* with the contrast control wide open and have absolutely nothing in hand with which to deal with a fading signal. In addition to this they also have another serious weakness in that they have a high noise level at full gain so that the picture is marred by a continuous moving graininess which is both irritating and distracting to the viewer. This, however, is not a criticism of the receivers or their designers—they simply were not intended to operate at such distances from a transmitter and those who buy them are indulging in the optimism of a man who expects an 8 h.p. car to pull a caravan over the Scottish Highlands.

We do get periods of bad fading from time to time, perhaps as often as once every six weeks, and when it comes it usually lasts for five or six days before clearing up. Providing there is sufficient gain, it is very seldom that the picture is lost completely but it is necessary continually to adjust the contrast control and, to a lesser extent, the brilliance, in order to hold the picture. Of course, increasing the gain does bring up the amplifier noise and produce the graininess that I mentioned

above but, with good design, this is far from objectionable since it is only to be seen during the actual fade.

If a fade is so bad that the picture is lost completely, even with the contrast at maximum, then, of course, one has to be resigned to a broken programme. This



This circuit shows a method of gain control which avoids troubles resulting from detuning effects.

very seldom occurs and I can only recall three such instances in the last six months. But my receiver has one R.F. and six I.F. stages and it is therefore reasonable to expect that it will hold all but the weakest signals.

Under the worst possible conditions of fading, I have yet to come across a case in which both sound and vision have faded simultaneously. In fact, fading on sound is very rare and it is always possible to follow the programme on sound alone until the picture builds up again, which may be anything from ten seconds to ten minutes.

I have written this with a view to encouraging any would-be home constructors who have so far held back from set making in the belief that fringe area reception is not worthwhile. Nothing could be further from the case and, I repeat, serious fading is quite rare and not nearly so devastating to programme enjoyment as might be expected. Furthermore, difficulties of this nature add zest to the pleasure and interest of set building and design.

## High Gain

As I have said, satisfactory fringe area reception demands high gain and this can only be obtained by a large number of valve stages if the necessary bandwidth is to be maintained. From the point of view of design, this raises a number of difficult problems in connection with stability and I would offer two points of advice to those who are considering building their first set. Either choose and stick to a reliable design such as the "P.W. Television Receiver," or, if you wish to be more ambitious, build your design around one of the ex-Government I.F. strips, such as the R1355. These latter are inherently stable and give adequate over-all gain and bandwidth.

As is always the case where weak signals have to be dealt with, care and attention must be devoted to detail as well as the broad principles of design. The most obvious of these, I suppose, is the problem of getting the

minute amount of energy that is induced in the aerial down to the receiver with a minimum of loss on the way.

The coaxial cable or balanced twin-feeder is designed to do this for us but it can only do this efficiently if it is correctly matched at both ends and if it is itself well constructed and reasonably free from resistance and dielectric losses. Both these points are under the control of the experimenter; the first calls for the greatest care in making the terminations to the cable and the second simply means—do not use cheap cable, however tempting the price.

With regard to making the cable connections, make absolutely sure that, at the aerial end, the aerial manufacturer's instructions are *precisely* followed: remember that an extra loop in the bared conductor can quite easily upset an otherwise perfect match. Be certain that the joints themselves are really tight and clean and are likely to remain so when exposed to the weather for a very long period.

If you can arrange the mechanical part of the aerial array so that it can easily be brought down for overhaul, so much the better: a few ohms resistance at the aerial connection not only loses signal strength due to  $I^2R$  losses but also causes a mismatch so that you weaken the signal two ways for the one cause. Regular inspection of these joints will, therefore, pay good dividends.

#### Contrast Control

Another detail of design that gets scant attention in many home-designed outfits is the contrast control. Far too often this merely consists of a potentiometer in the cathode circuit of an R.F. or I.F. stage, thus following ordinary broadcast radio practice.

There are a number of objections to this arrangement, but by far the most serious is that a variation of grid voltage causes a variation of input impedance of the controlled stage. At broadcast frequencies this effect is too small to be of any consequence, but at V.H.F. a very considerable alteration of tuning of the grid tuned circuit results. What happens is this—as the contrast control is brought up towards maximum, the grid becomes less negative and the effective grid/cathode capacitance increases: this capacitance is

across the grid tuned circuit and the frequency to which this circuit is tuned therefore decreases. Thus a change of gain control setting produces a change of picture quality as well as contrast and the net result may well be a spoiling of the picture instead of an improvement.

Fortunately this effect can to a very large extent be prevented by making the suppressor grid voltage change at the same time as the grid volts: the circuit on p. 447 shows one way of arranging this. Of course, the sweep of voltage change for the suppressor has to be considerably more than that for the grid and the values shown are satisfactory for valve types EF50 and SP61.

#### Overloading

A common fault that arises when using a simple contrast control circuit is that the control appears to function in reverse: that is, as the control is advanced, the contrast is reduced. In extreme cases, the screen goes blank white when the maximum is reached. This can be due to a valve stage being overloaded—probably the last I.F. or video stage—but it is more likely that one or more I.F. stages are instable and are going into self-oscillation at full gain. Overloading is unlikely in the fringe areas and it is fairly certain that, if you have eliminated the possibility of a faulty valve, you are in for the tedious and difficult job of tracking down instability in your I.F. amplifier.

And here, by way of conclusion, is a fault that I have recently tracked down on my own receiver. The symptoms were bad graininess and a lack of line hold: the picture was of normal contrast and brightness but the top continually pulled out of sync. I feared the worst and that I should have to take everything down and search for an obscure dry joint or, at best, a faulty resistor. And then, just in time, I remembered from my experience of broadcast radio that distressing habit of triode-hexodes of suddenly generating a background noise like steam escaping from an express locomotive. I put in a new frequency changer and the trouble was cleared and, in addition, the graininess which, I suppose, had been increasing very slowly during the previous weeks, and which I had not noticed, was gone as well and the picture was once of good quality.

## New Domestic Receiver

**PHILIPS ELECTRICAL, LTD.**, have made an addition to their range of projection television receivers.

The new model, 1800A, is a console version of the present table model 600A, and gives the same size picture, i.e., 13 $\frac{1}{2}$ in. x 10 $\frac{1}{2}$ in.

The receiver employs the same optical system as in the previous models, to give the large picture, and once again the same advantages are present, the picture being reproduced on a completely flat screen without glare. This model is for use on A.C. mains only, and has a working consumption of 160 watts. The four controls are: Brightness, Focus, Contrast and Sound volume combined with On/Off switch.

The receiver incorporates a super-heterodyne circuit which accepts the lower vision sideband.

Interference limiters are included for both sound and vision channels; the sound limiter being fixed while the vision limiter is variable to suit any condition of interference.

The frame scanning generator is of the normal blocking

oscillator variety, while the horizontal scanning generator is a single-valve type with the addition of a "booster" diode. Electrical safety devices are incorporated to prevent damage to the projection tube in the event of either or both of the deflecting circuits failing.

The extra-high voltage required for the operation of the projection tube is derived from a separate oscillator, a voltage tripler circuit being used to raise the voltage to the required value, which is approximately 25 kV. A feed-back system is employed to effect good regulation on this extra-high voltage unit. The 25 kV. is generated inside a hermetically sealed can, and by this means, together with the care taken in the design of the connection of this high voltage to the projection tube, the dangers normally associated with extra-high voltage supplies have been eliminated.

Electro-magnetic focusing and deflection of the cathode ray tube are employed.

The price of this model is 92 guineas (tax paid) and is obtainable on h.p. terms.

# "The Course of Justice"

How This Effective Series of Programmes Came to be Written

By DUNCAN ROSS

IN the summer of 1948 I prepared a series of programmes on the work of Magistrates' Courts, which was produced by Ian Atkins. We were surprised—and delighted—with the reactions of both viewers and critics to this series and planned that it might be extended and repeated after the Sutton Coldfield transmitter opened. At the end of April 1950 Cecil McGivern—who not only controls all programmes through departmental heads but directly supervises the work of our small documentary unit—welcomed the suggestion that I start finding ways of enlarging the series.

The groundwork on documentary programmes invariably starts with books, and although the facetious could remark that copying from one book is plagiarism while copying from two is considered research, a long "browse" in a library is the most valuable preliminary to any investigation. Some writers for other media may be surprised that books are regarded as only a minor preliminary to writing a documentary drama for television; books are all that are required to complete the entire research of most authors. A television documentary writer, however, must go out and see things for himself. The very word "documentary" demands it, for its real meaning is "the creative interpretation of reality," and not, as many people mistakenly believe, something that owes its origin to documents. The documentary writer must study reality at first hand, for, like Plato describing his metaphysics, there can be no worthwhile documentary programme until "there has been intercourse with the thing itself and it has been lived with." The fact that he is also a television-writer will demand it, too, for, despite that other misleading word "writer," his craft has nothing to do with literary ability. His main master is the camera and if he does not study his subject as through a camera lens he will never be able to interpret it adequately to viewers, who will only see what the camera shows them.

After about a week of reading, the real work in the Juvenile Courts began. (The reading still went on, but at night when the work in the courts had finished. During the whole research period I find that I went through 34 heavy tomes, as well as hundreds of Government papers, reports, statistics, newspaper files and piles of periodicals dealing with some aspect or other of delinquency and crime.) There are six Juvenile Courts in the Central London area. As they are not open to the public it was necessary to get permission to attend them, and this, in turn, made it obligatory that the scripts should eventually be vetted by various authorities—never a pleasant prospect for any writer. Fortunately, all the authorities concerned welcomed the idea of the programmes and full facilities and help were given by the Home Office, the L.C.C., Magistrates' Association, the N.S.P.C.C., and many other bodies. The most valuable contact was the

Chief Clerk to the six courts, who not only arranged that I could sit in the courts but always made sure that I sat where the proceedings could be heard—not always an easy matter where the conversation between the magistrate and the defendant is often carried out in whispers so that the child will not be frightened and will give his or her side of the story as freely as possible. At some courts I sat with probation officers, at others with L.C.C. inspectors—sometimes with the police and sometimes with the Press. Often I remained outside the courtroom studying the types of character in the waiting-room. Time was spent with the plain-clothes men who look after the fines and those who look after the children in the remand room. As far as possible, every aspect of every court was gone into.

## Once a Week

In many ways Juvenile Courts are more difficult to investigate than Magistrates' Courts. For one thing, they only meet once a week. Toynbee Hall, for instance, is on Monday, Tower Bridge and Friends' House on Tuesday, Chelsea on Wednesday, Stamford House on Thursday, and Lambeth on Friday. Many cases that go through Juvenile Courts are strikingly similar in character, but I needed a variety of cases that would interpret as far as possible the whole range of court procedure. I found that I would come across a valuable case at Toynbee, another at Lambeth, several at Tower Bridge and so on, but all juvenile cases are remanded for a week or a fortnight for investigation. Eventually, a large log-book had to be kept on where and when the cases would come up again, so that I could follow them through. As the log book filled I saw the period of research stretching out and resigned myself to the inevitable—there would be many false trails but no short cuts.

Gradually, as the weeks passed, I began to select the



Pat Fryer as "Peggy" in the Court Scene, during which it is ruled that her mother (Sheila Raynor) is unfit to care for her, owing to the disgraceful state of the home.

cases and characters best suited to interpret the work of the courts. I had now to study the setting in which they should be placed and eventually I narrowed my courtroom visits to Toynbee and Lambeth. Either seemed ideal for reconstruction in the studios. The other courts had certain drawbacks: Tower Bridge was built as a Magistrates' Court and was too formal to be typical of a Juvenile Court; Stamford House was too awkward a shape for camera positions, and Chelsea, although ideal in many respects, had fewer cases, a bad entrance, and no waiting-room. Toynbee is small, intimate and was particularly useful as the chairman is Basil Henriques, whom I had already considered as the best possible person to introduce the series. Lambeth, too, was geographically ideal for cameras, and it dealt with more cases than any other court, as well as having the largest number of probation officers—and by this time I knew that the best angle from which to take my "story" was that of a probation officer.

With only two days a week at the courts the other four days could be spent "in the field" studying the breeding grounds of crime. By picking the brains of policemen, P.O.s, L.C.C. men, reporters, magistrates and others, I found the most likely districts in which to get atmosphere and film locations. Days and nights were spent prowling around parts of Poplar, Stepney, Paddington and Lambeth areas. Sometimes I had introductions, sometimes I just "snooped." One lucky day I came across Arthur Collis who had just published his book, "These Our Children." It opened my eyes a bit wider and took me back to Stepney. There I found a group of earnest young people called the Pacifist Service Unit who were helping "the submerged tenth." I learned a lot from them and they passed me on to another Family Service Unit who, without being pacifists, were doing the same work in Paddington. I know the slum of Gorbals fairly well, but there were many houses that I saw in these areas which sickened me more.

### Slums

But the slums alone are not responsible for juvenile delinquency, and many visits with probation officers were paid to homes in other districts. Eventually I narrowed this part of the research down to the Camberwell Green probation office where Mr. Liddle, the chief officer, and a Miss Semple were particularly experienced and helpful. I found that Miss Semple walked miles on her rounds but chatted all the way and was better than any book in telling the history of the cases she had dealt with. In the homes she visited she made everybody at ease so that they spoke freely about their problems, and many of the sets which viewers saw in "Probation Officer" were based on actual homes I visited with Miss Semple.

I was lucky, too, in having the complete co-operation and advice of Captain Hanvey, the principal of Stamford House Remand Home, and of the psychiatrist, Dr. Peter Scott, who allowed me to study the cases under their care. Some day I want to write a full programme on a remand home, for here more than anywhere else, I think, one can see where a boy can be "pulled back" or left alone to turn into a hardened criminal.

Eventually ideas start taking shape. From the accumulated mass of information, characters start building themselves. Research has shown the great conflict of opinions amongst those who serve the courts—the constant struggle between old and new ideas. That conflict must be brought out in the scripts, so the main characters are planned: an argumentative old missionary with forty years of experience behind her and a young

girl starting her career with a head full of theories. But what of the "shape" of the whole series? There must be a scene in the remand home showing the psychiatrist at work, but there was a similar scene in No. 3 of the original Magistrates' Court series. How will that script be affected? After careful study a decision is taken with Ian Atkins: No. 3 is scrapped. It was not good enough and what was said in that script can now be incorporated more concisely in the ones dealing with Juvenile Courts. How many scripts can cover the work of the Juvenile Courts? Dozens could be written, but two can cover the main points. No. 1 can show viewers a typical court with typical cases. In that programme they will see that most cases are put on probation so it is logical to show what probation means in No. 2. But simply showing a court and a probation office will not interpret the proceedings, so the two main characters are introduced into the court. As the old P.O. explains things to the new recruit she will also inform the viewers why certain actions and decisions are being taken—and the two characters will fit nicely into No. 2 when we show the old missionary on her rounds.

### Assizes

Two of the Magistrates' Courts scripts were still worth repeating but they had to be revised and brought up to date. The Assizes? Yes, the upper court must be included to demonstrate the three main channels of English criminal law. The Juvenile Court could start with a child who believes that "findings are keepings" and the series end with a murder trial. That would cover the full range of the three courts, but we must be careful with that murder trial. The temptation to play tricks with drama is very strong, but it would not be typical of the Assizes to reconstruct a sensational case. The series must have integrity—and in documentary dramas the "documentary" is still more important than the "drama." Better to take a case that is all too common: robbery with violence that ended in murder.

Gradually the characters emerge in the mind. They start "talking." Snatches of dialogue are written down. Work begins on No. 1. A chart is drawn up for already fifty characters and twenty cases are shouting to be heard. A chart is the only way to discipline the characters, to show how much time should be given to each, how the ingredients of comedy and tragedy should be used and how the dramatic pattern of the whole "play" will prevent the programme from being a mere catalogue. Ahead lie five scripts, 220 speaking parts with perhaps five departments of Home Office to steer them through, as well as several sections of the L.C.C., the Magistrates' Association, the N.S.P.C.C. and all the others. Worst of all there is Cecil McGivern. He never interfered with one single phase of the work—but he is the hardest critic of them all when the work is done. Well, there is no use worrying now. The worst is over. All you have to do is to sit down and write the scripts.

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# “Surplus” Sound & Vision Receiver

Using R3084 as the Basis of a Modern Television Receiver

By A. W. DALE

THE R3084 receiver has recently been made available at a very reasonable price on the surplus market and is one of the best pieces of equipment obtainable for television conversion, since the bandwidth of the I.F. strip is ample and the use of two R.F. stages ensures adequate sensitivity for use in the extreme fringe areas. Receivers R3131 and R3132 are almost identical types and may also be used. The converted receiver is capable of giving commercial quality results at very low cost, since only a few small components and the sound detector and output valves (E.B.34 and E.L.33 respectively) need to be bought, apart from the R3084 itself. It also provides high and low voltage rectifier valves which may be used in an external power supply for the complete receiver. The following is a description of the conversion as carried out by the writer.

The receiver as purchased contains an 80 volt A.C. motor, used for aerial switching, and a large condenser block which play no part in the conversion and should be removed. In order to ensure that the finished receiver is not overcrowded with components, no attempt was made to include power supplies on the same chassis, so that the 2,000 cycles/second power supply transformers, valves and holders, etc., together with their associated wiring, were removed, although some constructors may desire to leave these valves in position and fit a small internal power supply. The heaters of the valves in the original receiver are provided with decoupling chokes wound on Aladdin formers, and these are also removed in order that the formers may be used in the sound receiver. The .001  $\mu$ F condensers fitted across the heaters should, however, be left in circuit to provide decoupling. The wiring to the two cathode follower valves is also removed, and these valves comprise the R.F. stages of the sound receiver in the conversion. Two new international octal valve-holders are next mounted

on the chassis alongside these R.F. stages. One is used for the sound detector and noise limiter, and the other for the sound output valve. Fig. 1 shows the valve layout at this stage, being a plan view of the chassis. This diagram also shows the position for mounting the sound output transformer.

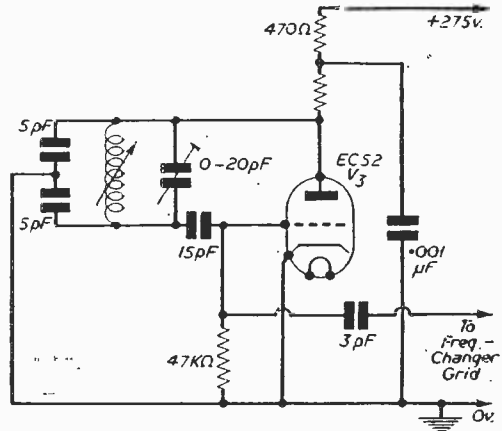


Fig. 3.—The oscillator circuit.

### Coils

The alterations required in the vision section of the receiver are quite simple. The valve heater circuit must, of course, be rewired after the removal of the decoupling chokes. The two R.F. stages and the frequency changer grid circuit were intended to operate at 176 Mc/s (or 214 Mc/s for the R3131) in the original circuit, so that the decoupling condensers to the screen grids of these

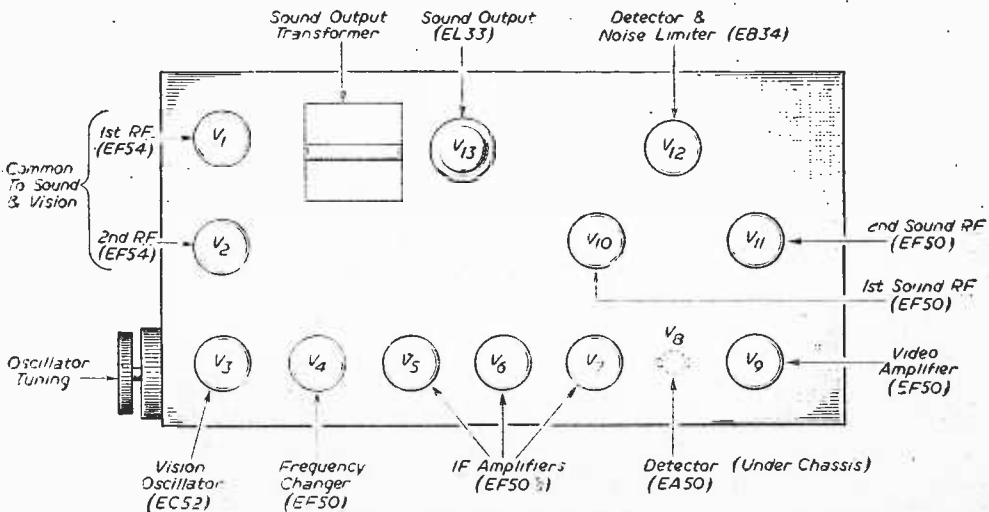


Fig. 1.—Plan view of the chassis.

valves should be increased to .001 $\mu$ F to be effective at television frequencies. These stages were originally series tuned and should be converted to the conventional shunt tuning after rewinding the coils in accordance with the table below :

	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	
London .....	10	8½	9½	No. of turns of
Holme Moss ..	8½	7	8	28 s.w.g.
Sutton Coldfield	6½	5	6	enamelled wire

L<sub>1</sub> = 1½ turns of No. 28 s.w.g. enamelled wire wound at the lower end of L<sub>2</sub>.

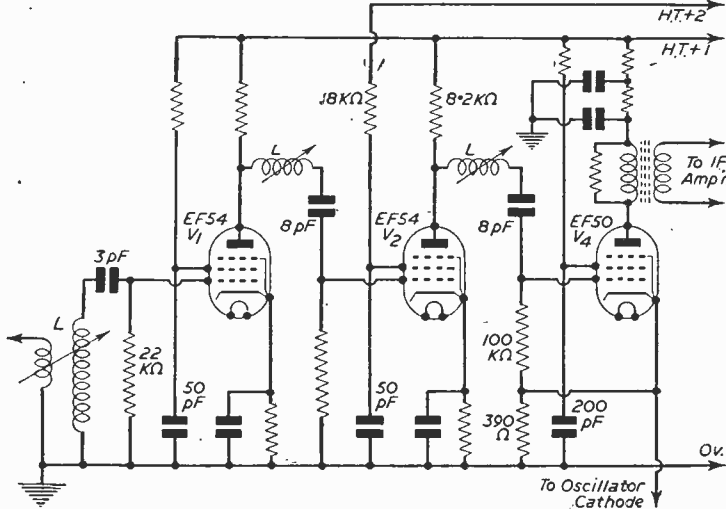


Fig. 2 (a).—The original R.F. and frequency changer stage. Components with values indicated are those which require alteration.

A tuned circuit is also placed as an anode load to the second valve and the sound output is taken from this coil so that the first two R.F. stages are made common to both sound and vision. The coil (L<sub>3</sub>) consists of five turns of No. 28 s.w.g. enamelled on an Aladdin former and will tune over the required range of frequencies with a 0—20 pF trimmer. The original and modified R.F. and frequency changer stages are shown in Fig. 2.

The oscillator next requires attention. For the London transmitter, which operates at 45 Mc/s, the oscillator may be at either 15 Mc/s or 75 Mc/s, since the intermediate frequency of the R3084 is 30 Mc/s. The latter frequency was chosen, since the harmonics of the 15 Mc/s oscillator caused interference with the vision signal and the oscillator coil should thus be rewound with 4½ turns of No. 28 s.w.g. enamelled wire (close wound)

and a 0—20 pF trimmer placed across the coil, the complete oscillator circuit being re-arranged, as shown in Fig. 3. For Sutton Coldfield the transmitter is at 61.75 Mc/s so the oscillator frequency should be 91.75 Mc/s, and 3½ turns on the oscillator coil will permit this frequency to be covered. For Holme Moss (51.75 Mc/s) the oscillator frequency becomes 81.75 Mc/s, and four turns are needed. The adjustable core is left in the oscillator coil former so that final adjustment of the frequency can be made whilst the receiver cover is in position. (In some versions of this receiver oscillator tuning is carried out by means of a variable condenser across the oscillator coil. The addition of the 0—20 pF trimmer to the rewound coil will, however, produce a result similar to that achieved in the inductively tuned circuit of the writer's receiver.)

The only modifications required to the I.F. stages involve the fitting of a gain (contrast) control, which is shown in Fig. 4, and operates on two of the I.F. stages, together with the fitting of separate 47 k $\Omega$  dropper resistors in the screen circuits of these valves, since they were originally fed from a separate H.T. line via a common dropping resistor mounted on a panel at the rear of the chassis, and this may be removed. This modification is also apparent from Fig. 4.

**Video Amplifier**

To complete the vision receiver, a filter choke is wound for inclusion in the diode detector circuit, and about 100 turns of number 38 s.w.g. wire on a ½ in. former will suffice for this purpose. The video amplifier is then altered, as shown in Fig. 5. A small cathode by-pass condenser is used so that the high-frequency response of the circuit is accentuated as negative feedback is applied to the video stage at low frequencies

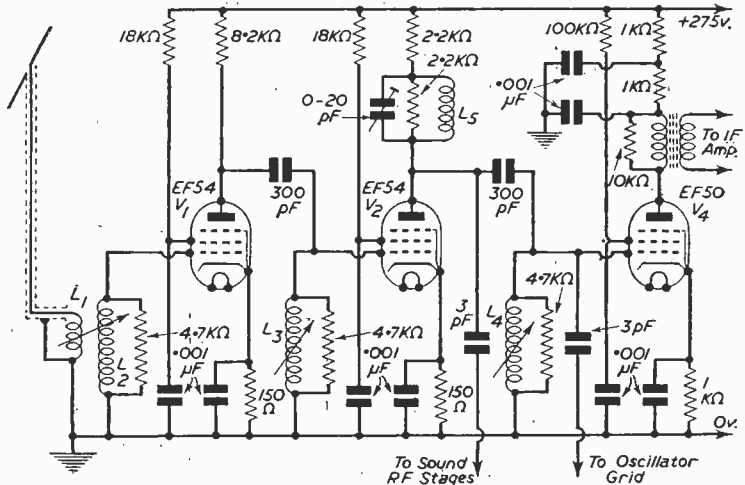


Fig. 2 (b).—The modified R.F. and frequency changer stage.

where the condenser provides little or no decoupling effect (no compensating choke is used in the anode circuit for this reason). The output from this stage is fed out to a separate time-base chassis, which may be of any type provided grid modulation of the cathode-ray tube is used, otherwise the diode detector must be reversed.

in the original model and an EF50 was employed for the purpose. The component values used are shown in Fig. 6 and may be of use to a constructor having an EF50 on hand, but, of course, almost any valve may be used for this purpose quite well.

**Alignment**

The final operation is the alignment of the complete receiver, which may be carried out either by means of a signal generator or by using the transmitted signal itself. The oscillator control knob should first be set at the mid position and all screening cans, except that covering the oscillator section itself, should be firmly bolted on. The video output may be examined either aurally, using headphones, or visually, using the C.R.T. itself, and the oscillator is adjusted by means of the trimmer condenser to give maximum output for a signal at the transmitter frequency applied to the aerial input circuit. The oscillator screening cover may now be bolted on. The tuning of the I.F. stages should not be interfered with (provided signal generator tests show adequate bandwidth and sensitivity in the region of 30 Mc/s). The R.F. stages should first of all be peaked at the vision carrier frequency and then the second stage is detuned slightly to a frequency just below the optimum and the frequency changer grid circuit to a frequency slightly above this so that a good bandwidth is preserved throughout. The sound receiver coils should, of course, be peaked at the sound carrier frequency. Sound rejectors have not been included in the vision circuits as sufficient rejection was obtained without them. If, however, sound

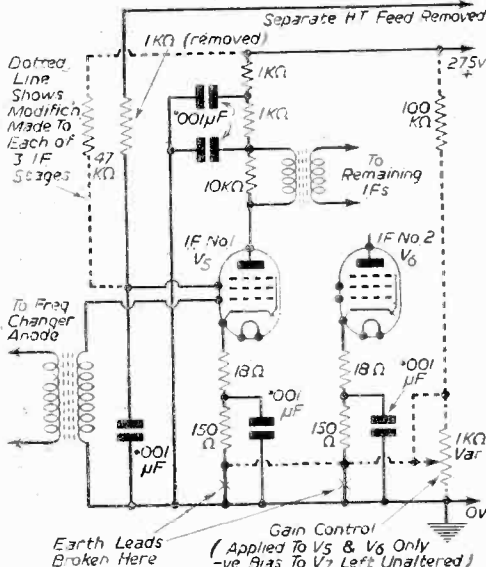


Fig. 4.—Modifications to the I.F. stages.

The sound side of the receiver next requires attention, and here a T.R.F. circuit was used, identical with that employed in the PRACTICAL TELEVISION receiver sound section. Reference to back numbers of this periodical (or to the separate reprint of the articles now available) will provide full circuit and coil winding data for this part of the work. Interstage screening was needed between the sound R.F. stages, but this was simply carried out by means of strips of tinfoil about 2in. wide soldered to the earthing tags already existing on the receiver chassis close to the sound R.F. valve-holders. In fringe areas it may be found that the volume of sound output is not sufficient unless the common R.F. stages are detuned well below the vision optimum, and it may be advisable to incorporate an L.F. amplifier between the detector and output stages in such cases. This was done

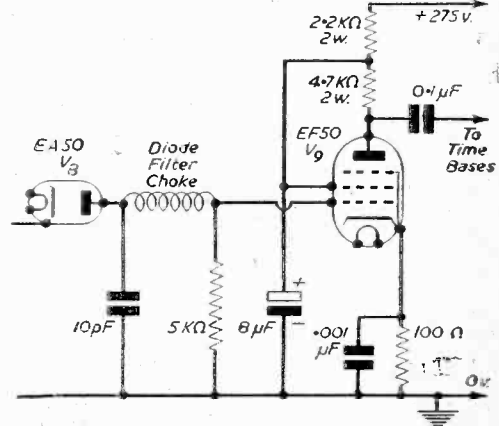


Fig. 5.—Video frequency amplifier.

should appear on vision, or vice versa, a careful adjustment of the tuning of L5, the anode load of the sound R.F. stage, will generally effect a cure.

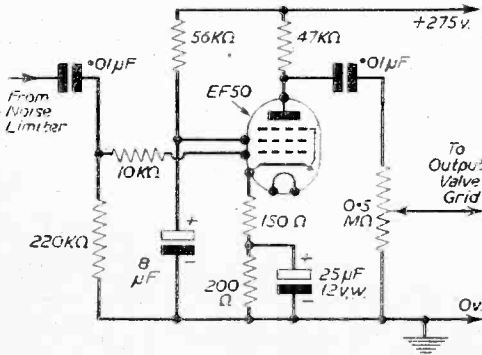


Fig. 6.—Suggested A.F. stage.

4th. Edition

# REFRESHER COURSE IN MATHEMATICS

By F. J. CAMM

8/6, by post 9/-

**T**HIS article has been inspired by requests for further details of the above set, as outlined in the previous article, and gives circuit details of each unit as described, and in the order previously treated, i.e., power unit first and R.F. stages last.

**Power Unit (Fig. 1)**

This diagram is largely self-explanatory. The relay is an ex-government component designed for 6-volt 1-amp operation. It is operated from the 5-volt rectifier winding and closes in 30 secs., resetting in 1 minute from switching off. R1, as previously explained, must be given varying values as testing of the several units is carried out. The E.H.T. may, of course, be obtained from a combined H.T. and E.H.T. transformer. The rectifier connection shown transfers the stress normally between the rectifier heater winding and E.H.T. winding to heater winding and earth, and is generally the best method. E.H.T. is earthed.

**Tube Circuit (Fig. 2)**

This again is quite straightforward and reasonable latitude in component values is permissible. For instance, the 100k shift controls may be replaced by 50k in the alternative circuit shown. R8 may be omitted if a 1M is used for R7. The 3M (R5) is made up by three 1M 1-watt resistances to reduce the voltage across each. The 2M X and Y plate decouplers are a good average value. Lower values reduce the horizontal scan slightly and higher values seem to degrade the picture slightly. C6 removes the final trace of hum bars.

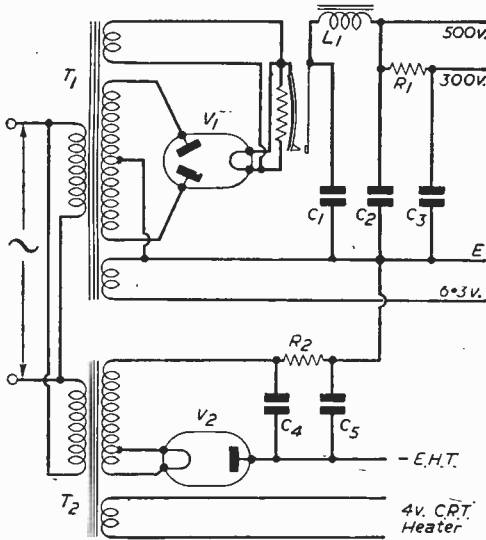


Fig. 1.—Mains unit.

- C1 = 4  $\mu$ F. 700 v.
- C2 = 32  $\mu$ F. 500 v.
- C3 = 32  $\mu$ F. 500 v.
- R1 = 1,000 ohms 30 w.
- L1 = 204 300 mA 180 ohms choke.
- V1 = 5U4.
- T1 = 500-0-500 v. 6.3 v. 8 a. 5 v. 3 a. 200-250 v. input.

- Relay—See text.
- C4 = .1  $\mu$ F. 2,500 v.
- C5 = 3  $\mu$ F. 2,000 v.
- R2 = 250 k $\Omega$ .
- V2 = VU111 or other E.H.T. rect.
- T2 = E.H.T. transformer 2,000 v. 2-0-2. volt. 4 v. CRT heater.

# Using th

Further Details of the Set D

By R.

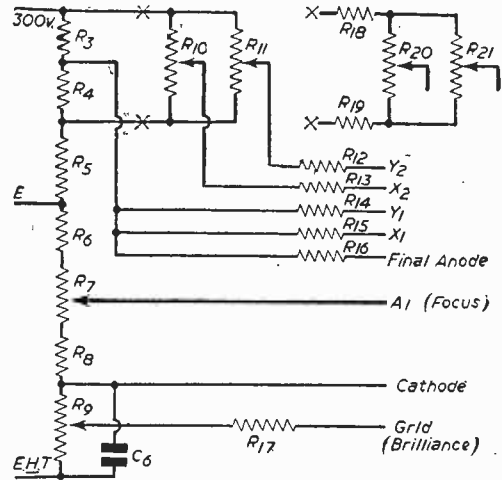


Fig. 2.—Tube circuit.

- R3, 4 = 27 k $\Omega$ .
- R5, 9, 10, 11 = 100 k $\Omega$ .
- R6 = 3 M $\Omega$  (3-1 M $\Omega$  1 watt).
- R7 = 500 k $\Omega$ .
- R8 = 330 k $\Omega$ .
- R12, 13, 14, 15 = 2 M $\Omega$ .
- R16, 17 = 1 M $\Omega$ .
- R18, 19 = 20 k $\Omega$ .
- R20, 21 = 50 k $\Omega$ .
- C6 = .5  $\mu$ F. 350 v.

**Time Bases (Fig. 3)**

SP61s are used for these, as for most of the set, in identical circuits for both line and frame time base, with the changes in values indicated in the components

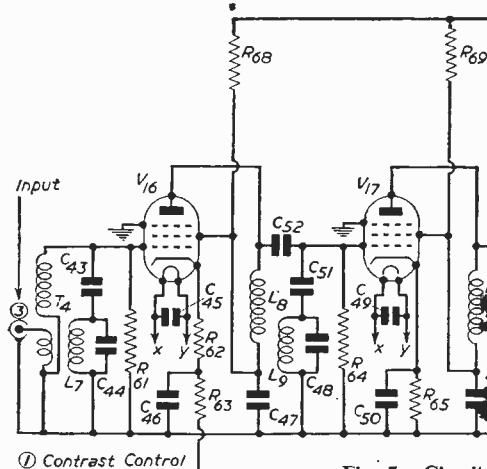


Fig. 5.—Circuit

- R61, 64, 66 = 4.7 k $\Omega$ .
- R62 = 30  $\Omega$ .
- R63, 65, 67 = 150  $\Omega$ .
- R68, 69, 70 = 470  $\Omega$ .
- R71 = 3.3 k $\Omega$ .
- R72 = 200 k $\Omega$ .
- R73, 74 = 4.7 k $\Omega$  2 w.
- R75 = 47  $\Omega$ .
- C43, 60, 61 = 10 pF.
- C44, 48, 56 = 100 pF.

# e VCR97

described in the June, 1950, Issue  
SHATWELL

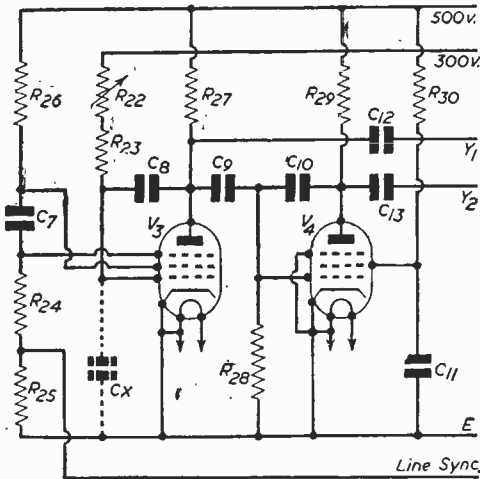


Fig. 3.—Time bases.

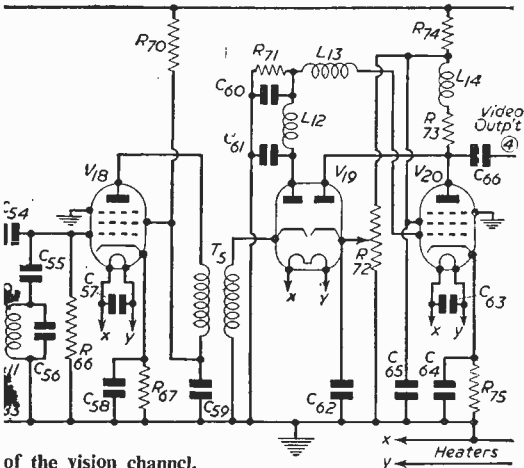
- |                              |                        |
|------------------------------|------------------------|
| <b>Line</b>                  | <b>Frame</b>           |
| R22 = 2 M $\Omega$ .         | R23 = 1 M $\Omega$ .   |
| R23 = 250 k $\Omega$ .       | R24 = 100 k $\Omega$ . |
| R24 = 50 k $\Omega$ .        | R25 = 10 k $\Omega$ .  |
| R25 = 5 k $\Omega$ .         | C7, 8 = .01 $\mu$ F.   |
| R26 } = 55 k $\Omega$ 1w.    | C9, 10 = .001 $\mu$ F. |
| 30 }                         | C12, 13 = .1 $\mu$ F.  |
| R27, 29 = 47 k $\Omega$ 2 w. | V3, 4 = SP61s          |
| R28 = 2.5 M $\Omega$ .       |                        |
| C7, 8 = 100 pF.              |                        |
| C9, 10 = 70 pF.              |                        |

list. The values quoted are those used in the original circuit, but "standard values" would doubtless be quite suitable. Tag board construction was used for these circuits, coupled to the valveholders, etc., on assembly. Line linearity gives very little trouble, high output being the first priority in aims. Frame output is ample and linearity is the main aim. As shown, linearity is quite good on both, and a 5in. by 4in. picture was obtained without appreciable distortion, and the valves have given service since October, 1949, without a single replacement. Incidentally, raising the Y plate decouplers usually gives a slight increase in width but causes slight frequency drift on warming up.

Correspondence on line prominence in this journal and *Practical Wireless* seems to indicate that interlace is generally poor on VCR97 sets, since approximately 100 lines per inch, given by good interlace, are hardly visible as lines at all. The author's experience seems to suggest that at the high outputs necessary with this tube the frame sawtooth is of regularly irregular amplitude or slope, so that, although triggered correctly, the lines lie directly on each other instead of interlacing. The condenser CX (shown dotted) improves matters considerably and a value between .005 $\mu$ F and .02 $\mu$ F is usually sufficient, the minimum giving good results, as it weakens the T.B. lock slightly. If a height control is considered necessary, a 10K $\Omega$  wire-wound variable resistor in the 500-volt lead to the frame SP61 anodes, by-passed by a 25 $\mu$ F. 50-volt condenser, will serve admirably.

### Sync. Separator (Fig. 4)

This stage incorporates a D.C. restorer and cathode follower, providing outputs of different phase for tube



of the vision channel.

- |  |                      |
|--|----------------------|
| C45, 46, 47, 49, 50, 53,<br>57, 58, 59, 62, 63, 64 =<br>.01 $\mu$ F.-.1 $\mu$ F. | C65 = 8-16 $\mu$ F.  |
| C52, 54 = .001 $\mu$ F.  | C66 = .1 $\mu$ F.    |
| C51, 55 = 5 pF.  | V16, 17, 18 = SP61s. |
|  | V19 = EB34.          |
|  | V20 = EF50.          |

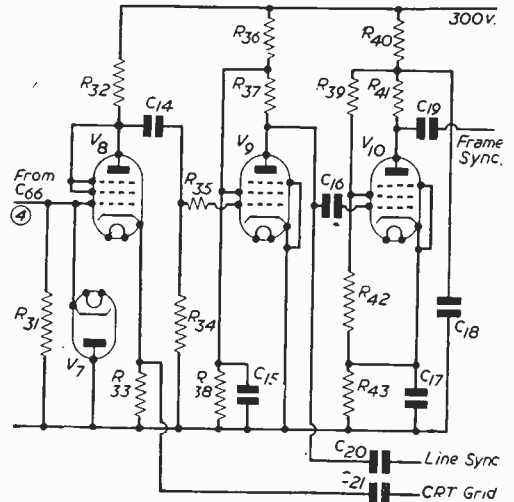


Fig. 4.—Sync. separator.

- |                               |                                |
|-------------------------------|--------------------------------|
| R31 = 1 M $\Omega$ .          | C14, 17 = .1 $\mu$ F.          |
| R32, 33 = 4.7 k $\Omega$ .    | C15, 18 = 2 $\mu$ F.           |
| R34 = 5 M $\Omega$ .          | C16 = 230 pF.                  |
| R35 = See text.               | C19 = 100 pF.                  |
| R36 = 30 k $\Omega$ 1 w.      | C20 = 25 pF.                   |
| R37, 40, 41 = 25 k $\Omega$ . | C21 = .03 $\mu$ F. (2,500 v.). |
| R38, 43 = 22 k $\Omega$ .     | V7 = EA50.                     |
| R39, 42 = 47 k $\Omega$ .     | V8, 9, 10 = SP61s.             |

grid and synchronising circuits. The two-valve separator circuit gives clean pulses and ensures good conditions for interlace. R38 is rather critical and R35 should be given a value between 25KΩ and 50KΩ to ensure absence of "pulling" on whites, most noticeable on test card "C," which, if you are out at work during the week, you will rarely see. The 2μFs were used, as they are liberally sprinkled about ex-government units and serve as well as the higher capacities usual in these positions.

are exactly the same as the rejector coils in the vision chassis. The coupling transformer to the vision channel (T3) is included as it is most convenient to mount it close to the input coil of this section. L3, L4 and L5, L6 are mounted approximately 1/4 in. between centres and give an ample bandwidth to avoid trouble with frequency drift in the oscillator. SP6Is are again used, screened leads being in order in this section, and the I.F. is 9.5 Mc/s. An EB34 (or two EA50s) is used as detector and automatic noise limiter. The L.F. stages are quite

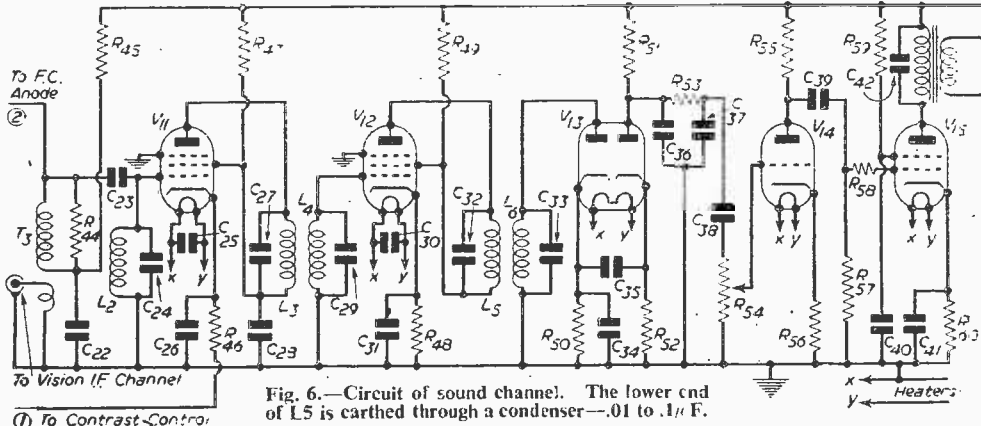


Fig. 6.—Circuit of sound channel. The lower end of L5 is earthed through a condenser—.01 to .1 μF.

- R44 = 4.7 kΩ.
- R45, 47, 49 = 470 Ω.
- R46 = 300 Ω.
- R48 = 220 Ω.
- R50, 53 = 33 kΩ.
- R51 = 2.5 MΩ.
- R54 = .5 MΩ.
- R55 = 47 kΩ.
- R56 = 1,000 Ω.
- R57 = .5 MΩ.
- R59 = 3.3 kΩ.
- R60 = 270 Ω.
- C22, 25, 26, 28, 30, 31 = 0.1-1 μF.
- C23 = 5 pF.
- C24, 27, 29, 32, 33 = 100 pF.
- C34 = 25 pF.
- C35 = .01 μF.
- C36 = 300 pF.
- C37 = .001 μF.
- C38 = .01 μF.
- C39 = .1 μF.
- C40 = 8 μF.
- C41 = 50 μF. 25 v.
- C42 = .005 μF.
- V11, 12 = SP6Is.
- V13 = EB34.
- V14 = 6C5.
- V15 = 6V6.

Vision Channel (Fig. 5)

This again uses SP6Is in the I.F. stages, with an EF50 video amplifier. The detector and noise limiter can be as shown, an EB34, or similar type, or two EA50s. Needless to say, tag board construction is of little use other than in the video stage, and screened leads must *not* be used, the introduction of capacity in the tuned circuits narrowing the bandwidth. Hence the twin chassis to mount the valves grid to base. The coil data is given in the table, and the video filter and corrector coils are similar to those described by Mr. S. A. Knight in the February, 1949, issue. The noise limiter is necessary only in bad conditions. The coil data given is correct for the prototype, but it must be realised that in a set built up from available components and to probably slightly differing layouts, some slight adjustments may be necessary. These are quite simple, however, if construction from video back to input is carried out, checking with 'phones and signal generator to ensure the coils peak at the correct frequencies. A 3-megacycle bandwidth is the aim (13-10 Mc/s), being 50 per cent. down at 13 Mc/s with a flat response from 12.5 to 10 Mc/s. The transformer T5, which is closely coupled, should, of course, peak at the centre of the band, although the "peak" is very flat. The input is by 80-ohm coaxial from the sound channel chassis, terminated at each end by a Pye socket.

Sound Channel (Fig. 6)

This is built up on the same chassis as the R.F. and F.C. stages, but is treated here as a separate unit. Coils

COIL DATA

Coil	Pri.	Sec.	S.W.G.	Former diameter	Remarks
T3	50	4	38 linen or enamel	1/4 in.	Sec. over Primary — paper interleave — close wound.
T4	4	54	38 linen or enamel	1/4 in.	Primary over sec. — paper interleave — close wound.
L2, 3, 4, 5, 6, 7, 9, 11	23	—	26 linen or enamel	1/4 in.	Close wound.
L8	29	—	38 linen or enamel	1/4 in.	Close wound.
L10	43	—	38 linen or enamel	1/4 in.	Close wound.
L12	55	—	38 linen or enamel	1/4 in.	Close wound on same former — 1/4 in. spacing between coils. — Pile wound between checks 3/16 in. apart. Sec. spaced over 1/4 in. of former. Prim. interwound at E. end.
L13	25	—	38 linen or enamel	1/4 in.	
L14	55	—	34 linen or enamel	1/4 in.	Spaced over three-quarters of former.
T5	11	11	36 S.S.C.	1/4 in.	
L15	5	—	36 S.S.C.	1/4 in.	Spaced over three-quarters of former.
L16	6	—	36 S.S.C.	1/4 in.	
L17	9 1/2	—	18 enam.	Air-spaced	Close wound on 1/4 in. former and sprung off.

0BA Brass slugs throughout, except sound filter coils (copper) and corrector coils (air core'd).

straightforward and the 6C5 could be omitted in many instances, as sound output is ample at about one-quarter full output. A.V.C. is not necessary. The input to this section must be positioned so that a direct connection to F.C. anode is possible, and all stages, including F.C., must be thoroughly screened to prevent I.F. interference, as must the vision I.F. channel.

critical and a screen mounted across the valve pins is sufficient. EF54s could be used with slightly greater gain and the coils will probably suit these valves with adjustment to the cores. If not, a slight increase in turns is most likely to be the only change necessary.

The set has in the last month or two been converted to

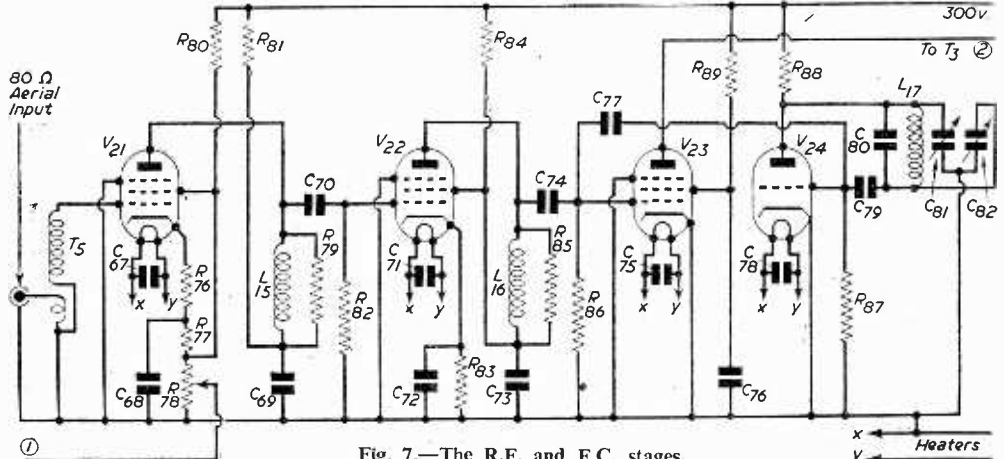


Fig. 7.—The R.F. and F.C. stages.

R76 = 50 Ω.  
R77 = 150 Ω.  
R78 = 1.2 kΩ.  
R79, 85 = 3.3 kΩ.  
R80 = 100 kΩ.

R81, 84 = 470 kΩ.  
R82, 86 = 2.5 MΩ.  
R83 = 220 Ω.  
R87, 88 = 47 kΩ.  
R89 = 100 kΩ.

C67, 68, 69, 71, 72, 73, 75, 76, 78 = .001 μF.  
C70, 74 = 100 pF.  
C77, 80 = 10 pF.  
C79 = 25 pF.

C81, 82 = 25 pF. ganged.  
V21, 22, 23 = EF50 or EF54.  
V24 = EC52 or P61.

R.F. and F.C. Stages (Fig. 7)

Here SP61s are abandoned for EF50s and their single end construction, of much advantage at the TV frequencies and bandwidths. An EC52 is used as oscillator, but an alternative would be the P61. The oscillator tuning condenser is a twin-gang mounted as a split-stator. The oscillator coil is air-spaced. Decoupling condensers are of a much lower value, no heater chokes have been necessary, and one side of the 6.3-volt heaters is earthed, as in all units. Screening is less

a 12in. magnetic tube (T12/44) with great success, and it is hoped to describe the conversion at a later date. Radio was then added and gramophone followed, the complete tele-radiogram now operating from a 9-position push-button unit giving six stations, television, gramophone, and "Off." The TV circuits are used for radio and gramophone wherever possible. However, the VCR97 gives a good, economical basis for a beginning, and is ideal for gaining experience before venturing to more ambitious (and expensive) realms.

### Monoscope Cameras

TEST-PATTERN cards and boards, upon which television cameras are focused for transmission testing purposes, are shortly to be superseded by a new type of camera which has a full-range test pattern engraved on the face of the pick-up tube. Eight of these cameras have been ordered by the B.B.C. from the designers and manufacturers, Marconi's Wireless Telegraph Co., Ltd.

These new cameras will be used for testing and once one has been put on the air from a remote outside broadcast point it will allow engineers to make constant and accurate transmission checks of mobile transmitter, co-axial cables and micro-wave links along the route to the main station and through the main transmitter and aerial array back to a receiver. All this will be accomplished without taking an ordinary camera out of service for test purposes.

It will also mean that the test pattern transmitted will always maintain the same standards and fidelity, for pick-up tubes vary slightly and the practice of using the nearest available camera for testing may occasionally result in slight changes in the test transmission standards.

The output of the monoscope camera is of standard form with blanking, but without synchronising signals. If, however, a composite signal is required the monoscope camera can be used with a synchronising generator or mixer.

The order includes five wave-form generators and all the allied inter-connecting cables.

### CLUB REPORT

**BRITISH TELEVISION VIEWERS SOCIETY**  
Hon. Sec.: Leslie G. Pace, 140; Fairlands Avenue, Thornton Heath, Surrey.

TELEVISION Auditions formed the subject of a talk given to members of The British Television Viewers' Society, at their monthly meeting at Kennard's Restaurant, Croydon, on Monday, January 8th.

The speaker was Miss Mary Cook, head of the Light Entertainments Auditions Unit, who described the setting-up of this important department in 1947 and explained the procedure adopted from the moment when applications for auditions are received to the trying-out of likely performers at a subsequent camera test.

The speaker left no doubt in the minds of members present of the importance of the Auditions Unit to producers of Television variety shows.

Miss Cook spoke also on the work of the Nuffield Centre, in London, where she assists in producing Light Entertainment shows for Forces audiences.



# Aerial Construction

Details for Making Up "H" and Multi-element Aerials for the London and Midland Transmissions

**M**ANY requests are received every week for details of construction of television aerials and the information is obviously beyond the scope of a letter. We gave such details at the beginning of last year in the PRACTICAL TELEVISION Supplement of *Practical Wireless*, but all back numbers are out of print and in response to the very many requests we are reprinting the main details below. For those who require a single dipole, of course, it is only necessary to ignore the reflector portion of the standard H-type aerial, and cut out the crosspiece. The remaining details relating to the aerial dipole itself will then hold good.

The dipole and reflector, or H-type aerial, is, of course, the most generally useful, and even on fringe areas is capable of good results, and the construction of this type will be dealt with first.

The cost of the prototype aerial was 4s., the feeder, 15s., and the chimney brackets a further 4s. This was accomplished by buying the necessary metal from a scrap dealer, where it is sold by weight, the insulating material being bought from government surplus stores. Although this was drilled, the holes were, after assembly, packed with Bostik glazing compound.

## Design

Dealing first with the technical side of the design, refer to Fig. 1. The length (a) is a function of the wavelength and is obtained as follows:—

$$(a) = 1.56 \times M \quad \text{where } M \text{ is the wavelength in metres. (Vision channel.)}$$

or

$$(a) = \frac{467.4}{f} \quad \text{where } f \text{ is the frequency in kilocycles. (Vision channel.)}$$

(in feet)

For all practical purposes this is 7ft. 6in. for Sutton

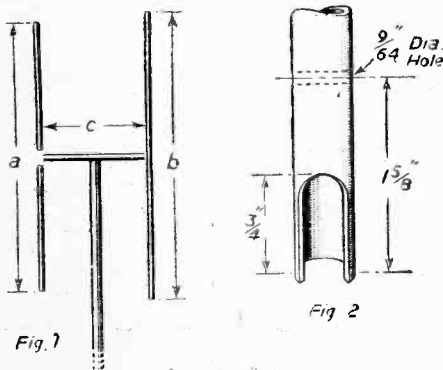


Fig. 1.—Standard "H" aerial with main measurements indicated. Fig. 2.—The lower ends of the aerial are cut as shown here. Fig. 3.—Centre of the cross piece.

Coldfield, and 10ft. 5in. for Alexandra Palace, and this is the total length of the two halves of the dipole element.

The reflector (b) should be slightly longer than the dipole, and is normally .51 of the wavelength. For the Sutton Coldfield frequency 7ft. 9in. is sufficient. For Alexandra Palace, 10ft. 9in. is suitable.

The dimension (c) is not quite so critical, and is usually fixed by mechanical considerations. The gain obtained by the use of a reflector is affected only slightly by variation of its spacing from the dipole between one-eighth and one-quarter of a wavelength, but, since the curve depicting this gain slopes rather steeply below one-eighth, there is more likelihood of "flutter" through vibration of the elements with one-eighth spacing. For Sutton Coldfield 4ft. spacing is both technically sound and mechanically easy, but the comparative spacing for Alexandra Palace is 5ft. 6in., and this increases both the weight and flexibility of the assembly. The loss in using 4ft. spacing for Alexandra Palace is not likely to exceed .5 decibel.

## Construction

Turning to constructional matters, (a) and (b) are of 3/8 in. dural or aluminium tube. (c) is of 7/8 in. tube, again dural or aluminium. The mast can be of wood or metal, but 1 1/2 in. dural tube was used in the original model, a 10ft. mast being used. Aluminium should not be used on the Alexandra Palace aerial, as the greater size imposes a greater strain on all elements.

All the following dimensions refer to the Sutton Coldfield frequency. The changes necessary for Alexandra Palace are both simple and obvious.

- First cut the tubing to size as follows:
- 2 lengths 3/8 in. diameter—3ft. 9in. long.
  - 1 length 3/8 in. diameter—7ft. 9in. long.
  - 1 length 7/8 in. diameter—3ft. 10 1/2 in. long.

Mast not less than 1 1/2 in. diameter and about 10ft. long.

Each end of the 7ft. 9in. length should be plugged with either wood, ebonite or aluminium, and one end of each of the 3ft. 9in. lengths similarly treated. The opposite

(Continued on page 463)

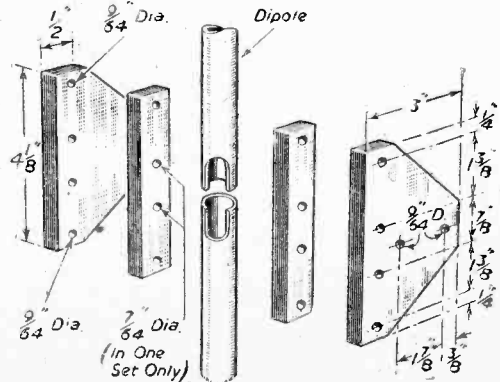


Fig. 4.—Essential details of the clamp. Two sets of these are required.

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# HENRY'S

**931A. PHOTO-CELL MULTIPLIER AMPLIFIER UNIT COMPLETE.** Incorporating 931A photo-cell, 2 valves type 6AC7, 6AG7, etc., etc. Can be adapted for use in window lighting, warning systems, locating foreign bodies in liquids, flaws in textiles, burglar alarms, circuit switching by relays, etc., etc. Panel size 9 1/2" x 3 1/2". Circuit diagram not available. Price 45/- complete, post free.

**R.3515 I.F. STRIP.** A complete I.F. Unit, comprising 6 SP61 I.F. Stages, tuned to 33.5 Mc/s., 1 EA50 diode detector, and 1 EF36 or EF39 output or video stage. A few modifications only are required to adapt this unit, which will give pictures of extremely good quality. Price, complete with valves, and foolproof modification instructions, is 45/-, plus 5/- carriage and packing. Limited quantity only.

**3547 RECEIVERS.** Absolutely brand new, in sealed manufacturers' packing cases. Incorporating 15 valves type EF50, 2 of SP61, EF36, EBC33, 3 of BB34. Complete 45 Mc/s. I.F. Strip, motor dial and drive, pots, etc., etc. £6 only, plus 10/- packing and carriage. Whilst they last!

**EX-K.A.F. INDICATOR UNIT TYPE 62.** Containing VCR37 CRT with mu-metal screen; Crystal Unit and valves 10V/R65 (SP61), 2V/R54 (BB34), 2V/R92 (EA50), etc., etc. Two deck chassis in metal case, 10 x 18 1/2 x 1 1/2". New condition. 67/6 each. Plus 7/6 packing and carriage.

**A.M. UNIT TYPE 159.** Comprising EF50, RL37, SP61 and EA50. Coils, relay, and many condensers and resistors. The whole in metal box, 8 1/2" x 6 1/2" x 3 1/2". New. A bargain at 15/-, carriage paid.

**SPECIAL PURCHASE.** Brand new H4/200 E.H.T. pencil rectifiers, 2,400 v. 3 mA., only 15/- each. Also RECTIFIERS, J59 (new, ex-stk.), 7/6 each. Westinghouse 30 EHT 35, 17/4; 36 EHT 100, 26/6. S.T.C. 330-volt, 75 mA., 5/-; G.E.C. 6 v. 1 amp., 4/-.

**SLIDER POTS.** As used in all the latest T.V. sets. A bank of four, comprising 2 or 10K., 100 ohm and 500 ohm. Only 6/- the set. Easily split up.

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**RECEIVER TYPE 25.** The receiver portion of the T/R1196. Covers 4.3-6.7 Mc/s., and makes an ideal basis for an all-wave receiver, as per "Practical Wireless," August, 1949, issue. Complete with valves, types EF36 (2), EF39 (2), EK32 and EBC33. Supplied complete with necessary conversion data for home use. Only 22/6. Chassis only, 8/6.

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COMPANY LIMITED**  
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TELEPHONE: 400

(Continued from page 460)

ends of these two tubes should be cut as shown in Fig. 2, and drilled with a 9/64ths drill 1 1/2 in. from this end. An elongated 3/8 in. diameter hole should be drilled and filled in the centre of the 7/8 in. tube.

The next step is to cut out the pieces of insulating material shown in the exploded view (Fig. 4). The best method of doing this is to cut out the pairs together, so that identical dimensions are assured. The holes in each set should be drilled with the four pieces clamped together. Note that in one set additional centre holes are required and that these are smaller than the outer.

The two 3ft. 9in. lengths are then positioned and bolted with 4 B.A. bolts through the holes already drilled. There should be a 3/8 in. gap in the centre between the ends, and the cutaway portion faces the front. Making sure that the tubes form a straight line drill the 7/64ths holes from the paxolin into the tube, and fix *one side*

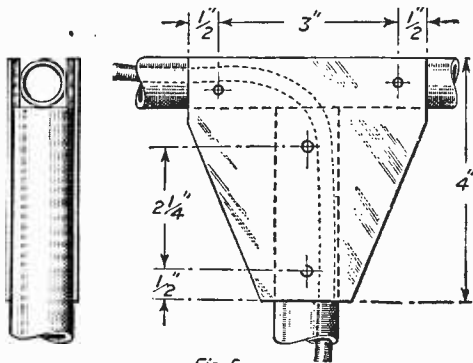


Fig. 5.—The centre clamping piece.

of each tube with a 6 B.A. steel bolt and nut, and file off any of the bolt projecting through the nut inside the tube.

The 7ft. 9in. length is then fixed centrally in the other set of paxolin insulators and, after drilling through from the paxolin, bolted by 4 B.A. bolts, two only being necessary. This, the reflector, can now be fixed to the crossbar by 4 B.A. bolts, a 3/8 in. gap being left between the reflector tube and the end of the crossbar. Fix by one bolt first, set at right-angles *exactly* and tighten up this bolt before drilling the second. The elongated hole in the crossbar should be facing along the line of the reflector.

The dipole must now be similarly fitted at the other end of the crossbar, a 3/8 in. gap again being left, but great care is essential to ensure that it is perfectly in line with the reflector as well as at right-angles to the crossbar.

The mast fitting is the next step. Two 16 s.w.g. plates of aluminium or light alloy are used, with packing pieces of either metal or paxolin between them and the 3/8 in. crossbar, to make up the difference between this and the mast. The run of the cable, shown dotted, makes it necessary to position the front fixing bolt off the centre of the crossbar. Four 2 B.A. bolts are used here, and again care is essential to line up the mast with the aerial assembly.

The mechanical construction complete, the coaxial cable, which should be of 75:80 ohms impedance, must be fitted. In the original model 30 yds. were fitted, and has proved to be sufficient for most needs. It is

necessary to remove the dipole element from the crossbar by removing the two 4 B.A. bolts passing through the crossbar, and also to remove the mast, leaving the fixing plates attached to the crossbar. The cable must then be threaded through the mast, and via the elongated hole through the crossbar, until a foot or two projects at the dipole end of the crossbar. Strip off about an inch of

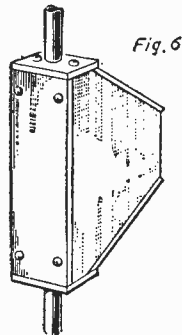


Fig. 6

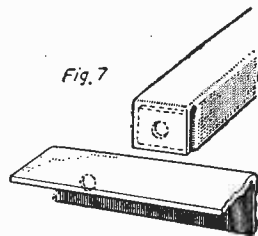


Fig. 7

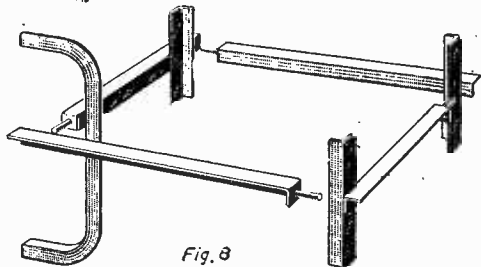


Fig. 8

Figs. 6, 7 and 8.—Further clamping pieces and details of a suitable chimney lashing.

the rubber sheathing, and with a pointed instrument unpick the metal sheath up to the rubber. Twist this together and solder a 6 B.A. tag to it. Bare about 1/2 in. of the inner conductor and solder a similar tag to this, taking care not to melt the insulation. These tags are now fixed to the dipole by means of the unused 7/64ths holes in the ends of the elements. 6 B.A. bolts are used, passing through the paxolin and elements. Since there are already nuts at the opposite side of the tube, the bolts must be cut to length first, leaving room for the tag and a 6 B.A. nut.

The inner conductor goes to the upper element and the metal sheath to the lower.

Carefully reassemble the aerial, drawing the cable back slowly and making sure it is clear of all bolts passing through the tubes.

To render the assembly weatherproof, give all the connections a few coats of shellac, and from 1/8 in. paxolin cut covers for the dipole and reflector assemblies and fix by 6 B.A. brass screws into tapped holes in the edges of the 1/2 in. paxolin, as shown in Fig. 6. The top and bottom covers are drilled 3/8 in. and slipped over the elements. Before screwing the covers in position, coat the edges of the 1/2 in. paxolin with Bostik, and spread this liberally around the elements where they will protrude. The gaps about the crossbar can also be packed with this material.

Chimney Lashings

These can be made quite cheaply from light 1 1/2 in. angle iron, again obtained from a scrap dealer. Dimensions

obviously depend upon the chimney stack, but the work can be completed ready for fitting by counting the bricks used in the stack and measuring this on the outer wall of the house. The 5/16in. drawbolts used will allow up to ½in. adjustment in either direction on all dimensions. Figs. 7 and 8 show the essential details.

The draw bolts should be about 1½in. long and threaded at least 1in. of their length. The upright angle pieces are about 9in. long and spread the strain over the corner of the brickwork. They are held in position by the frame itself. One frame gives sufficient rigidity with the Sutton Coldfield aerial, but possibly two will be necessary for the larger Alexandra Palace array. The bracket to which the mast is bolted is also of 1in. angle iron and must be heated to red heat to bend in a vice, and again heated to hammer out any kinks resulting from bending. It should be about 12in. between the fixing arms, and the arms should be kept as short as possible so long as the mast clears any buttress round the top of the chimney stack. The mast is fixed by two saddle clips and a bolt through the top clip passing through clip, mast and bracket.

### General

It should be realised that the diameter of tubing used is dictated entirely by mechanical considerations. More fragile tubing would not withstand the rough weather, and, although a greater diameter for dipole and reflector elements would increase the bandwidth, the result is hardly likely to be noticeable, and the increase would also mean a proportionate increase in crossbar and mast to support the array. Weight is not the main factor, but wind resistance, which increases out of proportion to weight. This is, however, the only limiting factor, and the constructor can adapt the design to available material provided a margin of strength is allowed. The ½in. paxolin is capable of supporting any practical array without danger.

### Noise

One final point, and one which has been troubling many listeners, is the question of noise. If the aerial is erected in a very open position it may be found that in high winds it hums and the noise seems to be amplified in the rooms of the house on the side adjacent to the aerial. In the majority of cases this may be prevented by filling the aerial with some light packing material, such as powdered cork, sawdust, etc. A plug should be cut and fitted firmly in the lower ends of the aerial and reflector after assembly, and then the material poured in at the upper end, after which a further plug should be inserted and painted with shellac or similar weather-proof material.

Although the H-type aerial just described is, without doubt, the most popular and generally useful type, occasionally the need for something slightly better is felt, either from the viewpoint of signal pick-up or, as in most cases, interference rejection.

In some situations ignition and other interference is prolific, and experience has shown that although signal strength is such that nothing like full gain is needed to provide a good picture, the programme value suffers from this interference. Vision and sound limiters reduce the effect to negligible proportions in the case of sound, but cutting of whites and tearing of lines on vision make an alternative desirable. The H-type aerial just described may, in such cases, be converted to a triple array, with surprisingly effective results.

The addition does not necessitate any drastic alteration

to the existing aerial and can be applied to any H-type with suitable connections for spacing of the elements. The 1½in. mast will, however, be found to be too flexible for the weight of the new array. If a wooden mast or stronger tube has been used, it is possible that no alterations will be needed even here, but, if not, the expedient described later is quite satisfactory, can be carried out without dismantling, and results in a very strong assembly.

### Design

This array has two additional elements spaced the same distance from the dipole as the original reflector and half that distance from the existing reflector. In other words, referring to Fig. 1 on page 460, the three reflectors are each positioned on an arc, radius (c) centred about the dipole. The correct dimensions for the fitting of these can be determined mathematically, but a far simpler method of sufficient accuracy and more attractive to the non-mathematically minded is to make a scale-drawing of the assembly and take the required measurements from this. For 4ft. spacing between reflector and dipole this will show that the two additional reflectors should be 3ft. 11in. apart and 6½in. forward of the existing reflector.

Since it is impracticable to build a triple reflector A.P. aerial using quarter-wave spacing, i.e., 5ft. 6in. between dipole and reflector, it is necessary to use these dimensions for this array also.

*(To be continued)*

## New Marconi Cameras

**A**N entirely new range of television equipment, which can be used, at will, either in studio or for mobile outside broadcasting stations, has been designed and produced by Marconi's Wireless Telegraph Co. Ltd. at their laboratories and works.

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The Mark II cameras feature many major advancements in television design. A four-lens rotatable turret in which screw mounting is eliminated allows the quick setting up or changing of lenses by a new clip-in method. This lens turret is operated from the rear of the camera by the camera operator, and the vision output is automatically blanked when the turret is rotated. Focusing is done by racking the camera tube and deflection assembly relative to the lens. Control is by a single handle. Circuits for supplying and deflecting the tube, for raising the vision signal to transmission level to the camera control, and H.T. supply unit, are all contained within the camera itself.

A headset is provided on the camera for communication between the operator and the control room. Programme assistants can also plug in to obtain programme sound and instructions from the producer. A call circuit links the cameras with the camera control units. A comprehensive system of cue lights is provided.

Their extreme sensitivity enables them to provide really good pictures by the light of a single candle. They will operate without adjustment over a wide range of varying light values, a unique feature which allows rapid panning across scenes of considerably varied illumination, conditions often met in television outside broadcasting.

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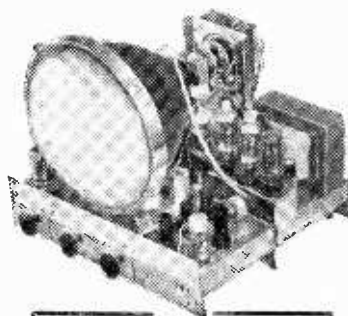
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Any of these Kits may be purchased separately; in fact, any single part can be supplied. A complete price list of all parts will be found in the instruction book.

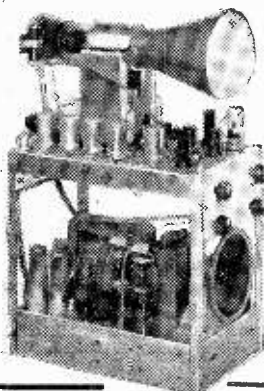
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"MAGNETIC" CONSTRUCTION BOOK 3/-



ELECTROSTATIC CONSTRUCTION BOOK 2/6

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This unit includes the VCR97 Tube, Tube Fittings and Socket, and a 6in. P.M. Moving Coil Speaker with closed field for Television.



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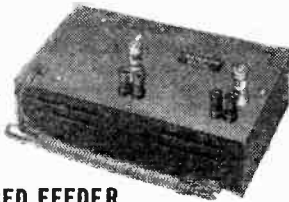
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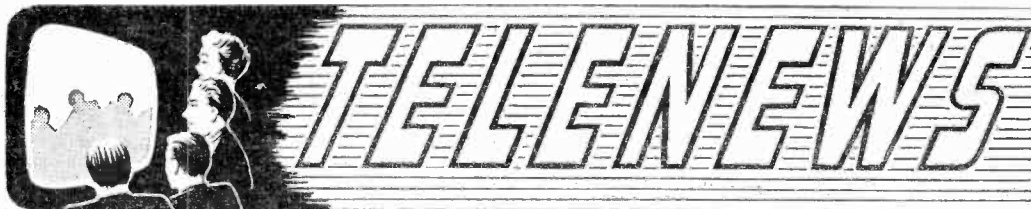
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### Television Servicing Certificate Examination

**T**HE Radio Trades Examination Board announce that arrangements have been made for the examination of candidates who live outside the range of a B.B.C. television transmitter. These candidates will be accepted for the written papers only on the understanding that they will sit the practical examination within 12 months of the opening of a television transmitter in their area. The certificate will not be issued until the completion of the examination.

In view of this, arrangements are being made for candidates from Scotland to sit the written papers of the May, 1951, examination.

### Faraday Medal for T. L. Eckersley

**T.** L. Eckersley, one of the most distinguished of the Marconi Company's senior research engineers, has been awarded the Faraday Medal, which is one of science's premier awards. It will be remembered that he was awarded a Fellowship of the American Institute of Radio Engineers in 1946 "for his outstanding contributions to the theory and practice of radio-wave-propagation research." Mr. T. L. Eckersley is a well-known figure at international Conferences dealing with telecommunications. He was, naturally, engaged on important and secret work during the recent war, having been with the Air Ministry from April, 1940, onwards, and having initiated the scientific part of the Inter-Services Ionospheric Bureau. A great deal of radar work, not of a purely applied or experimental nature, was based on his theory of diffraction round the world. Mr. Eckersley's work for the Admiralty included a theory of scattering which helped to locate submarines, which were hidden by the scatter of the sea waves, in the roughest weather.

### Scottish Children Dance

**P**PIPE-MAJOR CHARLES TURNBULL and four children from the Royal Caledonian Schools at Bushey, Hertfordshire, recently gave a display of Highland dances in the children's television magazine programme "Telescope."

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

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

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Through the courtesy of Philips Electrical Ltd., two of the latest large screen projection television sets (picture size: 18in. by 13½in.) were loaned to the schools to enable the other children—who are all Scottish orphans—to see the display.

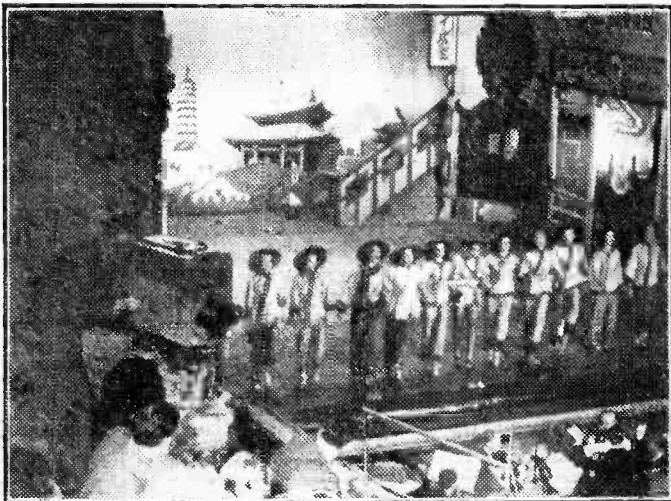
Our Scottish readers will be particularly interested to know that the Royal Caledonian Schools, which are entirely supported by voluntary contributions, were founded in 1815 to care for the children of Scottish soldiers who died or were disabled in the Napoleonic wars.

It is recorded with pride that children representing every Scottish county, clan and regiment have found a happy home and a good upbringing at the schools.

### Mullard Teaching Aids

**C**ONSIDERABLE interest was shown in a number of Mullard teaching aids exhibited at a special exhibition held at the Imperial College of Science, South Kensington, from January 3rd to 5th. This exhibition was organised by the Science Masters' Association in connection with their annual conference, and it included a wide range of scientific equipment and teaching aids.

On the stand, organised by the Mullard Technical Publications Department, an interesting series of eight educational film strips were shown, two of which were continu-



A scene being televised from the Grand Theatre, Croydon, during a special performance of the pantomime "Aladdin." Three Marconi Image Orthicon Cameras were used.

ously projected on a screen. Other exhibits included a selection of the company's technical publications, some of which have been specially designed to meet the needs of teachers and instructors. Exploded specimens of miniature and sub-miniature valves were also shown.

#### TV in Japan

A SPECIAL train was recently used to give television displays in 15 major cities in Japan, the tour lasting about four months.

Television sets and transmitters are being manufactured by Japanese makers and cameras are being developed. Officials state that it will be possible to set up a television station in Tokyo in one month from the grant of a permit and receiving sets will be on sale within two months at a minimum cost of about £30. There will be only one transmitter in Tokyo. It is expected that sponsored programmes will be transmitted.

Before the war Japan started television experiments as early as 1925 and the first experimental programme was transmitted in 1939 from Kamata, near Tokyo.

#### Association des Auditeurs de la Radiodiffusion Francaise

MEMBERS of this French Association recently came over as the B.B.C.'s guests at the Lime Grove Studios.

The radio industry installed an aerial, amplifier and 19 television receivers at the Park Lane Hotel so that the party could see a normal British television programme after dinner.

The secretary general of the Association brought with him booklets giving the names and positions of all members of the party. It consisted of 58 in all, including 22 deputies, 11 senators, the technical director of Radiodiffusion Francaise, leading representatives of the French radio-electric industry and five Press representatives from Paris (Figaro, France-Soir, Le Monde, Le Populaire and Le Semain Radiophonique).

#### Interference Suppressors

A. A. ELECTRICAL CO. LTD. are supplying and fitting free of charge distributor suppressors to customers' and travellers' cars, vans, etc., who call at their Chiswick Works, i.e., 67, Rothschild Road, W.4. They feel that in this way they are giving some assistance to the anti-interference campaign, and are confident that if this practice was adopted by others it would serve a most useful purpose.

#### Dutch Amateur Television Station

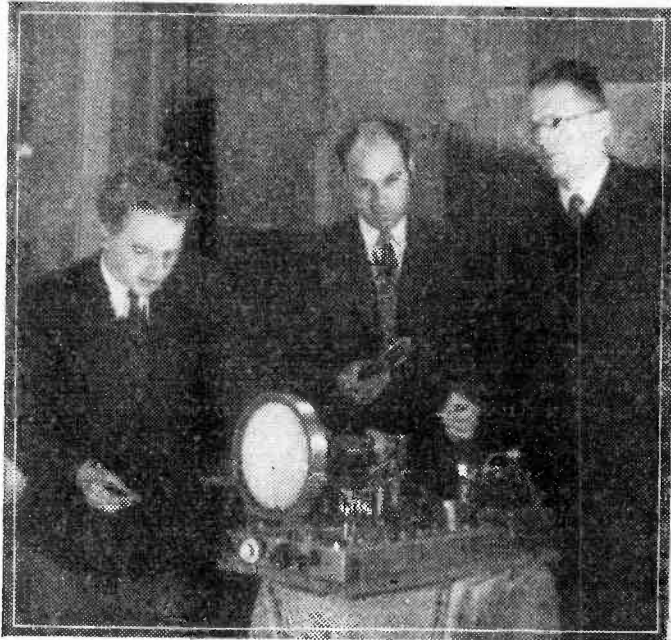
A GROUP of Dutch amateurs operate TV station PAØVT at Winschoten, near Groningen. All apparatus is amateur built. Vision transmissions are made on 145 Mc/s, with sound on 29.4 Mc/s. Sequential scanning is employed, 250 line definition, 50 frames per second.

In the illustration below may be seen amateurs (left to right) PAØZX (V.E.R.O.N. TV Manager), PAØBE and PAØTB with their home-constructed 5-channel receiver using a Type MW-22 C.R. tube.

When installing their television sets, viewers should not wait until their 20s. sound licences have expired, but should purchase without delay a £2 television licence, which also includes sound reception. A rebate on the unexpired portion of the sound licence should be claimed from the Post Office.

#### Postage Stamps

THE Postmaster General announces that the special 2½d. and 4d. postage stamps to commemorate the Festival of Britain will be put on sale



Dutch Amateurs and their equipment. (Photo is by Bram Spier (PAØSA).)

#### Broadcast Receiving Licences

THE statement below shows the approximate numbers issued during the year ended December 31st, 1950.

Region	Number
London Postal .. .. .	2,341,000
Home Counties .. .. .	1,632,000
Midland .. .. .	1,734,000
North Eastern .. .. .	1,885,000
North Western .. .. .	1,597,000
South Western .. .. .	1,055,000
Welsh & Border Counties	726,000
Total England & Wales ..	10,970,000
Scotland .. .. .	1,119,000
Northern Ireland .. .. .	206,000

GRAND TOTAL .. 12,295,000

The total includes 586,100 television licences.

at all post offices in Great Britain and Northern Ireland on and from Thursday, May 3rd, next. The stamps will be double the size.

New designs for the high value (2s. 6d., 5s., 10s. and £1), postage stamps of the permanent series have also been prepared, and the following alterations in the colours of the ½d. to 2½d. postage stamps of the permanent series are being made:

½d. from green to orange; 1d. from red to blue; 1½d. from brown to green; 2d. from orange to brown; 2½d. from blue to red.

There will be no change in the design of the ½d. to 2½d. stamps.

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**I.F. STRIP 194**. Another of the units specified as an alternative for the "Inexpensive TV." A first-class strip giving tremendous amplification, and well recommended for constructors who have built televisors but have come "unstuck" in the vision or sound-receiver. Complete with 6 valves VR65, and 1 each VR53 and VR92, and a copy of the book, which gives full details of conversion to both stations. Size 18in. x 5in. x 5in. ONLY 45/- (postage, 2/6). "PYE" 45 mc/s. I.F. STRIP. Ready made for London vision channel. Complete with 6 valves EF50 and 1 EA50. ONLY 60/- (postage, etc., 2/6).

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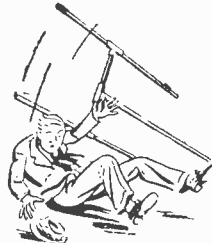
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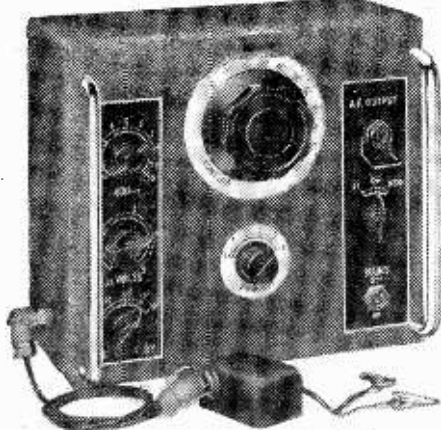


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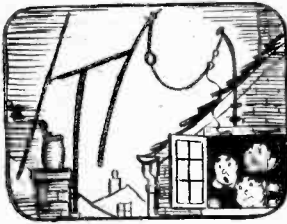
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# LET'S HAVE A DIVORCE!

## A Critic Attacks the Present B.B.C. Control of Radio and Television

**T**ELEVISION, the baby of public entertainment, is growing fast into a lusty child. There have been teething troubles and family jealousy from its elder brother—radio. Growing pains have led to changes in the foster parents. Heads have fallen fast at Alexandra Palace. To-day, George Barnes, the first Director of Television (his predecessors ranked as Controllers) is the third person since the war to control its fortunes.

### Resignations

Why did his predecessors resign? Both Maurice Gorham and Norman Collins were men of proved ability. Each had a successful career previously with the Light Programme during the testing time of war and the period immediately following. Each appeared to be giving complete satisfaction so far as the general public could judge.

The answer lies in the particular appeal television has for those who serve it. Nobody would voluntarily endure the frustrations encountered at Alexandra Palace over the past years unless television represented to them something in the nature of a religion. No appreciation will ever be sufficient for the pioneers who saw a vision and, full of faith, triumphed over handicaps that would have daunted lesser people. But there are handicaps and *handicaps*. Some are unavoidable and have to be endured; others are not necessary, and too many of these over a protracted time inevitably lead to the resignations of men who can earn their livelihoods more congenially by other means.

### Archaic Equipment

To examine some of these handicaps and frustrations it is necessary to look back into television history. The first public service in the world began at Alexandra Palace in 1936. By 1939, when war broke out and stopped television, the pioneering efforts of the first producers had evolved a television technique. It was proved that this new form of entertainment had in it something of the stage, films and radio, but was nevertheless different collectively from all of them. The producers of those pre-war days hankered after many things to improve the quality of their programmes. Above all, they wanted bigger studios and better equipment. Television started again after the war and, in the nature of things, with more experience the programmes became better. The Outside Broadcasts department in particular seized magnificently the opportunities that came their way. But the important thing is this. Six years after the war, and 14 years after the start, the equipment at Alexandra Palace is to-day practically the same as installed in 1936! The cameras there still have no turret lenses, and viewers who are interested in production will easily be able to identify programmes from Alexandra Palace as against Lime Grove by the tortuous way cameras are compelled to track.

It is true that there are now two studios at Lime Grove which are well equipped. The second of these came into being only in December. These additional facilities are most welcome and will result in better programmes. But the question may fairly be asked, what would have happened but for the chill wind of adversity that blew on the film industry and made it anxious to

sell the Lime Grove studios? They were acquired less than a year ago and, but for this accident, it is highly probable that no further studios would have become available until the promised White City centre is built in years to come. What were viewers expected to do in the meantime—continue to be grateful for programmes produced by archaic equipment?

All this is evidence that the B.B.C. has not nurtured television as it deserved; in this is the key to the resignation of the two Controllers.

*(And the cause of The Beveridge Committee.—Ed.)*

### Staff Devotion

It may be that the devotion television inspires in those who serve it was made too obvious to the radio side of the B.B.C. Possibly television fanaticism was carried beyond desirable limits and the impression conveyed that radio was senile, decrepit and on the way out. It is, of course, a fact that radio after 25 years has comparatively little further progress to make; all subsequent developments must be in the nature of perfecting what has gone before. It is also a fact that radio can do certain things better than television; and vice-versa.

The world is an oyster for the young television service and inevitably it will overtake and pass radio in its appeal. It is not thought possible that anyone will dispute this statement; not even the B.B.C. This being so, why does the Corporation fail to nurture television adequately?

During the past few months Sir William Haley, Director-General of the B.B.C., has been acting as if he anticipated and feared that the Beveridge Committee will recommend that television be separated from radio. He has been jumping the starter's gun and pouring as many radio men into television key posts as he possibly can. As evidence of this, the heads of Rádio Drama and Outside Broadcasts have each had television added to their responsibilities. Ronnie Waldman, well known in radio, is now acting head of Television Light Entertainments. Men experienced in television administration are having radio personnel posted over them. Everything possible has been done, and is being done, to make radio and television so inextricably intertwined that a full separation will never be possible.

### Separate Radio from Television!

*If British television is to grow to full stature and regain its leading position in the world there must be a divorce from radio.* The two systems cannot be mixed without harm to both. Each demands full time service from those who work for it. In practice, this means that de Lotbiniere and Val Gielgud should not be asked to continue their dual responsibilities and instead should specialise in either radio or television. If guidance is needed in this decision, it is hoped that de Lotbiniere will choose vision, because under his direction Outside Broadcasts have gone from strength to strength. On the other hand, under the guidance of Val Gielgud, television drama has not made any appreciable progress against what went before.

In this connection it is impossible not to mention "Party Manners," made prominent by the extreme folly of the Chairman of the B.B.C. Governors. Apart from any intrinsic value in the play itself it appears

undesirable that, with the world's wealth of drama to choose from, the Head of Drama should include two of his own plays on television within the space of eight months. It was also distasteful to see the avidity with which the play was taken to the West End stage where, thanks to being a *succès de scandale*, it achieved a longer run than any of his previous unpublicized plays had ever enjoyed. But it is not on account of the sorry story of "Party Manners" that Val Gielgud should leave television; it is because, as stated previously, drama has not progressed sufficiently, due in great measure to the inability of one man to serve two masters.

Television is now acquiring more producers, chiefly from radio. It does not matter where they come from provided they have a worthwhile contribution to make and are prepared to forsake all others and faithfully serve television. No matter what their previous experience has been, it will take them several months to acquire a working knowledge of production and to learn their place in the elaborate chain of technical and artistic endeavour which makes television so different from any other form of production—and so fascinating. If at the end of their apprenticeship they are not television

whole-hoggers, they should be returned to the scenes of their previous endeavours.

The teething troubles of British television should by now be things of the past. The announced timetable for the expansion of the service is far too slow and should be speeded up. It is wrong to deny the benefits of television to a large proportion of the country's population for the lengthy time forecast. Why should not plans be made now and put into operation in the near future to provide alternative programmes to viewers served by Alexandra Palace and Sutton Coldfield? Why cannot longer hours of transmission be provided so that viewers, who have survived the honeymoon period where everything shown was thought marvellous, can have a more extensive menu to choose from?

Those in charge of the television fortunes at Alexandra Palace will make little progress towards these ideal developments so long as they are firmly bound to radio, particularly as radio holds the financial whip hand. A divorce is greatly to be desired. May it come soon, so that television, freed of its entanglements, can take its rightful place as the greatest medium yet known for public entertainment, enlightenment and inspiration.

## Metal 16-inch Tubes

**T**HE "English Electric" Group of Companies, which made a notable contribution to the domestic television receiver industry with the first low-cost, direct-viewing, big-screen television receiver, again makes television news.

The English Electric Valve Co., Ltd., a member of the Group, now announces the introduction of a new style steel and glass cathode-ray tube to the British domestic receiver market. After months of careful preparation, supplies of the new type tube, which has been so successful a feature of American television receiver production, are now being produced at the Chelmsford factory of the Company.

Necessary plant and equipment have been designed and installed for quantity production, and it is hoped that the availability of the new tubes will make an appreciable contribution towards overcoming the shortage of large-size cathode-ray tube supplies under which British television has laboured so long.

The design of the steel cathode-ray tube closely follows orthodox pattern. It consists essentially of a high quality, nearly flat glass face-plate, suitably coated on its inner side to provide a brilliant image—a body in the shape of a spun steel cone—and a glass neck containing the electron gun. The gun, cone and screen have co-axial symmetry.

The specification of the spun steel cone or tube body is such that complete fusion between the steel and the glass used for the face-plate and neck is obtained, and the use of steel permits even tighter manufacturing tolerances than are possible in the case of the all-glass tube.

### Advantages

A summary of the main advantages of the new manufacturing technique are:

Mass-production methods can be employed and so increase supplies available for the cathode-ray tube market.

Due to design of the metal cone, a nearly flat face-plate is possible, with a resulting improvement in picture appearance.

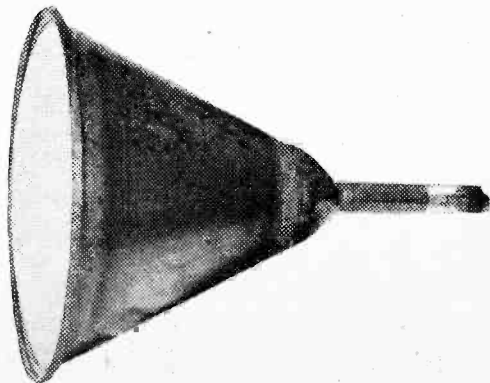
The tube is more robust, due to the use of a steel cone, and it is lighter in weight than its all-glass counterpart.

Other features include increased picture brightness, good contrast even under high ambient light conditions, and a large, useful screen area in relation to face area.

One size tube only will be available, of 16in. diameter, Type No. T900. The list price has been fixed at £16, plus purchase tax £4 3s. 3d.

Trade discounts and guarantee period will be those applying in the cathode-ray tube industry.

The marketing of the tube T900 will be undertaken by The English Electric Co., Ltd., Television Department, Queens House, Kingsway, W.C.2, to whom all enquiries should be addressed.



This view of the new tube shows the flatness of the face, and the main metal body.



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 RE1/120 120 mA. (Fully shrouded). 200/230/250 volts input. 250-0-250 6.3 volts at 7 amps. 5 volts at 3 amps.  
 RE2/120, 120 mA. (Fully shrouded). 200/230/250 volts input. 350-0-350. 6.3 volts at 5 amps. C.T. 5 volts at 5 amps.  
 RE1/EHT, Primary 200/210/230/240/250 volts. 2.5 kV. at 4 mA. 4 volts at 1.5 amps. 4 volts at 2 amps. C.T. (Tested at 10,000 volts to earth and between windings.)  
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5Z4CT	7/6	32-350, 2/6	32-500, 6/0
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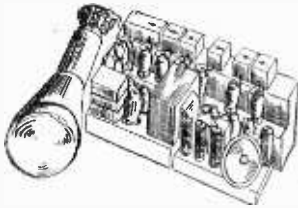
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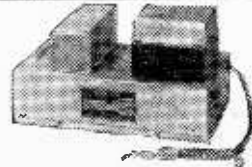
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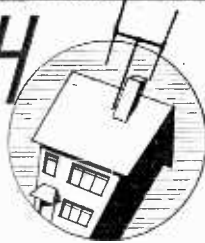
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## TELEVISION PICK-UPS AND REFLECTIONS

# UNDERNEATH THE DIPOLE



By Iconos

## THE STATUS QUO

THE health of British television and broadcasting has been checked by the Beveridge Committee, and its exhaustive—and comprehensive—report favours the *status quo*. Doubts were, indeed, expressed by some members about the wisdom of perpetuating the present monopoly, but the 600-page prescription indicates that for the next 10 years our medicine will be “mixture as before.”

Meanwhile, spurred on by keen competition, American television goes ahead both artistically and technically, and each month brings news of advances which make our TV system seem archaic. In the space of a few days I have received particulars of startling developments in colour television, in TV studio technique and equipment, in methods of filming for television and in telefilm photography—known in the U.S.A. as “Kinescope recording.” B.B.C. technicians are first class and are making progress under great difficulties, but they lack both the competitive urge and the financial rewards which await their brother technicians in America. The Beveridge Committee seemed to be uneasily conscious of this fact, and ingeniously contrived, on certain matters, an appearance of compromise which has failed to pacify either the supporters of absolute monopoly or the opposite camp which favours competitive systems, “commercials,” initiative and progress. One technical journal has commented on the Report in a forthright manner, ending with the exclamation: “What pitiful nonsense this is!” but, considering the constitution of the Committee—what else could be expected?

## THE MULTICAM SYSTEM

THE use of 35 and 16 mm. film for photographing programmes for television has been growing in the U.S.A., and the resultant prints are released simultaneously to a large number of TV stations thousands of miles apart. Technical qualities are said to be higher than the average direct studio television system, and far superior to telefilm. The newest technique in filming television material has been named “The

Multicam System,” and is a method which allows three or more motion picture cameras to be operated at the same time on long-shots and close-ups, but with special start, stop and synchronising arrangements which enable economies to be made in film stock footage. Hitherto, it has been necessary to run all the cameras all the time, with consequent huge expenditure on film stock, developing and printing. Just how much film is thus used in the U.S.A. can be deduced from the fact that one big film stock manufacturer is supplying more film to the television industry than it is to the cinema business! The Multicam System introduces no specially new device, but involves the advanced development of known systems of synchronising sound and picture recordings. During a scene or sequence lasting, say, 10 minutes, three cameras may be required at the commencement, followed by a single camera covering a close-up, and, subsequently, variations utilising one or more of the cameras. Control of each camera is in the hands of the director or technician, who switches on one or another camera off-stage. As a camera runs up to speed, a synchronising and identification mark is automatically made on the picture film, simultaneously with a similar mark on the sound film, which runs continuously throughout the scene. In this way the producer has a large variety of camera angles available with the minimum expenditure on film stock, and also, with the aid of occasional overlaps, gives himself sufficient film material to enable speedy “cross, cutting” to be carried out during the subsequent editing process. It is the additional editing facility which appeals particularly to programme sponsors, giving them the opportunity of deleting dull moments or actors’ “fluffs,” and generally streamlining their continuity and presentation.

## PRODUCTION TIME SCHEDULES

THE new “Multicam” technique has cut down production schedules of TV filming by as much as 80 per cent. Thus, the shooting of a half-hour weekly musical programme, *Nocturne*, has been reduced from about 15 shooting hours to little more than three hours, and *The Triumphant Hour*, a feature-length production with many exterior scenes and a great deal of trick photography, took about four days. Using normal filming methods, it would have taken about three weeks to make. The system has also been used alongside television cameras during direct TV studio transmission from Los Angeles, KNBH, in which case a 30-minute programme has been photographed in 30 minutes without the film stock waste caused by “rolling” all of the four cameras used all of the time. Popular American programmes such as *The Ed. Wynn Show*, *This Is Your Life* and *Truth and Consequences* have been recorded in this manner.

For quality reasons, this method is preferred by many sponsors to the more obvious method of photographing the TV reproduction on a cathode-ray tube. But this method of Kinescope recording has been improved, too, and is likely to be extensively used on certain classes of production.

## LIGHTING IMPROVEMENTS

OF course, speeding up the shooting of TV films has not been achieved solely by new camera control equipment. Many ingenious types of lamps and lamp mountings have been introduced, including provision for suspending all lights and cables from the studio roof. A new type of balanced “lazytongs” pantograph suspension has been devised, which permits lamps to be moved silently and quickly during the actual shooting of a scene. Dimmer control is also available, and a variety of lamps are used, principally 500 to 2,000 watt tungsten filament type in floodlight and spotlight housings. But fluorescent tubes and tungsten striplights are also available. Experiments have been made with the zirconium gas-arc and the compact light source (high

pressure mercury) lamp, but in this particular field the Americans seem to lag behind England. Carbon arcs are rarely used. The rotating selector switchboard and dimmer control in the newest TV stage at Radio City, New York, is a sight which must turn the British TV engineer green with envy! Those U.S.A. boys certainly dash ahead, unimpeded by red tape or Beveridge Committees!

#### THE NEWSREEL

THE B.B.C.'s newsreel is now watched with considerable respect by the makers of the cinema newsreels, and several little tricks and styles of editing used in the TV newsreel have been copied by them. They realise that the rapid increase in television viewers, who see the B.B.C. newsreel, may mean a decrease in the desire of the public to see a newsreel when they go to a cinema.

The cinema newsreel people are making a gallant effort to retain popularity, even to the extent of imitating certain features of the B.B.C.'s newsreel. The most obvious answer would be for them to turn over to colour, but the tedious and complicated processes take time and cost a lot of money. Nevertheless, it is possible that the cinema newsreel of the future will include one colour "story," probably of the "magazine" type, which does not date, in each issue. The good old stand-by interviews with Brumas and other "personalities" of the Zoo are always popular and can be given a topical twist by an appropriate commentary.

#### SATIRE

HUMOUR of a satirical type has never been very successful with the masses, but television revues are

gradually educating public taste and creating a demand. The well-edited selection of a year's items surveying the events of 1950 was followed by a burlesque revue of the year's most popular TV features. I thought this was one of the funniest and best things ever done, quite in the "Hellzapoppin" vein, and I was surprised to hear that dozens of viewers had telephoned protests at the "nonsense" even while the show was still being televised. The guying of their own programmes was brilliantly done by the B.B.C. boys, who even managed to extract humour from their well-known "technical hitch." This is a production which deserves to be repeated. So long as the B.B.C. can laugh at themselves occasionally, they will retain an immense amount of that intangible asset called "good will."

# Television Applications

## Some Commercial Uses to which Modern Television Apparatus is being Applied

ALTHOUGH many people look upon television as a means of entertainment, it is finding an increasing number of applications, not only to commercial undertakings but also in scientific research. Not only in the U.S.A. but in this country also, certain business houses have installed transmitters and receivers by means of which a branch may refer to documents at the head office, and vice versa. Hospitals have installed the equipment to enable students and others to watch a special operation being performed, without crowding the operating theatre, and at the same time to enable "close-ups" to be given. In this connection, of course, the latest Pye colour apparatus has been employed to deal more vividly with special operations such as those on the eye.

#### War-time Uses

Experiments have been carried out in various countries to see whether air-borne transmitters could relay to base details of the terrain over which they are carried. If this arrangement could be perfected it could, of course, be carried by radio-controlled planes and if suitable lenses could be used, height would not be a deterrent, and presumably jet-propelled planes which would be difficult to bring down could be used. A battle or campaign could be conducted much more efficiently if the Base Commander is able to see what is taking place over a wide area.

#### Research

Another aspect, and one which appears to have a very much wider application than has hitherto been thought possible, is illustrated on our cover this month. This illustrates an American application and the picture was taken at Princeton University, New Jersey. Here a

television transmitter is coupled to a microscope, in which there is nothing novel. This does, of course, enable very high magnifications to be obtained, and it is claimed that powers of over 2,000 are possible by this means alone. In this set-up illustrated, however, a comparator microscope is employed and cells are being studied under two different forms of illumination at once. On one side the cells are viewed in the violet end of the spectrum, whilst they are also scanned by a red, sensitive tube. Two separate pictures are obtained and discussions may take place and the object may be viewed instantaneously by several research workers. The picture shows Dr. Arthur K. Parpart, chairman of the Department of Biology at the university, and L. E. Florty, of the research staff of the R.C.A. laboratories, using the new microscope.

### BUILDING THE "PRACTICAL WIRELESS" RECEIVER

A large number of readers, unable to obtain back numbers of the issues containing the series of articles on the construction of the "Practical Wireless" receiver, have asked us to reprint these articles in book form. This has now been done, and copies may be obtained from or through any newsagent, or for 3s. 9d. by post from us.

Orders should be addressed to The Publisher, Book Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Printed on good quality paper, this 32-page book gives complete stage-by-stage instructions for the construction of this highly efficient 18-valve television receiver, which received so many favourable comments when it was exhibited on our stand at the recent Radio Show at Birmingham.

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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).

## THE "CASCODE" PRE-AMPLIFIER

SIR,—I can clearly visualise the pained expression on Mr. West's face as he wrote his somewhat reproachful reply to my further comments on the Cascode—or Wallman—amplifier. He is apparently hurt because I did not agree in full with his ideas on the subject. My disagreement, however, did not constitute "condemnation" of the proposals. Nor, equally, did I regard Mr. West's earlier letter as a condemnation of my own ideas.

Mr. West quotes a further reference to the literature of the subject; I have lately been introduced to another, on page 657 of the M.I.T. Radiation Laboratory Series Volume 18. From this, I note that the time-honoured method of neutralising an R.F. circuit by adjusting for zero signal with no L.T. applied to the first valve has been found satisfactory in this instance. The description also states that an accuracy of 5 per cent. was found adequate for the (fixed) neutralising coil. In view of Mr. West's insistence on the critical nature of this adjustment this is rather puzzling.

In the statement to the effect that the cathode circuit of the second (grounded-grid) valve must be tuned so that the valve presents a "pure load," I presume that Mr. West means that the input impedance must be purely resistive. This, however, can be achieved more simply in other ways which are fully described in the literature of the grounded-grid stage. One method involves adjustment of the relative values of the anode-cathode and anode-grid capacitances of the grounded-grid valve by the addition of small external capacitances. Another involves the use of a suitable small impedance in the earth return of the grid of the valve.

Mr. West states that such an impedance is "most undesirable," and thereby bars the way to an interesting field of development. Being aware that "direct earthing to R.F." is not a practical possibility with suitable valves at television frequencies, I took the trouble to analyse the effect of a small impedance at this point. I suggest that Mr. West should do the same before being too dogmatic in public. It may also indicate new possibilities for development of the circuit.

With reference to the "parallel-connection" of the valves, I would merely point out that there are definite advantages in using a limited H.T. supply for R.F. amplifiers handling low signal levels. Also, if a "pure load" is so essential at the input to the grounded-grid valve, what will be the result of connecting an R.F. choke across that input?

With regard to Mr. West's last paragraph, I would refer him to his original letter, in which he said: "The circuit he gives is not the best arrangement for a pair of valves in cascade." He then proceeded to give his own views on the matter, and I gathered that he was there describing what was the best arrangement. He has now indicated that he intends to continue development of the circuit, and I am very pleased to hear it. I would suggest, however, that he will make little progress if he does not break free from certain of his fixed ideas on the subject.

In conclusion, I would like to take this opportunity of thanking those who, by spoken word or correspondence, have expressed their interest in this discussion.—D. W. THOMASSON, A.M.Brit.I.R.E. (Exeter).

## VIDEO STAGES

SIR,—The 6AG7 mentioned by Mr. L. Walde (Feb. issue), should, according to the R.C.A. Manual, have up to 120  $\mu$ F decoupling on the screen.

I use 4 K $\Omega$  in the anode and 20 K $\Omega$  in the screen, with 300 volt supply. The screen is decoupled by 32  $\mu$ F and there is 56 ohms in the cathode. I have found no other valve to compare with this.—K. S. HOPKINS (Birmingham).

## "MY EARLY EXPERIMENTS"

SIR,—I was very interested in "My Early Experiments," by Prof. A. M. Low, but I would like to point out that these experiments in television were by no means the first.

In 1913 I bought a copy of "Electricity in the Service of Man." This was a 15th edition and printed in 1890. I quote from page 782.

"The Telephote, or Pherope, is an instrument to which the ambitious purpose has been assigned of enabling a person living, for instance, in London, to see by telegraph a picture or an occurrence such as a race taking place in York. Although the problem is far from being solved, Messrs. Ayrton and Perry have been able to show that it is within the range of possibility. We cannot do better than to give a quotation from Professor Perry on this subject."

This is followed by details which give in principle Professor A. M. Low's ideas.

The actual date of the lecture is not given, but it must have been at least a quarter of a century before 1914.—JOHN W. ROBINSON, GSUP (Carnforth).

## DEFINITION LIMITS

SIR,—I have noticed several correspondents and authors in your excellent little paper state that the home constructor should be satisfied with nothing less than the 3 Mc/s bars. The people who make these statements must live in an area of high field strength, and more than likely use the A.P. channel, upper side band. But has anyone ever tried using the lower side band, and who is living in an area of low field strength (50 to 80  $\mu$  V/metre). The 2½ Mc/s base are easily obtained, but the 3 Mc/s bars are to be seen but not clearly. I have only seen one manufacturer's products do this, in my area, and they really do stand out. My own set is a converted R3084A, driving a 9in. magnetic tube. I should like to hear comments from other readers similarly situated. I have access to an accurate signal generator for lining-up purposes and have checked the video stage for H.F. response.—N. A. HOUGH (12, Shelagh Ave., Widnes, Lincs).

## AMATEUR EFFORTS

SIR,—I have been experimenting with television for about 15 months. In that time I have built three television receivers. In the first one the time bases were Miller Transistrons, the tube was a VCR97, with about 800 volts E.H.T. and the vision receiver was a T.R.F. with only 2 R.F. stages. At 50 miles from Alexandra Palace this was, of course, insufficient, so I built the superhet vision receiver as described in the February, 1949, issue of "Practical Wireless," but retaining the same Time Bases and Power Pack. With all these units, and the sound receiver, the set was rather bulky, and when the mains transformer burnt out I decided to build a more compact televisor. This one was built in two units only, one the power pack and sound output and the other contains the vision receiver, the sound receiver, the Time Bases and the tube. The latter unit was mounted

above the power pack and hinged. The Time Bases are again Miller Transiron oscillators, using 6AC7s, with 6SN7s as push-pull amplifier. The vision receiver is a superhet with two R.F. and three I.F. stages. The sound is a T.R.F. with four R.F. stages, the first two being common to vision. All R.F. and I.F. amplifiers are 6AC7s. The power pack has two mains transformers, one supplying 250 volts to the vision and sound receivers, and the other, 350 volts for the time bases and sound output and 1,500 volts for the tube with a voltage doubler (6H6). The aerial is home made and is an H-type, but the receiver works quite well on a dipole with no reflector. I had a little trouble with instability in the vision receiver at first, but now it is operating perfectly.

If any reader should want further details I shall be pleased to oblige. Also I would like to correspond with some person of my own age, 15 years, who is also interested in television.—C. KENNY (31, Westbourne Street, Hove, 3, Sussex).

#### VCR140

**SIR**,—Referring to your correspondents' requests in the January issue for information regarding the VCR140 cathode-ray tube, perhaps the following data may be of some assistance.

**Base.** International Octal.  
Pin 2 Heater.  
Pin 5 Grid (modulator).  
Pin 7 Heater.  
Pin 8 Cathode.  
Side cap on tube. Anode.  
Overall length. 587 mm.  
Diameter. 306 mm.

#### Operating Conditions

Heater voltage. 4 volts at 1 amp.  
Anode voltage. 5,500 volts.  
Maximum anode voltage. 6,500 volts.  
Focusing. Magnetic.  
Deflection. Magnetic.  
Screen colour. Blue.

Personally, I have no experience regarding the suitability of this tube for television work, but I have grave doubts in this respect as the screen is of the long persistence or "afterglow" type, although I have heard it suggested that it may be possible to "cook" the screen by exposing it to bright sunlight, or alternatively leaving the tube for a period with the raster running at full brilliance, thereby reducing the length of the afterglow. If any of your readers have any information regarding this I, too, would be interested to hear from them.—R. THOMAS (Bilston).

#### London-Birmingham Converter

**SIR**,—Your contributor Gordon J. King, in a description of his London/Birmingham Converter, refers briefly to the "double converter" method of achieving reception of the Birmingham transmitter on a London type receiver. The term "double converter" does not in itself give much information, particularly since it is already employed in connection with double frequency changing in specialised types of receivers. I have, for want of some better title, referred to the arrangement as a "double mixer," but feel that this term is almost as ambiguous and again does not give much information to the inquiring reader. I feel, therefore, that it may be of interest to outline as briefly as possible what this alternative method is and also endeavour to show that the advantages secured justify the small additional complication.

A converter of the type described by Mr. King will use a local oscillator frequency of 16.75 Mc/s. This frequency when mixed with the vision carrier of S.C. (61.75 Mc/s) will provide an I.F. of  $(61.75 - 16.75) = 45$  Mc/s. The sound carrier of S.C. is at 58.25 Mc/s. This frequency mixed with the same local oscillator frequency will provide an I.F. signal at  $(58.25 - 16.75) = 41.5$  Mc/s. This is, of course, delightful, and on the face of it just what is needed; however, it is important to note that the local oscillator frequency must be close to the 16.75 Mc/s value if it is assumed that the circuits of the sound section of the receiver are normally selective. Any small departure from this frequency will result in a large loss in sensitivity and/or distortion of the sound. For example, if the local frequency were 16.5 Mc/s, the converted sound carrier will be at a frequency of 41.75 Mc/s. It is in general unlikely that the sound section of a normal London type receiver will provide sufficient sensitivity or good reproduction under these conditions. It will be apparent, of course, that such a deviation in frequency of the local oscillator is unlikely unless intentional. However, in order to secure optimum picture reproduction it is essential to be enabled to vary the local oscillator frequency. It is also essential to do this without affecting the converted sound carrier frequency for the reasons given above. This need to be able to vary the local oscillator frequency is due to the fact that the S.C. vision carrier has one set of sidebands partially suppressed. Strictly speaking, it is desirable to align the vision circuits in a rather special manner to receive such transmissions correctly, the response at the carrier requiring to be down with respect to that at the transmitter sideband frequencies. Both phase and amplitude distortion can readily occur if this is not the case. For a receiver aligned to receive the London transmitter the correct operating point for reception of a single sideband transmitter is not at 45 Mc/s, but must be found by varying the frequency of the local oscillator until the converted carrier is located at an acceptable point with respect to the pass band of the particular receiver concerned. A wide range of adjustment is desirable and, as remarked above, no, or very little, change of the converted sound carrier is tolerable. If a single local oscillator frequency is employed it is not possible to satisfy these requirements, and mainly for this reason a "double mixer" is to be preferred. This method employs a suitable valve as a mixer operating in conjunction with two separate local oscillators. One of these local oscillators is at a frequency of 99.75 Mc/s, thereby providing an I.F. of 41.5 Mc/s. The other is at a nominal frequency of 106.75 Mc/s, which provides an I.F. of 45 Mc/s. This latter oscillator frequency can be adjusted without affecting the sound oscillator and thus the vision carrier is readily located correctly on the receiver's pass band to ensure high-quality picture definition. A double triode will operate quite satisfactorily as the dual frequency oscillator, so that the additional complication is seen to be quite small. So far as second channel interference is concerned the double mixer stage also has advantages, for the two channels will be  $99.65 + 41.5$  Mc/s and  $106.75 + 45$  Mc/s. There are two other possible reception channels due to the separate vision and sound I.F. frequencies, but it will be seen that it is unlikely that any interference will be experienced. For the single mixer arrangement second channel interference will occur at 28 Mc/s and 24.75 Mc/s. Both these bands are extensively used and some interference is to be expected unless suitable rejection circuits are included in the design.—S. WEST, (Gt. Yarmouth).

# YOUR Problems SOLVED

## REPLACING FOCUS UNIT

"My set is about four years old and I am now in process of modernising it. I wish to replace the electro-magnetic focus unit by a permanent magnet, so would you please recommend a suitable magnet and point out any snags?"—J. Field (Gerrards Cross).

Theoretically it is a simple matter to make the change, but there is one snag. In many receivers the focus coil acts as a smoothing unit and/or a voltage dropper. If, therefore, it is simply replaced, either a part of the receiver will receive no H.T. supply or trouble may be expected due to lack of smoothing. The circuit should be examined, and if the H.T. passes through the present coil (across which may be a fixed and variable resistor acting as focus control) the current through the circuit should be measured or the equivalent resistance measured or calculated. The focus coil may then be removed and replaced by a fixed resistor of equivalent resistance and wattage rating. The Bel Sound magnet may be slid on the tube without the need for making any special support, but other magnets will call for a special support. The Haynes and the Elac may both be adjusted from the rear, and should be easily mounted on the existing focus coil support.

## RASTER SIZE

"Could you please tell me how to adjust the height and width controls of my Pye set to get the picture right? I bought the set second-hand some time ago, and although I get a splendid picture I can't make it the right size. If I turn it to get it to fill one way, part of the picture is out of the screen the other. Does it mean that one of the controls wants renewing?"—D. Getheridge (N.W.5).

We doubt whether there is anything wrong with the receiver in the way of a fault. The picture shape has been changed within the last twelve months, and your receiver is probably fitted with a mask designed for the original shape. You will thus always have a part of the mask area showing or part of the picture underneath the mask. The remedy, if you must fill the mask exactly, is to purchase a new mask of the correct aspect ratio, as it is called, and replace your present mask.

## FLY-BACK VOLTAGES

"I am building a mixture of your receiver and the Viewnaster (not because I know enough to be able to pick out the best bits of each, but to use up parts which I happen to have available). On trying the set I had a picture for about 10 minutes, then the width dropped to about one inch, with a lot of crackling noises from inside the set. I found eventually that the condenser in series with the linearity control was dud. I bought another, and the same thing happened, although the condenser lasted

about an hour. Could you help me to locate the cause of this trouble?"—G. Smedley (Birmingham).

Your trouble is, apparently, due to the same fact as that relating to many others—you have overlooked the high peak fly-back voltages in this part of the circuit. Presumably you have used an ordinary type of condenser with, perhaps, a working voltage of 500. As you probably know in this part of the circuit there are very high voltages, and the condenser must be of the type designed for a working voltage of at least 1,500—higher if you can get it. The condenser specified in this position in the "Practical Television" Receiver is rated at 2,000 volts D.C. working.

## STRAY FIELDS

"I have completed a television receiver and am puzzled by a fault. Unfortunately I have not followed anyone's particular design, but have used standard components. On the picture things look fairly satisfactory, but when I receive the tuning-in signal the ring round the clock is a funny shape. It tapers slightly towards the bottom—something like an egg, but opposite one o'clock it goes out like a bump on a man's head. No juggling with linearity, width or height controls will pull it round. I have changed the coils twice and each time the makers said they had tested them and they were in order."—A. G. Bloomfield (Chingford).

We think undoubtedly your layout is responsible for the defect. You must bear in mind that transformers—especially mains transformers—have a fairly large external field, and the C.R. tube can be affected by such a field. If, therefore, you have such a transformer or main smoothing choke within a fair distance of the neck of the tube, this is distorting the beam, and the remedy is to place them either farther away, or much farther forward (near the front of the tube), where their effect will not be so marked. You might try orientating them, but we think this will have little effect, and a complete change of position is called for.

## POOR SYNC

"I have a very well-known commercial receiver which gives me a splendid picture and tone, but there is one troublesome fault which you can probably easily identify for me. If anyone goes out of the room whilst we are looking in and switches on the lights anywhere else in the house, the picture jumps and sometimes may go all to pieces for several minutes. It comes back all right, sometimes after only a few seconds. What is the cause of this?"—G. T. A. Ling (Norwich).

You are probably receiving a fairly weak signal (due either to your locality or the use of a small aerial) and thus the sync pulses are only just strong enough to hold the picture. The radiation resulting from the arc which takes place when the electric light switch is operated is sufficient to upset the lock, but there is just sufficient strength available to pull the time bases into step within a short time. The remedy is to improve signal strength by improving the aerial, or if the fault has developed since the receiver has been installed and it has been working without this trouble in the past, have the sync stage overhauled, as the valve(s) may need replacement.



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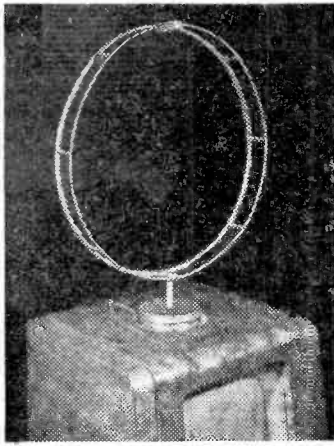
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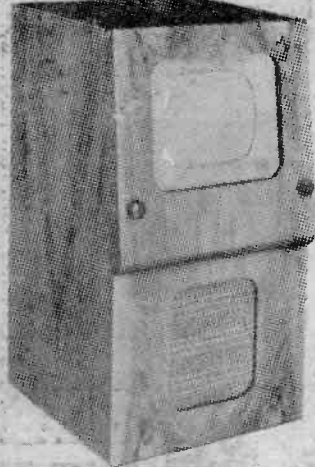
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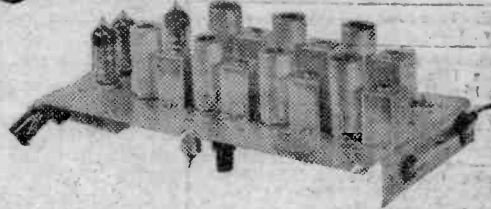
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