BAND III AERIALS

PRACTICAL TELEVISION

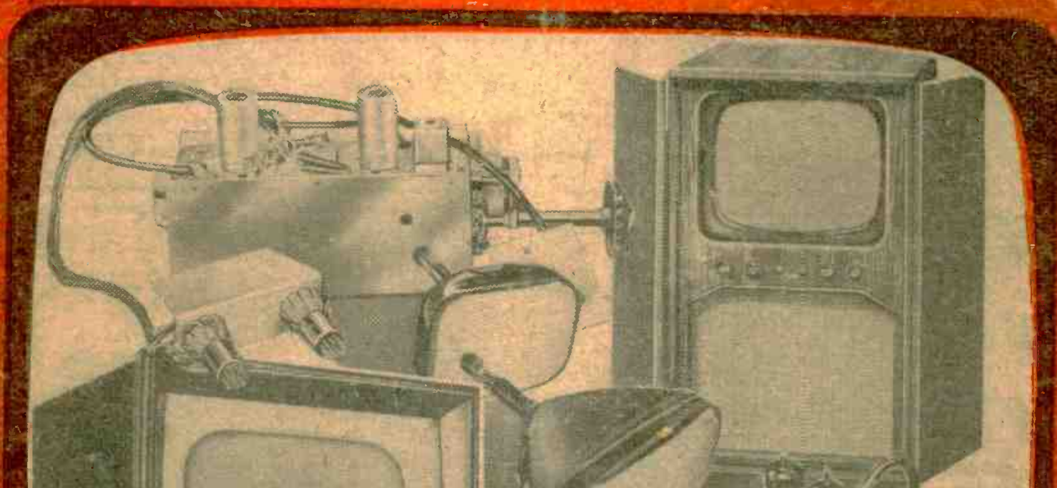
AND TELEVISION TIMES

A NEWNES PUBLICATION

1/-

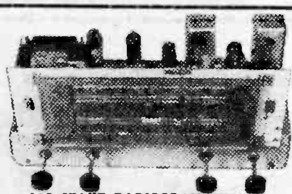
EDITOR F. J. CAMM

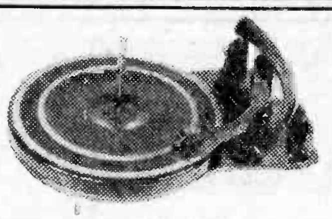
Vol. 6 No. 64 SEPTEMBER, 1955



FEATURED IN THIS ISSUE

- Inlay and Overlay
- V.H.F. Mixers
- Making a Fringe Area Band III Converter
- Testing Line Output Transformers
- Receiving the I.T.A.
- Servicing the Philips Projection Receiver





Practical Television

& TELEVISION TIMES

Editor : F. J. CAMM

Editorial and Advertisement Offices : "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. 'Phone : Temple Bar 4363. Telegrams : Newnes, Rand, London.

Registered at the G.P.O. for transmission by Canadian Magazine Post.

Vol. 6 No. 64 EVERY MONTH SEPTEMBER, 1955

Next Month—Free Blueprint of Band III Converter and our New 3-colour Cover

A FREE blueprint of a Band III converter to enable the viewer to receive the I.T.A. programmes on an existing TV receiver will be presented with every copy of next month's issue. Easy to construct and low in cost, the mere operaton of the switch will enable you to switch from the BBC to the I.T.A. programmes.

We have already described two converters—one for the service area and one for the fringe area. Next month's FREE GIFT BLUEPRINT, however, deals with a more compact design. The aerials are automatically switched in this new model, which is probably the most compact unit yet designed. We show how to make Band III aerials in this issue, and shall be describing yet another converter, so that there will be a model to suit any type of receiver owned by readers.

Commencing with next month's issue, this journal will now be contained in an attractive full three-colour cover each month, and it will depict some outstanding feature described within. This now brings PRACTICAL TELEVISION into line with our companion journal, *Practical Wireless*, and the other journals in our Practical Group. There is bound to be a great demand for next month's PRACTICAL TELEVISION in its new form containing the 1s. FREE GIFT BLUEPRINT. It is important, if you wish to secure a copy, to order it to be delivered by your newsagent now.

TV AND EDUCATION

IN the World Survey of Television recently published for Unesco by H.M.S.O., the important part that television is playing in education is supported by facts. In the United States, 13 educational television stations with a potential audience of 20 million people were already in operation in January, 1955. Plans for 33 more were well advanced and applications for 48 more were pending. Broadcasts include regular courses for high school and college students, home-making course and broadcasts on crafts and hobbies.

"The Practical Householder"—our New Companion Monthly

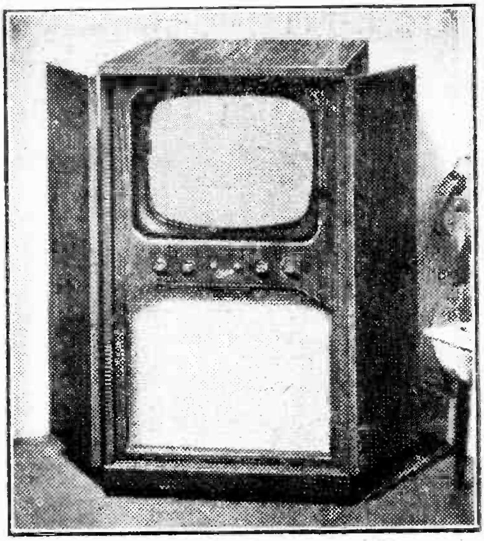
WE have pleasure in announcing that on September 8th we shall publish the first issue of *The Practical Householder*. The newcomer joins our group of practical journals to cater for the pressing need for a monthly magazine which will co-ordinate the "do-it-yourself" movement which is sweeping the country, and which is now catered for by an important and growing industry. It will deal with every practical aspect of the household and its equipment. It will teach you how to lay linoleum, repair and maintain the hot-water system, build a shed or garage, tile a roof, install and repair electrical apparatus, refrigerators and vacuum cleaners, how to re-upholster the suite, overhaul the sewing machine and the lawnmower, how to re-enamel the bath, make furniture, do painting, graining and wallpapering, lay and repair brickwork, lay crazy paving, and how to make home fitments—to mention but a few of the subjects with which it will deal. As with all our group of practical journals the text will be illustrated on a generous scale. We shall deal more fully with the new journal next month, but it is essential to place an order with your newsagent for its regular delivery *now*. In these days of economy of paper we only print copies ordered by newsagents, and you will help your newsagent to assess demand by going to him to-day and placing a regular order with him. We are giving readers this early opportunity of avoiding the disappointment experienced by thousands of readers of the PRACTICAL TELEVISION who were unable to obtain the early issues because they failed to take this elementary precaution. Do it now !—F. J. C.

TELEVISION AT EARLS COURT

A PRE-VIEW OF SOME OF THE EXHIBITS

OWING to the fact that all manufacturers have not released details of their exhibits at the time of going to press, it is not possible to give a fully detailed account of all that might be seen and the following pre-view therefore deals only with those items which have been announced. As in previous years, many manufacturers hold back "secrets" until the day of opening, and although one or two rumours have been heard it does not appear that there will be anything outstanding or surprising. As is to be expected, however, the accent will this year be on the forthcoming I.T.A. transmissions, and the major part of the Show will be devoted to television aerials, tuners and converters to enable users of existing receivers to tune in to the new frequencies. As has already been stated in these pages, a new aerial is essential, but the manufacturers have found ways of adapting existing aerials, whether indoor or outdoor models, and a number of "add-on" elements will be seen which may be clipped to different types of aerial so that either Band I or Band III signals may be tuned—with a single aerial feeder.

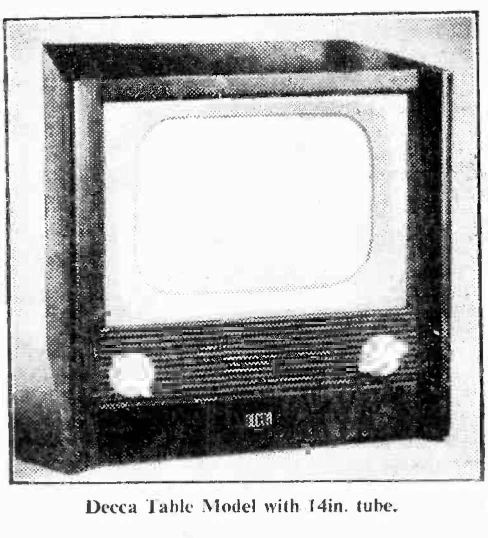
Experiments which have been carried out during the past few months have shown that best results are obtained with a multi-element aerial, in order to preserve sufficient bandwidth, and four- and five-element arrays, with the dipole folded, are now becoming a common sight in many parts of London. Small units, incorporating the printed circuit technique, will also be seen, and these are intended for inclusion either at the aerial end or at the receiver end, to enable a single lead to be used. They will be sold under various names.



This is the Marconiphone Model VC69A, a 17in. tube with 10½in. elliptical speaker.

AUGUST 24th to SEPTEMBER 3rd

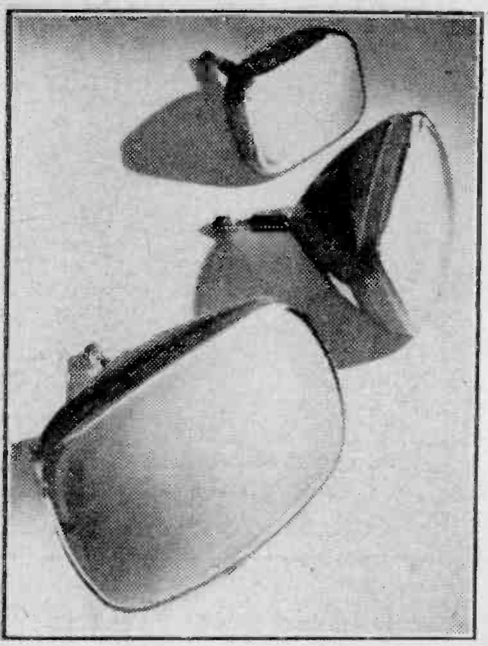
Our Stand No. 107



Decca Table Model with 14in. tube.

Tuners

In addition to many special Band III tuners, produced by practically every set maker, there will also be a number of "12-channel units" or similar tuners, designed to replace existing tuning units, or to be added to existing receivers. These provide a selection of any of the Band I channels and one or more of the Band III channels. An example of these is seen on the next page, and is an H.M.V. product. This sells at 6 guineas and is a 14-point tuner, designed for the H.M.V. "Highlight" receivers. An important point with many of these tuners is that they are intended to *replace* existing R.F. stages, and therefore valves have to be removed from the receiver. Special plugs are then inserted in the empty valveholders, and in some cases the valves themselves are inserted in the tuner. In other cases different valves have to be employed. As the I.F. is now being standardised in TV receivers, these types of tuner are only useful where that I.F. is used, and this precludes their use in quite a large number of receivers. A simpler type of unit is intended to be included between the aerial and the receiver, and calls for no modifications in the receiver itself. In fact in some cases it may not even be necessary to remove the back of the cabinet. The units in such cases are self-contained, with their own power unit and switch, and in most cases the two aerial leads are plugged into the unit, and a lead is joined from the unit to the receiver in place of the original aerial lead. Again the switching in some cases permits the receiver switch to be left in the "on" position, whilst in other cases both the



A group of rectangular tubes by Ferranti.

unit and the receiver will have to be separately switched. The control on the new unit then selects either the Band I or the Band III station. Under the test conditions which have been the only source of experiment so far, very little trouble appears to have been experienced from "patterns" due to the two transmissions becoming mixed in the converter, but whether or not this will hold good when the transmitter finally starts up on full power is not certain.

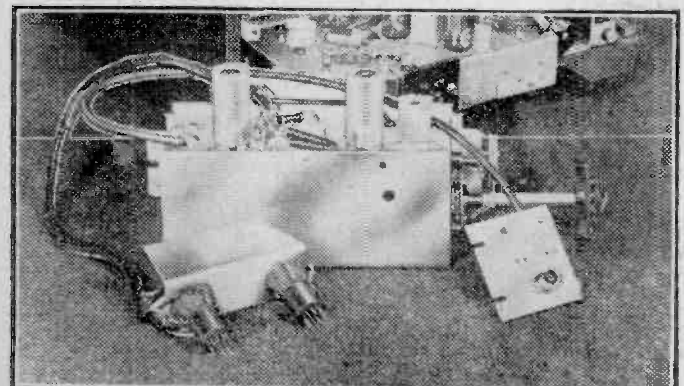
Tubes

Among the tubes to be seen will be some truly "outsize" models, but the popularity of these large surfaces is in doubt. In order to keep down the overall size of cabinets a marked increase in the number of rectangular tubes appears to be the trend. The metal cone appears to be on the way out, or at least has not increased in popularity. The aluminised surface is now the most popular, due no doubt to the brighter picture which results, but no details have been received of any change in screen colours, and projection receivers appear to remain in the same proportion as last year. It is doubtful to say what is the most popular size of picture, but it would appear to be now either 14in. or 16in., these two sizes appearing to be more or less equally popular.

General Design

With the inclusion of the rectangular tube, and the consequent overall reduction in size, the general appearance of the receiver has been changed somewhat, and a much neater cabinet results. From the illustrations of the three table models seen on these pages, it will be noticed that the general trend is to a two-knob layout, with very little depth below the tube. Volume and Brilliancy appear to be the most popular controls for panel use, and band switches and other subsidiary controls are placed on the sides.

Peto Scott Model TV1416T, also a 14in. Model.



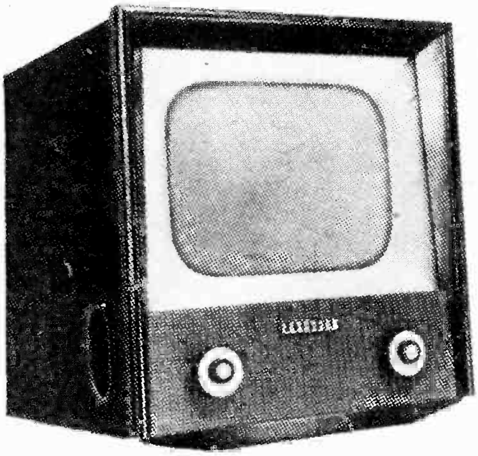
A 14-point Timer by H.M.V. for use with their "Highlight" Models.

There is also a growing tendency to replace the cabinet fronts by cloth and fancy materials in order to fit in with modern contemporary furnishings. This tendency has, in fact, been carried into some of the console designs, where also in the radio and loud-speaker cabinets a large sheet of cloth forms the front of the design.

There is a growing tendency to revert to the one-time popular multi-knob for the controls where two or more knobs are arranged concentrically, and whilst this does make for a neat appearance on the panel front, it is not always convenient. Much depends upon the knob shape and size, but it is very easy to turn two knobs together and thus upset the setting of one when adjusting the other. One or two firms appear to favour the edgewise control which again, whilst making for neatness of appearance, may not be the ideal form for older people or those who want something easy and robust.

Reproduction of Sound

Again we are surprised to note that of the designs of which we have so far been notified, no manufacturer has gone in for the "hi-fidelity" on the sound side. In view of the high quality which can be obtained from television, we would have expected some manufacturer to have made some attempt to do justice to it, by fitting at least a 12in. speaker, and making some attempt to use the lower part of a console cabinet as a properly-designed speaker enclosure. The market for hi-fidelity tuners and amplifiers on the sound side is now quite large, and quite a lot of money is spent by enthusiasts on speakers and speaker enclosures, and we would have thought one or two makers would have found it worth while to produce a "hi-fidelity" television receiver, where the quality of reproduction was in keeping with that now available from records and F.M. radio. It might be argued that many enthusiasts now own hi-fidelity loudspeakers and are fully equipped on the radio and gramophone side and that the existing equipment may be used with the radio receiver. But it is essential to reproduce the sound from the area of the tube in order to retain the illusion of realism, and although it is possible

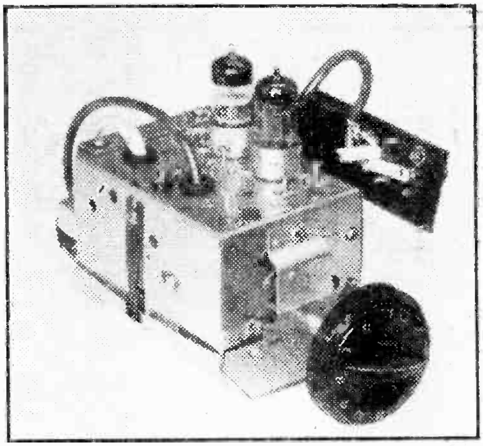


Ferguson Table Model with 14in. Tube

in many cases to take the output from the sound detector to a quality amplifier, in most commercial receivers very little attempt is made to develop the best from the sound channel and an 8in. speaker appears to be the more or less general rule.

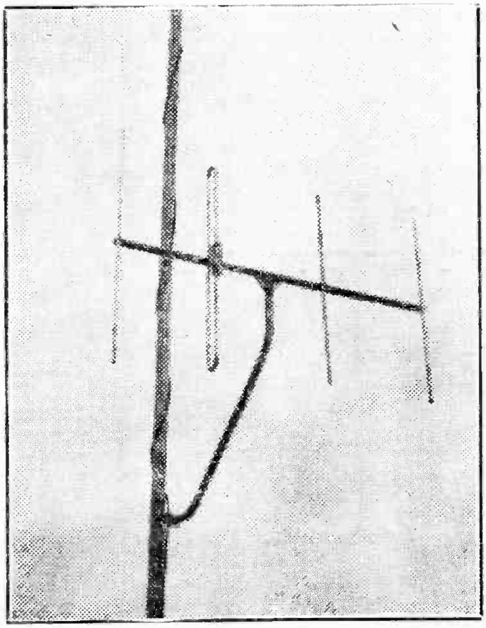
F.M. and Television

With further reference to the question of quality of reproduction on television receivers, as this issue goes to press we learn that at least one firm, McMichael's, will be showing a combined television and F.M. receiver. This takes the form of a 17in. receiver and includes in its console a standard AM/FM receiver. Each uses its own separate valves and components, and separate speakers. No details are yet available, however, concerning the amplification problem, and we do not know whether



The Pilot 13 Channel Turret Tuner.

this does in fact utilise a single high-fidelity amplifier for the two units. If the reference to "separate" indicates that each set (television and radio) is complete, this still does not come within the category mentioned earlier, where really high quality is provided for the television section. Incidentally whilst dealing with the McMichael products it is interesting to note that they have made a departure in the design of the line output design—a frequent source of trouble. A special form of generator has been developed by McMichael's in which the heat is kept to a minimum, and the resultant assembly is claimed to be safer and more reliable than many other high-voltage generators now in use. This feature is exclusive to the McMichael receivers.



This aerial array by Labgear is intended for mounting on an existing Band I aerial mast.

INLAY & OVERLAY

DETAILS OF AN INTERESTING TRANSMISSION TECHNIQUE FOR PRODUCING "FAKE" EFFECTS ON "LINE" BROADCASTS

THE basic principle of Inlay is that the final picture, as seen by the viewer, is composed of parts of pictures from two separate cameras. (Either or both cameras can be a film scanner but for simplicity the term "camera" will be used throughout.) The choice of which part of the final picture comes from which camera is controlled by a simple operation with pieces of cardboard on the face of a cathode-ray tube.

An Example

An example of what can be done will perhaps clarify the process. Suppose Camera No. 1 is looking at a photograph of Juliet's house and Camera No. 2 is looking at a real window in the television studio; then in the final picture seen by the viewer there will appear Juliet's house but the "photograph window" will have been removed and the real window substituted. Juliet will appear as if she were in a real house. Provided care is taken with the perspective of the two component pictures, such an illusion can be completely satisfactory.

The basic principle is simple, though, as is often the case with electronic equipment, the application is complicated.

At any instant in time the television picture consists of a single spot of light, modulated in intensity to give the appropriate brightness and displayed in position corresponding to the part of the scene being examined at that instant. Therefore, if we have a switch which changes over from Camera No. 1 to Camera No. 2, and back again, at the appropriate points of the picture (or the appropriate instants in time, which is the same thing) the output of the switch will contain the wanted composite picture.

Synchronised Cameras

Looking at Fig. 1, Camera 1 is "seeing" a photograph or model of the house and Camera 2 a real window on the studio floor. In the cameras the scanning spot is in exact synchronism. Suppose we consider line No. 100 in the television picture (about halfway down the picture). At the start of the line the switch S is over to Camera 1. It stays there until the spot reaches the edge of the window A, when it changes very rapidly over to Camera 2. The switch remains on Camera 2 until the spot reaches the point B, when it returns to Camera 1. It remains on Camera 1 to the end of the line. The television signal emerging from the switch, therefore, consists of the picture from L to A from Camera 1, A to B from Camera 2, and B to R from Camera 1; that is, the real window has been "inlaid" in the model of the house.

The switch requires to operate extremely rapidly (in about 0.1 microsecond) in order to avoid visible transitions, and it is entirely electronic in its operation. It consists of about 20 valves and particular attention is paid to its design to make it stable and positive in its action. If the switch can be appropriately controlled any shape from the picture from one camera can be "inlaid" in the picture from another camera.

The switch is controlled by a device known as the "Silhouette Generator," which consists of a simple flying spot scanner. A cathode-ray tube (with a short afterglow phosphor) is mounted vertically with its face horizontal, facing upwards. Above the cathode-ray tube is a photo-electronic cell (see Fig. 2).

Silhouettes from Paper

On the cathode-ray tube face is displayed a spot of light which is scanning in synchronism with the scanning spots in the television cameras. The light from this spot is collected by the photo-electric cell, causing a small current to flow. This current is

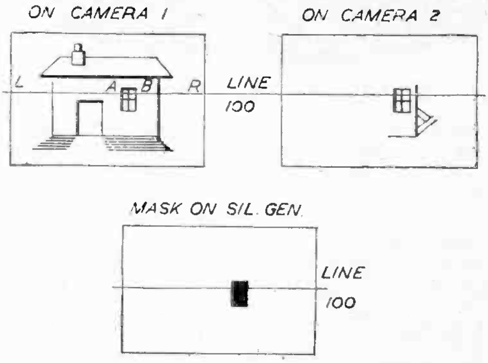


Fig. 1.—Principles of the arrangement known as 'Inlay.' The Inlay equipment described in this article is installed in several television studios and is often used for Inlay, for Wipes, and for Overlay. It is a valuable adjunct to the television service.

amplified and used to operate the switch to (say) Camera 1. If the light is interrupted then the photo-electric cell current ceases and the switch changes over to Camera 2.

The method now becomes clear. If we want to

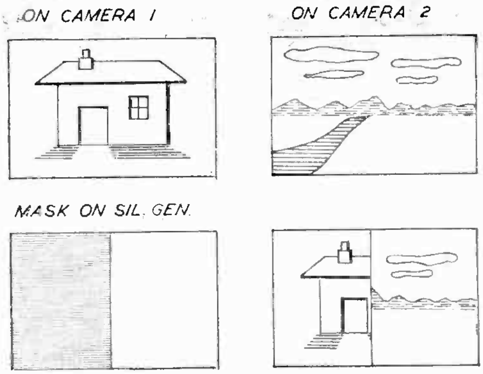


Fig. 4.—How a "wipe" is effected.

inlay part of Camera 2's picture into Camera 1's picture we need only to interrupt the light arriving at the photo cell from the cathode-ray tube at the appropriate place in the picture; thus, a small piece of black paper or cardboard of the right shape and size will cut the "photograph window" out of Camera 1's picture and substitute the real window as seen by Camera 2.

Fig. 3 shows this process photographed from a television picture monitor: 3 (a) shows the model house; 3 (b) the model house with the window cut away; 3 (c) the practical window on the studio floor; and 3 (d) the composite picture.

This method of controlling the inlaid area by pieces of paper or cardboard placed on the cathode-ray tube face is operationally simple and lends itself to other applications which, while being in essence "Inlay," do not appear to be so. For example, a large piece of paper covering half the screen will give a composite picture with a dividing line down the middle. On the left-hand side will be the picture from Camera 1 and on the right-hand side the picture from Camera 2 (see Fig. 4). This can be used for trick effects; for instance, an artiste walking across Camera 1's picture will pass out of sight as he crosses the dividing line, and appear to "vanish" in the middle of the picture.

Pictures "Wiped Off"

Another application of this method of control is to use a large piece of paper and move it across the raster. As it moves across it will give the effect of a line moving across the composite picture, on the left of the line being Camera 1's picture and on the right Camera 2's picture (see Fig. 5). This gives a transition from camera to camera in the form of a "wipe" because the line "wipes off" Camera 1 and "wipes in" Camera 2. This is sometimes æsthetically preferable to a "cut" or "dissolve" change from camera to camera. More elaborate wipes, such as diamonds closing into the middle, diagonal wipes, and so on, can be obtained with different shapes of mask.

In the practical equipment installed at Lime Grove the optical system between the cathode-ray tube and the photo-electric cell is elaborated so that a small image of the raster on the cathode-ray tube is formed

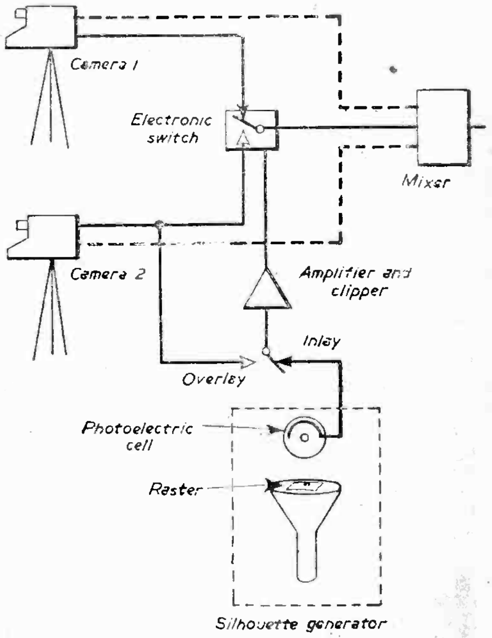
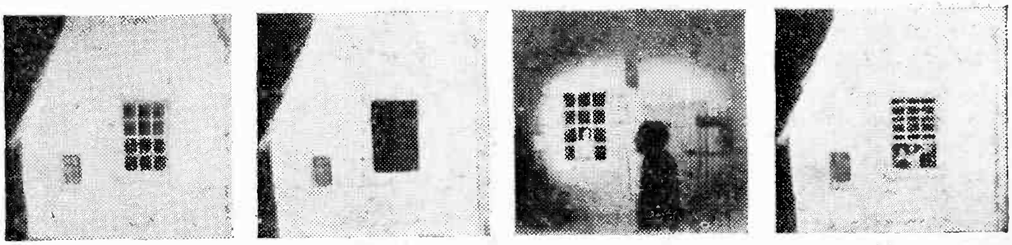


Fig. 2.—Block diagram of the complete set-up for Inlay or Overlay.

in a convenient plane. The light from the image is collected and passed to the photo-electric cell by a lens system. In this plane is a small motorised shutter which can travel at a selected speed across the image.



(a) (b) (c) (d)

Fig. 3.—How the producer sees an Inlay effect on monitor screens.

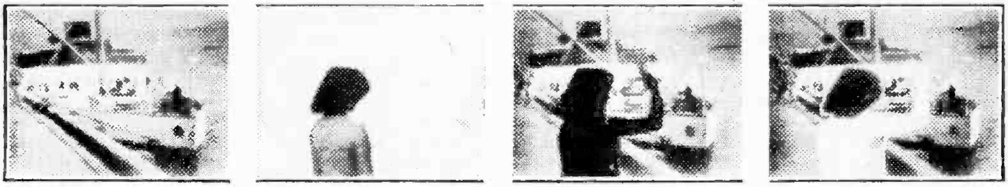


Fig. 7.—Monitor views for an Overlay effect.

This gives the necessary wipe effect, and because it is motorised the control can be extended to the vision mixing operator. Thus, in addition to the usual facilities of cutting, fading and dissolving from camera to camera, the new facility of wiping is added.

In the above description the operation of the electronic switch is dictated by the Silhouette Generator and is confined to static shapes (of any configuration which can be cut out of paper) or edges moving in simple ways. A further extension of the process enables the switch to be controlled by the picture content of one of the cameras being used so that the part cut out of Camera 1's picture conforms exactly to some part of Camera 2's picture, even if it moves as, for instance, an artiste would. That is to say the image of the artiste moving about in front of Camera 2 operates the electronic switch so as to cut his own silhouette in the picture from Camera 1. The composite picture will then give the effect of the artiste moving about freely in front of the background as if he were actually in front of it.

" Overlay "

This method is known as " Overlay" and operates as follows : Camera 2 looks at an artiste in front of a large white screen and the dress and make-up and lighting of the artiste are so adjusted that no part of him is as bright as the screen behind him. The television signal corresponding to this scene emerging from Camera 2 will be as shown in Fig. 6. It will be noted that the part of this signal AB corresponds to the edges of the artiste, and if " window " or clipping circuit is used a pulse of exactly the same length as

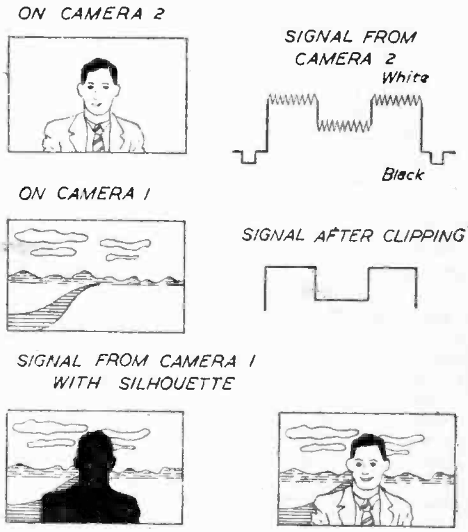


Fig. 6.—Principles of the arrangement known as "Overlay".

the width of the artiste is obtained. If the artiste moves across the picture, then this pulse will move, too. This pulse is used to control the switch so that now the composite scene comprises Camera 1's picture, say, a photograph of a landscape, in front of which the artiste in front of Camera 2 appears to move freely.

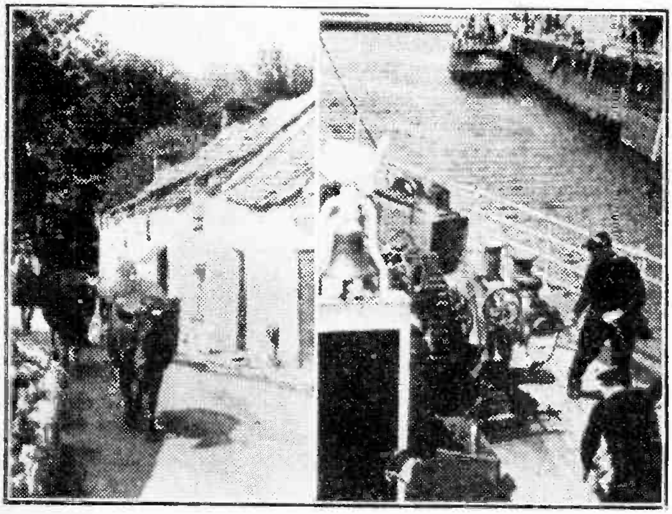


Fig. 5.—Photographic illustration of a " wipe ".

Tricky Process

This method is tricky to use because of the difficulty of ensuring that the brightness of the artiste does not approach that of the white screen. A small amount of perspiration on the forehead will catch the light and give a light spot which will operate the switch with disturbing results.

Fig. 7 shows the overlay process on a television screen : (a) Shows the background photograph of a ship ; (b) Shows the artiste in front of a white screen ; (c) Shows the background photograph with the artiste's silhouette cut out ; (d) Shows the composite picture.

[*Reproduced from Philips ' Forum ' by permission of Philips and the BBC.*]

Testing Line Output Transformers

A SIMPLE COMPONENT TEST USING AN OSCILLOSCOPE

By A. Bartholomew

WHEN a fault is suspected in a line output transformer, this cannot be ascertained by making a resistance test, as a single shorted turn in the windings will give no readable change in the specified D.C. resistance of the windings. Yet one shorted turn can so reduce the efficiency of the transformer that the E.H.T. voltage, when this is obtained from the line fly-back, is non-existent.

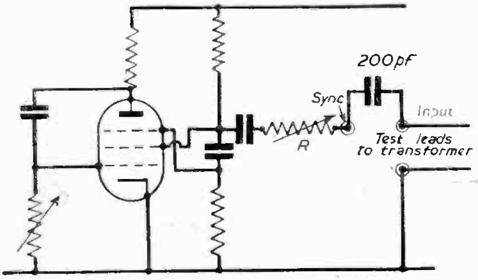


Fig. 1.—Exciting the transformer from a transitron.

However, the damping effect on the transformer, caused by even one shorted turn can be measured by exciting the transformer by a voltage pulse, and observing the ringing effect produced in the transformer on an oscilloscope.

Voltage Pulse

The voltage pulse to initiate the ringing is obtained from the oscilloscope timebase; if the 'scope has a transitron timebase the pulse can be taken from the sync terminal as shown in Fig. 1.

In this type of timebase a pulse is available at the sync terminal, when the variable sync control R is turned to maximum. A small condenser (anything from 100 pF to 1,000 pF) is simply connected between the sync terminal and the input terminal of the scope. With other types of timebase, such as the thyratron, or, if the 'scope has a sync buffer stage, the fly-back pulse can be obtained from the timebase output, or from the horizontal deflector plates of the 'scope tube. In all cases the small coupling condenser is joined to the live input terminal.

The input terminals of the 'scope are then clipped across the primary of the line output transformer, and the 'scope timebase set to run at about 5,000 c.p.s.

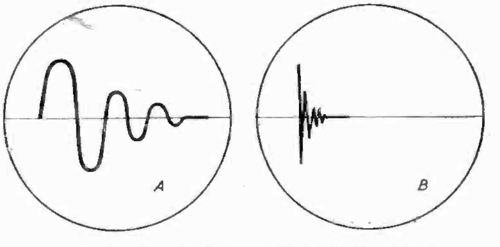


Fig. 2.—Waveforms obtained from the faulty transformer.

This setting need only be very approximate. With the gain of the 'scope turned well up, a wave-form will be observed as in Fig. 2 (A) or Fig. 2 (B).

A faulty transformer will give an indication as in Fig. 2 (B). It should be remembered that any other component which may be faulty, and is connected across the transformer, can give the fault indication shown in Fig. 2 (B).

Disconnect when Testing

When making this test the televisor must be disconnected from the power point. If on making the first test the fault indication is obtained, other components should be progressively removed from circuit. Disconnect the line-scan coils, then width coils, etc. If on removing a component from circuit the "no fault" indication Fig. 2 (A) shows on the 'scope, the part removed is faulty. For instance, it will sometimes be found when testing the Pye model V4, VT4 or VT7 Series Televisor that the shorted turn is in the width-adjusting coil. In this type of receiver, which has high or medium impedance deflector coils, the "ringing" test can be made

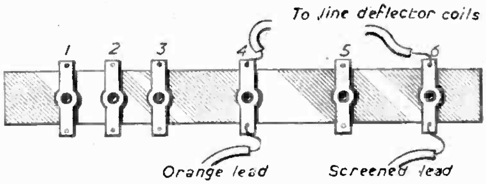


Fig. 3.—Tag strip in some Pye Models.

across the deflector coils. In this receiver the line deflector coils terminate on a tag strip at the rear of the CRT support as shown in Fig. 3.

With most types of televisor however, the test is best made across the primary of the transformer. It is important to remember to disconnect the televisor completely from the mains supply before making the above tests. Whenever possible the ringing test should be made with another televisor of the same type which is known to be operating correctly, as the ringing effect varies slightly according to the efficiency of the transformer, but this will be constant with two receivers of the same type.

V.H.F. Mixers

DETAILS OF A MOST IMPORTANT SECTION OF THE SUPERHET CIRCUIT

By H. E. Smith (G6UH)

THE design and construction of a really efficient mixer stage in a V.H.F. converter presents many problems, not only to the newcomer on these frequencies but also the professional V.H.F. engineer. In the frequency range 100-200 Mc/s it is essential to keep mixer noise down to the lowest possible level.

It is often quoted in various books of reference that "the noise figure of a mixer valve may be referred to the grid of the first R.F. stage by dividing by the stage gain." This quotation implies that provided due care is taken in designing a low noise R.F. stage or stages, the mixer may be left to look after itself.

This, of course, is quite wrong. It is the efficiency and noise figure of the mixer stage which will determine the ultimate performance of the converter. (The term *mixer stage* refers to the mixer valve *plus* oscillator voltage. One cannot refer to the efficiency of a mixer stage without considering it in a working condition, with R.F. signal on the grid, and modulated with voltage from the local oscillator.)

If for operation on 144-146 Mc/s or Band III TV, the following points should be considered :

(a) What type of receiver will be used as the I.F. amplifier ?

(b) Which circuit will provide freedom from oscillator pulling, instability and parasitics ?

(c) Should a pentode or triode be used ?

(d) Should low noise or high gain be aimed at ?

Taking the above points in the order given, let us see how one point depends upon another. If the converter is being built for operation on Band III it will almost certainly be used ahead of a receiver having one stage of R.F. preceding the mixer. When the converter is added, the R.F. stage becomes the first I.F. of a double superhet and, as such, should have a reasonable amount of gain in order that some sort of bandwidth can be obtained. A single valve will hardly be sufficient to provide this gain, so it is necessary to obtain the maximum gain from the mixer stage. A pentode mixer will therefore be the obvious choice.

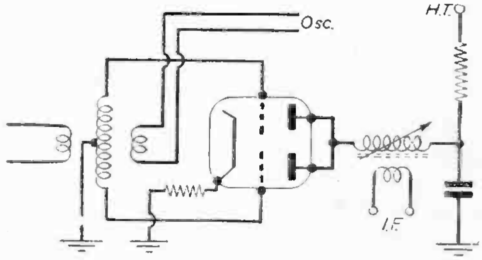


Fig. 3.—"Push-Push" twin triode mixer.

Point "b". Slight oscillator pulling exists with most V.H.F. mixers and this is not serious as most circuits are pre-set tuned in any case. Instability and parasitics can both be caused by poor layout, unsuitable component values, unsuitable valve, or excessive oscillator injection voltage.

Point "d". In general it is better to aim at low noise for 144 Mc/s operation and high gain for Band III work.

The Pentode Mixer

Pentode mixers have a higher noise figure than triodes, but at the same time they are capable of providing many times more gain. By careful adjustment of anode and screen voltage, and using a good

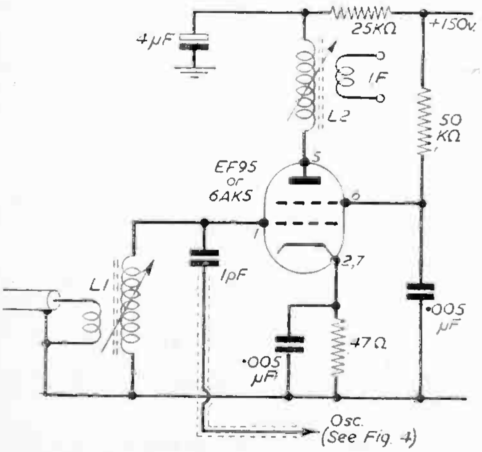


Fig. 1.—Pentode mixer, 100-200 Mc/s.

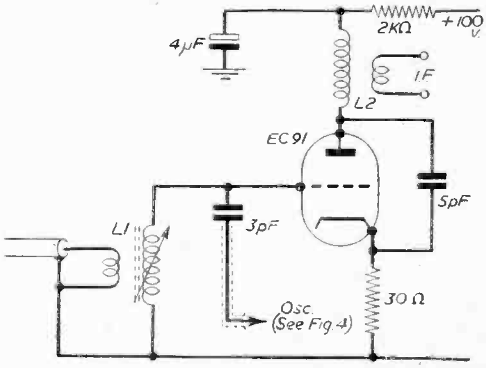


Fig. 2.—Triode mixer, 100-200 Mc/s.

high "Q" inductance for the I.F. coil it is possible to reduce the noise figure to reasonable proportions.

Fig. 1 shows a recommended pentode mixer circuit using a Mullard EF95 (6AK5). This circuit is suitable for operation on 144 Mc/s or Band III. If for the latter, L1 may be shunted with 10 k ohm resistor. A similar resistor could be fitted across L2, but this is not recommended for weak signal conditions because damping the anode coil in this way not only lowers the gain but increases the noise figure. Pentode mixers require very little in the way of oscillator injection and it is most important to ensure that the oscillator section of the converter is completely screened from the mixer, and to be sure that the only way that oscillator voltage can reach the mixer grid is via the oscillator coupling condenser.

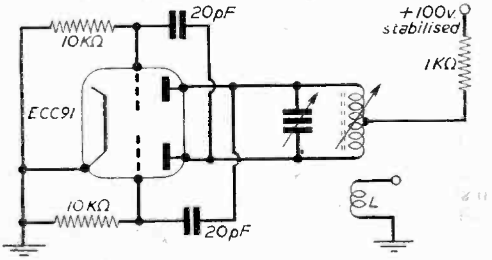


Fig. 4.—Twin triode push-pull oscillator. The coupling coil L comprises two turns wound centrally over the anode coil.

The Triode Mixer

When the converter is used ahead of a communications receiver for 144-146 Mc/s work, the triode mixer has sufficient gain to give a good account of itself. With the cheaper type of receiver it may be found necessary to incorporate an additional I.F. stage, but this is seldom required. The lower noise figure of the triode mixer allows the I.F. gain control of the main receiver to be increased to compensate for the lower gain.

The triode mixer circuit shown in Fig. 2 provides highly efficient mixing of both weak and strong signals. The 5 pF capacitor is connected from anode to cathode directly at the valveholder and prevents any tendency to oscillation on the sidebands of strong carriers. The twin triode mixer in Fig. 3, although often advocated for 144 Mc/s work, has very little to recommend it. The noise figure is more than twice as high, and the gain is far less than a single EC91 (6J4). Twin triode really come into their own

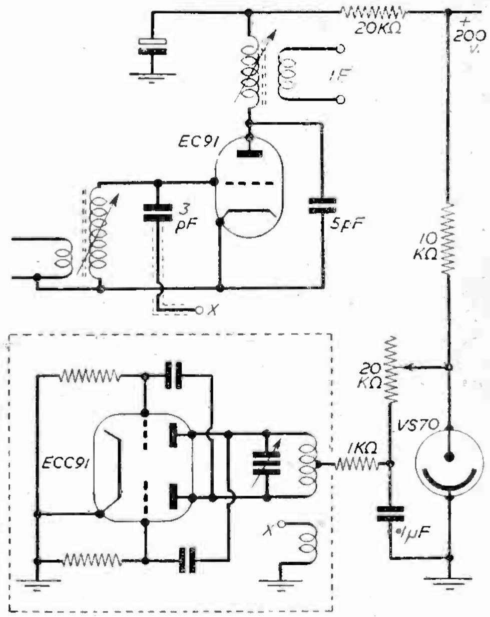


Fig. 5.—A mixer and oscillator combination with variable voltage control to oscillator (Values as Fig. 4).

when used as push-pull oscillators. Fig. 4 shows a really stable oscillator for all frequencies up to 200 Mc/s. As with all self-excited oscillators it is essential to use a stabilised power supply.

Finally, Fig. 5 shows a more flexible triode mixer and oscillator combination with pre-set adjustments allowing the mixer to be set up for optimum performance under weak signal conditions.

(NOTE.—The mixer input circuits shown in the sketches are all arranged for low impedance coupling. This is done for the sake of convenience only, and there is no reason why the mixer should not be coupled from the final R.F. stage by a capacitor of 20-50 pF).

Television at Sea

THE personnel of the Shell-Mex and B.P., Ltd., coastal fleet will soon be able to watch television while they are at sea.

All 14 vessels of the fleet are being fitted with 17in. screen, 13-channel TV receivers, installed by Pye Marine, Ltd. First vessel of the fleet to be fitted is the M.V. *Shell Director*, whose installation has just been completed at Newport (Monmouthshire); other vessels will get their TV installations as they return to port for overhaul.

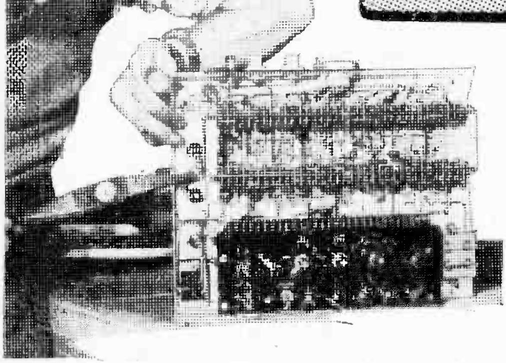
Although a number of other ships, outside the Shell-BP fleet, have so far had TV sets installed with excellent results, this is the first time that an entire fleet has been equipped by the owners, at their expense, for the benefit of personnel aboard. It is also believed to be the first time anywhere that a fleet of vessels has been equipped to receive television while at sea.

Special Aerial

Considerable research and many experiments at sea have been undertaken to perfect the special omni-directional, omni-frequency aerial which must give satisfactory reception, even while the ship is rolling in a heavy sea, and regardless of the direction in which it is headed.

Vessels of the Shell-BP fleet operate from the Orkney and Shetland Isles in the north to the Channel Islands in the south, and also to Northern Ireland and the Republic of Ireland. The 13-channel TV receivers with which they are being equipped will enable the ships' personnel to watch any of the BBC transmitters at present in operation, as well as the other BBC and Commercial TV programmes which will come into being.

Servicing TELEVISION RECEIVERS



No. 13.—PHILIPS PROJECTION RECEIVERS. COVERING MODELS 704, 1700 AND 1800

By L. Lawry-Johns

THIS article will in the main be concerned with the E.H.T. Scanning and Protection circuits, with brief notes on the power supplies.

The 704 and 1700 are 20in. screen models and the 1800 an 18in.; all three use identical circuits developed from the Model 600.

Undoubtedly the most common fault encountered is that of no picture, no raster.

The fault can be difficult to trace and the following procedure should be adopted. Switch the set on and allow to run for a few minutes, noting whether the high-pitched whine or whistle of the E.H.T. section is audible or not.

Then switch the set off and observe the screen. If E.H.T. is present on the C.R.T. anode an area of decaying illumination will be observed. If no illumination is seen and the rather loud whistle of the E.H.T. section is absent the fault is immediately localised to a relatively small part of the circuit. Looking in at the rear of the receiver an extension on the left-hand side of the main chassis carries the E.H.T. section, comprising, on the top of the chassis, the R.F. E.H.T. output transformer, the PL38, referred to as V4, and the UAF42, referred to as V3.

Of the two PZ30 rectifier valves on the left rear end of the chassis the left-hand one is the E.H.T. voltage doubling rectifier (referred to as V1) supplying some 400 volts to the E.H.T. section.

This valve should be tested before proceeding further. The only other part of the receiver which draws current from V1 is the focus coil and its series resistors.

If V1 is in order the receiver should be turned so as to allow the bottom cover to be removed. Under the E.H.T. section will be found a small black transformer and numerous other small components. The transformer is the oscillator (V3) anode-to-control-grid coupling, the windings being referred to as S10, S11. S10 is the primary and should measure 310 ohms. One end is connected to the strapped anode, G2, G3 grids and the other to the 400 volt supply line from V1. This winding very frequently "goes high" or open circuit, thus causing V3 to cease oscillating and the E.H.T. to fail. A variation on this, however, is for the primary winding to vary, causing large fluctuations of picture size, brilliance and focus.

The secondary winding S11 is less likely to give trouble and the primary should always be measured first. The resistance of the S11 winding should be 380 ohms. If the primary winding measures correctly attention should be directed to R14, which is wired across the valve base of V4, although it may be found displaced slightly away from it. It is a 390 K resistor connected from the 400 volt supply line to S10 and therefore supplies the control grid of V3 with an initial positive voltage. If this resistor is open circuited V3 will not oscillate. This is another frequent fault. V3 also contains a diode section, which is fed from a winding on the E.H.T. output transformer. The purpose of this is to supply a D.C. voltage to the control grid of V4 to improve the E.H.T. regulation. In this part of the circuit are included two resistors, R18 and 19, 620 K and 680 K ohm respectively.

Variations in picture size, brightness and focus can often be traced to these resistors when the S10 winding is blameless. It should be noted that most variations will occur on the white picture content.

As well as the various windings the output transformer can also contains the three EY51 rectifiers, which form the voltage tripler circuit, and their associated condensers. This part of the circuit is supplied as a complete unit and must be replaced as such. The output voltage of this unit is 25 K volts and therefore should be treated with respect.

This high voltage is necessary to provide the intense brilliance on the tube face in order to allow the image to be projected by the optical system on to the viewing screen. The small 2½in. C.R.T. is a Mullard MW6/2. In short, it may be said that the E.H.T. section consists of a blocking oscillator driving an R.F. E.H.T. generator, the output of which is voltage tripled to supply the anode of the C.R.T.

Before proceeding further a word of warning may be offered which may save some expense and possible confusion. If the V1 PZ30 is suspected it is not advisable to change it with its neighbour V2.

V1 is used as a voltage doubler whilst V2 is a more conventional H.T. rectifier with strapped sections. After a period of use in their respective positions they are intolerant of a sudden change of voltage-current demand. Blown fuses and an extra PZ30 to buy will often be the result of a change over.

Scanning and Tube Protection Circuits

If upon switching off the receiver the patch of light *is* observed and the whistle of the E.H.T. section is audible, the C.R.T. and E.H.T. sections may be assumed in order. Therefore the search may be directed to a part of the circuit which is rather complicated and which requires an understanding of the basic principles in order to localise the part of the circuit in which the fault exists. The timebases cannot be described in detail without reference to the tube protection circuit which is necessary on this type of receiver.

The purpose of this circuit is to prevent the tube face coating being burned by a concentrated beam of electrons which would result if either or both of the timebases ceased to function. For example, if the frame timebase ceased to operate a horizontal line would appear on the screen of intense brilliance, and when the fault was cleared the raster would be marred by the same horizontal line, this time black instead of white where the coating of the tube face had been burned. A vertical line would result from a line timebase failure, and a central spot would be immediately burned if both timebases ceased to operate. The method of preventing this minor disaster is to apply a heavy negative bias to the control grid of the C.R.T. which is removed only when both timebases are working.

Thus it will be appreciated that an understanding of the circuit is essential in order to locate a fault which has caused this negative potential to be present on the C.R.T. The following rough description will, it is hoped, enable the circuit to be understood so that fault location will be less tedious and perhaps less expensive.

An A.C. voltage derived from the mains transformer is applied to the cathode of one section of a double-diode V11 (UB41). The rectified negative voltage present at the anode of this section is applied via a 1 MΩ resistor to one end of the brilliance control, the slider of which is directly wired to the C.R.T. grid. Therefore, this negative voltage renders the tube inoperative. The 1 MΩ resistor is referred to as R109. The same negative voltage is applied to the G1, G3 grids of the line output UL44 (V21) which functions as a self-oscillating pentode. This voltage renders the valve inoperative and thus the line timebase is completely dead.

To allow the UL44 to oscillate a positive voltage must be applied to counteract the standing negative on the grids. The method of producing this voltage is as follows. Part of the frame-output pulses are connected via .1 μF (C83) condenser to the anode of V25B, double diode (EB91). The resulting D.C. pulses at the cathode are developed across R116 and C81 (5.6 MΩ and .015 μF) and smoothed by R115 and C85 (1.5 MΩ and .01 μF) before being applied to V21. When, and only when, this voltage is applied V21 will oscillate and the line timebase function normally. Thus, it is only left for the negative voltage on the C.R.T. grid to be removed and this is accomplished in the following way.

A winding on the line output transformer is taken to the second anode of V25 and the resulting positive voltage at the cathode of this section is directly applied to the opposite end of the brilliance control to which the negative voltage from V11 via R109 is taken. Thus, the slider of the control can be adjusted so as to allow the C.R.T. to function normally.

Frame Timebase

The triode section of V23 (UCH42) functions as a conventional blocking oscillator. The blocking transformer is identical to that of the E.H.T. section and is referred to as S46/S47. The same remarks apply to the primary S46, which can, and often does, go open circuit, causing the frame timebase to fail and the safety circuit to operate. The frame output valve is a UL41 (V24) connected as a triode. S46 can also vary, causing loss of framehold, varying frame height and intermittent operation of the protection circuit.

There are several resistors in the frame circuit which can give rise to various faults. R106 in series with the hold control is rated at 560 KΩ and will cause the control to be at one end of its travel without securing a steady lock if it should go high in value. R101 is a 1.5 MΩ resistor, which is in series with one end of the height control and will cause an uneven frame-scan (poor linearity) if it should gain in value.

Line Timebase

As already mentioned, a self-oscillating pentode is employed in conjunction with a UY41 (V22) efficiency diode. Several high-value resistors are used in the circuit, and if one of these should go open circuit rather misleading symptoms result. For instance, R119 (10 MΩ) is the series resistor which conducts the negative voltage from V11 to bias back V21 until the frame timebase is operative. Assuming the frame timebase is working and R119 is faulty, a large positive voltage will be present on the grids of V21, stopping it from working and causing excessive current to make the anode of this valve glow cherry-red. Under these conditions the valve cannot oscillate and thus the safety circuit causes the C.R.T. to be inoperative. In the Model 600A this resistor (R119) is valued at 6.8 MΩ (blue/grey/green). R115 and R116 are resistors which can cause the line timebase to be inoperative; these are in the cathode circuit of one section of V25 and are valued at R115 (1.5 MΩ), R116 (5.6 MΩ) (green/blue/green). The line output transformer can be a cause of failure of the line timebase and it is often difficult to decide if this is at fault or not. If V21 and V22 are both in order, all resistors check, frame timebase is working and neither a heavy negative nor a heavy positive voltage is present on the grids of V21 the transformer may fairly be suspected.

A resistor combination or a single resistor may be found on top of the line output transformer which may be too burned to have its colours identified. This is R93, and whatever combination is used for the replacement the total resistance should be 33 KΩ (wired from H.T. to cathode of V22 (UY41). On Model 600A the resistor combination is two 22 KΩ resistors in parallel.

Fault-finding

If, therefore, the C.R.T. is being biased back to cut off by a heavy negative voltage, first ascertain whether the frame timebase is working. There are various ways of doing this without instruments. A .01 μF condenser from the anode of V24 to the volume control will produce a loud hum which varies with the operation of the framehold control is one way. If the timebase is not working, check V23, V24 and S46/S47 transformer as described.

If this part of the circuit is in order check the line timebase for operation. A spark should be able to be drawn from the anode connection of V21 on the top of the line output transformer, and the cathode voltage of V22 should be some 30-40 volts higher than that of the H.T. voltage at the anode of this valve. If it is not functioning and the anode plate of V21 is glowing red, suspect R119 (10 MΩ) of being open circuit. If there is no sign of life in V21, check the screen voltage via R96 and R105. R96 is a 27Ω resistor and R105 is made up of two 5.6 K resistors in parallel. A reading of approximately 130 volts should be present.

If a heavy negative voltage is present on the control-grid (and suppressor) check V25, R115 and R116. It is quite possible for one section of V25 to be out of action due to heater failure, as this valve lights up very brightly when the set is first switched from cold. Also check V22 for emission, etc., and also V21. By this time the fault condition should have been rectified, unless the line output transformer is responsible. It should be noted that the C.R.T. can be burned if a fault develops in R109 which prevents the safety negative voltage being applied.

Transformer Tip

If the E.H.T. or frame blocking oscillator transformer has an open circuit winding it is often worth while to strip back the covering to expose the outer connecting tag. The winding connecting wire will often be found disconnected from the tag, and resoldering or the addition of a small piece of fuse wire will render the transformer 100 per cent. efficient.

Blown Fuses

Check both PZ30 valves for internal shorts, and if upon replacement of V2 and fuses H.T. is still not present or is low, check R7 and R8 anode surge-limiting resistors of V2. These are 68 ohms each. If trouble persists check electrolytics C4 (100 μF), C5/C37 (65/65 μF) and others if these are in order.

Negative Picture

Although this is normally a symptom of a failing C.R.T., it has been known for the anode load resistor of the video amplifier (V18) to cause this fault (3.3 K).

Unsteady Sync

Inability to hold the line or frame timebases should first direct attention to the sync separator V19 (UF42) circuit and then to the video amplifier anode decoupling condenser (65 μF electrolytic).

Microphonic Sound

A "gonging" noise on the sound is usually due to V10 (UAF42) becoming microphonic. If necessary its control grid-leak (1.5 MΩ) may be reduced in value.

If the sound is weak and/or has a vision hum audible the setting of C41 concentric oscillator trimmer should be checked, and if the trouble re-occurs check the associated 33 pF, screen-grid circuit of V14 (UF42) frequency changer, and the valve itself.

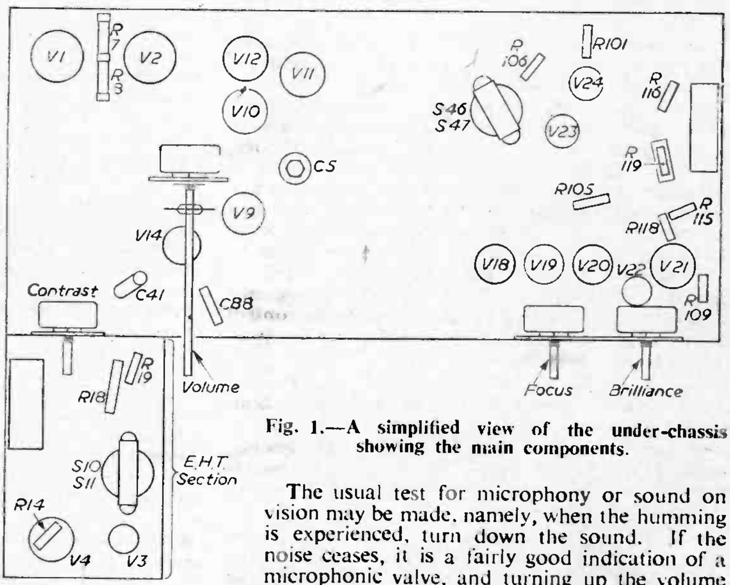


Fig. 1.—A simplified view of the under-chassis showing the main components.

The usual test for microphony or sound on vision may be made, namely, when the humming is experienced, turn down the sound. If the noise ceases, it is a fairly good indication of a microphonic valve, and turning up the volume will enable noise-free reception to be obtained with a very weak output. Increasing the volume will produce the hum if the valve is the cause of the trouble.

Other Models

Models such as the 1400A cannot be serviced by reference to these notes or diagrams. A completely different circuit is employed.

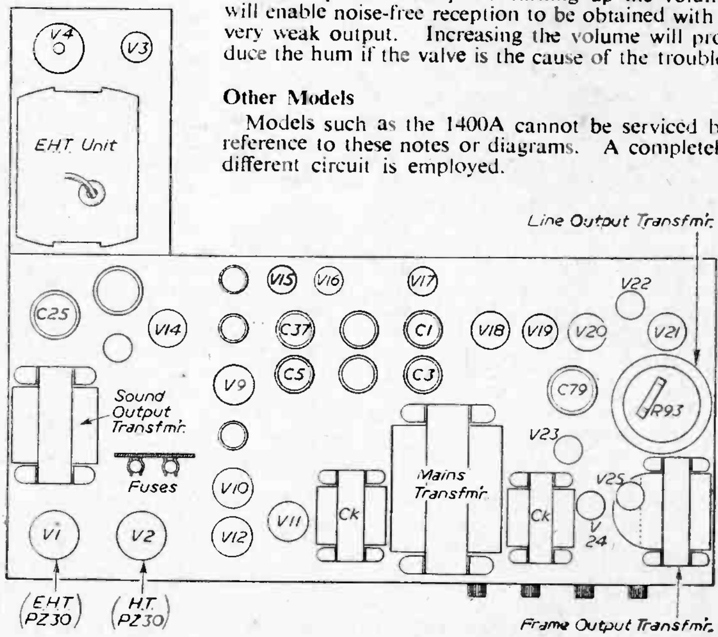
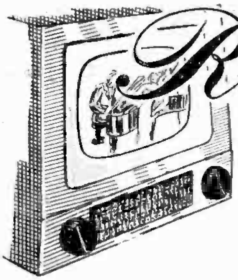


Fig. 2.—Top chassis view.



Receiving the I.T.A.

THE THIRD IN A SHORT SERIES ON THE PROBLEMS INVOLVED IN THE RECEPTION OF COMMERCIAL PROGRAMMES ON BAND III By Gordon J. King, A.M.I.P.R.E.

(*Continued from page* 106, *August issue*)

The Noise Factor

ALTHOUGH the converter circuit described in last month's issue works quite well in relatively high Band III signal strength areas, and is fairly easy to get operational, it does tend to introduce a certain degree of " noise " into the Band I receiver, which is noticeable as grain on a Band III picture which is being received in an area of low signal strength.

It is true that little " noise " is contributed by the aerial circuits themselves at Band III frequencies, but at these higher frequencies quite a lot of " noise " is created by the R.F. amplifier valve following the aerial circuits. In the output circuit of the R.F. valve there is, therefore, developed the signal voltage and also a spurious voltage as the result of this valve " noise." When the incoming signal is very weak it frequently happens that the " noise " voltage is equal to, or rises above, the amplified signal, and a limit is thereby imposed on the maximum useful sensitivity of the R.F. circuits.

As the frequency is raised, say, from Band I to Band III the " noise " level of a pentode valve increases partly as the result of random division of the electron stream between the screen grid and the anode (the partition effect). The total " noise " is also contributed to by other factors, such as the irregular flow of electrons between the cathode and anode, and also the same mode of electron flow in resistors and wires associated with the circuit.

" Noise " is, in fact, produced in all stages and in all components, but provided the first stage has a power gain in the region of four times, the " noise " produced in the following circuits and valves is negligible in comparison and can thus be ignored.

Even though the " noise " produced in current type R.F. pentode valves, such as the EF80, is considerably less than that given by older style counterparts—mainly as the result of special attention given during manufacture to mutual alignment of the grids—the " noise " may still outweigh the signal at Band III frequencies and thus reduce the useful operating range of the associated equipment.

Owing to the absence of the screen grid a triode valve, in a specially arranged circuit, can often be used to greater benefit at Band III frequencies. So used, the grid of the triode is invariably connected to chassis (earthed) and the signal applied to the cathode circuit. The amplified signal in the anode circuit is, therefore, in the same phase as the signal in the cathode circuit, which tends to produce the effect of lowering the input capacitance of the valve. Moreover, owing to the virtual screen between cathode and anode as the result of the earthed grid, the capacitance between anode and cathode is much reduced so that degenerative feedback, which would occur should the valve be used in a more conventional mode, is avoided.

The earthed grid technique is coming into prominence on receivers designed for Band II (the F.M. Band) operation. It has also been used in Band I TV receivers and was in extensive use at one time in American TV receivers. Of late, however, the earthed grid and similar arrangements appear to be losing favour with designers, and this is particularly marked in America where set designers have had considerable experience of investigating V.H.F. television reception and its allied problems.

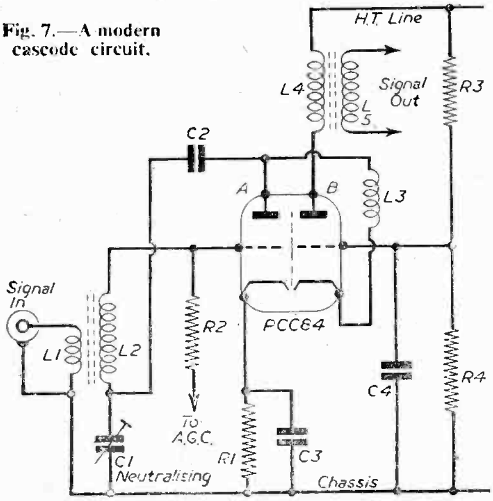


Fig. 7.—A modern cascode circuit.

The Cascode Arrangement

In place of a single triode valve, two triodes are used, the first is connected as a *neutralised* triode, the aerial signal being applied to the grid circuit, and the second is connected in the earthed grid mode. The two triodes—generally a double triode valve is used—are thus treated as a single R.F. amplifier stage (Fig. 7), and between them they are able to provide an R.F. stage having the low noise level of a triode coupled with the relatively high gain and stability of an R.F. pentode.

The Mullard PCC84 was introduced for use as a cascode first stage in composite Band I/Band III receivers. Its two triode sections are well screened from each other and both possess a high slope (mutual conductance) even when used with limited H.T. voltage. This latter factor is considerably advantageous, because it will be seen from Fig. 7 that the valve is best connected in series across a common H.T. supply, and where it is in use in a modern receiver the H.T. across each section may not exceed 90 volts.

The D.C. circuit between the two triode sections is from H.T. negative (chassis) to the cathode of section (A) through R1 ; from the anode of section (A) via L3 to the cathode of section (B) ; and from the anode of section (B), through L4, to the H.T. positive line.

Section (A) is biased in part by the voltage drop across R1, and sometimes in part by an A.G.C. bias conveyed through R2. As the cathode of section (B) is held at a potential well above chassis it is necessary to arrange the grid of the same section to be slightly less positive than the cathode so as to obtain a grid potential suitably negative with respect to cathode. This is achieved by connecting the grid to a tapping on a potential divider which is connected across the H.T. supply—resistors R3 and R4 perform this function.

From the R.F. aspect, the grid of section (B) is properly earthed to chassis through capacitor C4.

In order to neutralise the first section and so maintain a high factor of input damping, a neutralising bridge circuit, comprising capacitors C1 and C2, is adopted—although C1 is shown in Fig. 7 as a trimmer it is often only necessary to install a small value fixed capacitor.

As a means of improving the gain of the stage and rendering it reasonably constant over the whole of Band III the peaking coil L3 is often incorporated. This is arranged to resonate with its associated stray capacitances in the V.H.F. region, when it has the effect of tuning out the output capacitances of the first triode and the input capacitances of the second. Its precise resonance frequency is not critical and no adjustment is usually provided.

A Band III Frequency Changer

For use as a frequency changer at Band III frequencies, Mullard have also introduced an associate to the PCC84, namely, a triode-pentode type PCF80. Both of these valves, incidently, have 0.3 amp. heaters and are, therefore, suitable for A.C./D.C. type receivers where the heaters are series connected ; it should be noted, however, that the

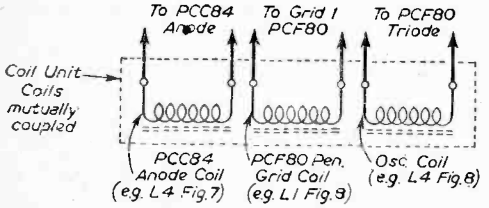


Fig. 9.—An inductively coupled coil unit.

PCC84 heater is rated at seven volts and the PCF80 at nine volts. Equivalent type valves in the Brimar range, but having 6.3 volt heaters, are the ECC84 and the ECF82 respectively.

A Band III frequency changer circuit using a PCF80 is shown in Fig. 8. Here it may be seen that the incoming amplified Band III signal is applied to grid 1 of the pentode section, and that the triode section is arranged as a fairly conventional oscillator. Mixing takes place in the pentode section as the result of a suitable level of oscillator voltage being injected into the control grid circuit through C1.

The required sum or difference frequency is developed in the anode circuit and tuned by L2 and L3. It is here that the Band III signal is fed out at either Band I frequency or, as we shall see later, at an intermediate frequency.

Since the oscillator frequency in Band III converters, adaptors and receivers is considerably higher than that hitherto used in TV equipment the possi-

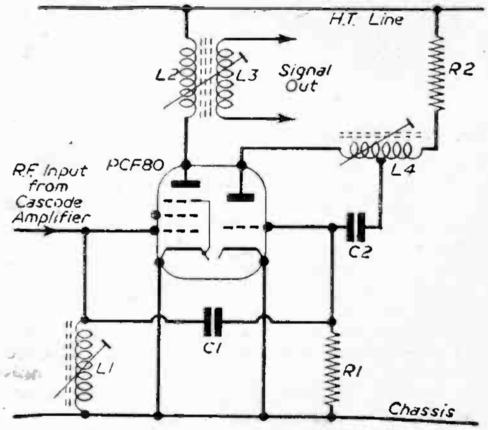


Fig. 8.—A Band III frequency changer circuit.

bility of oscillator drift is somewhat increased. So far as the valve itself is concerned this has a remarkable stability provided due attention is given to ventilation. It must be remembered however that at Band III frequencies only a slight alteration in the value of a circuit constant is liable to incite a frequency shift of several kilocycles. This is of course most marked in the oscillator section where the sound and vision may be severely disturbed as the result of such a frequency drift.

Capacitors are most affected by temperature rise and ordinary mica types tend to increase in value. Ceramic types on the other hand tend to reduce in value. It is, therefore, often necessary to use both types in the oscillator circuit so that the effect of one type outweighs that of the other type.

In order to keep the "noise" of a frequency changer as low as possible and to maintain optimum conversion gain it is most important to ensure that the correct oscillator voltage is being injected into the pentode section of the valve. This factor, unfortunately, cannot be easily checked by the experimenter, although measuring the grid current (control grid) of the pentode section aids in this respect. Normally this is something of the order of 40 microamps, but it is liable to vary slightly between units. As a further aid the anode current of the triode section and the cathode current of the pentode section may be measured, average current readings at these points are 8.5 mA and 6 mA, respectively.

Capacitive coupling between the oscillator and the mixer section of the PCF80 is not always used, in fact some designers appear to favour inductive coupling where, instead of a coupling capacitor such as C1 (Fig. 8) being employed, the coils are mutually coupled together within a coil unit.

The scheme is illustrated by Fig. 9, which clearly shows the coil-unit coils substituted for those in the cascode and frequency changer sections of Figs. 7 and 8.

A Cascode Band III Converter Unit

Fig. 10 shows a practical arrangement of a Band I/Band III converter, together with details of the coils.

It should be found that the coils will tune to both Channels 8 and 9, but if this is not found possible in practice the spacing between the coil turns should be altered as was described in last month's instalment. So that any oscillator drift may be counteracted, a fine adjustment of oscillator tuning has been provided on this circuit, the control of which should be brought out at an accessible position on the converter panel.

Good quality components should be employed, and it should be borne in mind that successful operation will be achieved only if the unit is mechanically stable and the shortest possible wires are used to connect the coils and components to the valveholder tags—in this latter respect extra special care should be given in finding the most desirable layout of components and coils relative to the valveholders.

An A.C./D.C. type power pack is shown, but this may be altered if desired and a transformer used instead, in which case 6.3 volt valves would be more suitable.

The line-cord should be cut to have a resistance suitable for the local mains voltage—the resistances which correspond to the normal range of mains voltages are detailed below :—

200 volts = 613 ohms
210 volts = 646 ohms
220 volts = 680 ohms
230 volts = 713 ohms
240 volts = 746 ohms
250 volts = 780 ohms

Tuning in the I.T.A. Programmes

If the A.C./D.C. power pack is used it must be remembered that the converter chassis will be "live" to earth if the mains is incorrectly connected to the converter—special *care* should be given to this point, therefore.

After connecting the converter to the receiver, the receiver Contrast, Sensitivity and Volume controls should be turned to maximum, and the converter Band Switch set to the "Band III" position. A Band III aerial suitable for the district should, of course, be plugged into the converter.

The oscillator coil L7 should then be carefully adjusted until the sound signal is heard—this may be

(*Continued on page 176*)

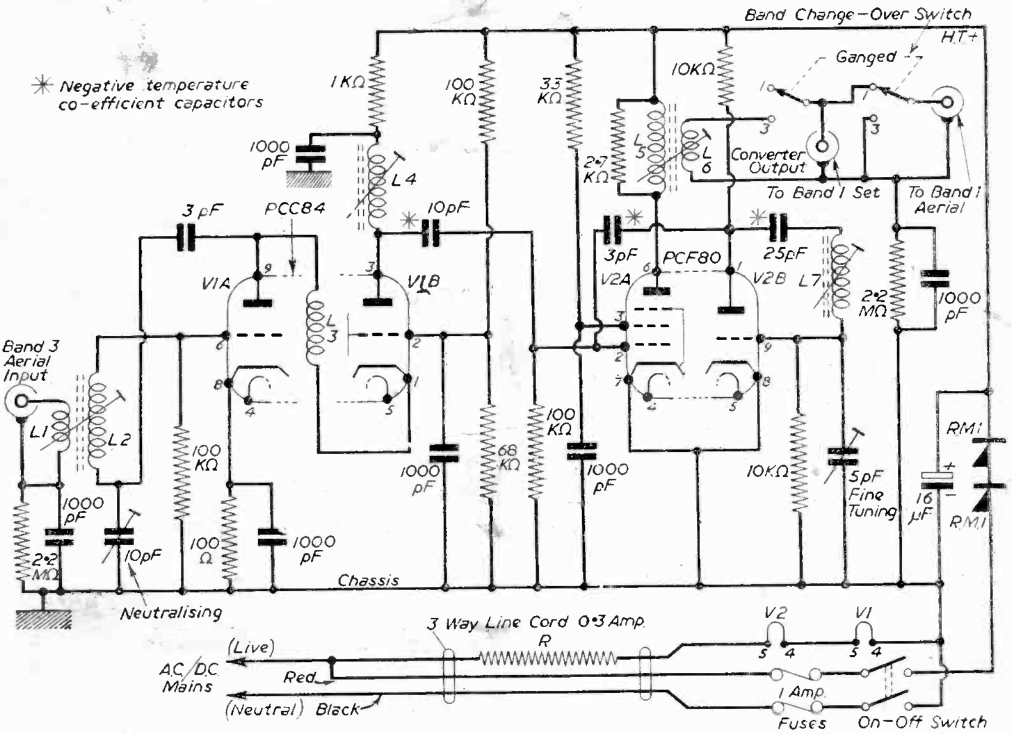
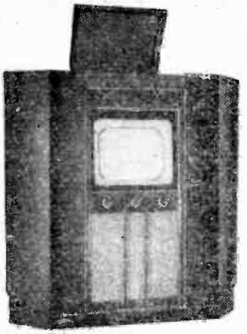


Fig. 10.—A cascode Band III converter circuit.

COIL WINDING DATA

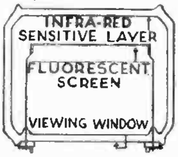
All coils wound on Aladdin low-loss ¼in. dust-cored formers.
L1—1 turn p.v.c. covered wire spaced ⅛in. from L2.
L2—2.5 turns 20 s.w.g. spaced ¼in.
L3—4 turns 26 s.w.g. insulated, close spaced (self-supporting).
L4—2 turns, wire and spacing as for L2.
L5—24 turns 26 s.w.g. insulated, close spaced.
L6—2 turns p.v.c. covered wire, spaced ⅛in. from L5.
L7—3.5 turns 20 s.w.g. spaced ¼in.

CHANCE OF A LIFETIME



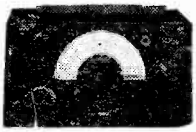
Corner Console. A massive cabinet but being corner fitted is not out of place even in a modern small living-room. Overall dimensions of this cabinet are 47in. wide x 31in. (deep to corner) x 50in. high. Made to house "15" Televisor, Radio Unit, Amplifier, Tape Deck, etc. Originally £18—our price, **£10**, plus 30/- carriage.

SNIPERSCOPE



Famous wartime "cats eye" for seeing in the dark. This is an infra-red cell with a screen which lights up (like a cathode ray tube) when the electrons strike it. It follows that as light is rich in infra-red these cells will work as photo cell for: burglar alarms, counting circuits. Price 5/- each. Data will be supplied with cells if requested.

R1155 YOURS FOR 39/-



The R1155 is considered to be one of the finest communication receivers available to-day. Its frequency range is 75 kc/s to 18 Mc/s. It is complete with 10 valves and is fitted in a black metal case. Made for the R.A.F. so obviously a robust receiver which will give years of service. Completely overhauled and guaranteed in perfect working order. Price **£9 19/6**, or H.P. terms available on request if required. Carriage and Transit Case 15/- extra. **Mains Power Pack, £5 10/-** or in polished cabinet, **£6/15/-**.

A SIMPLE AND USEFUL TESTER

A very simple instrument for measuring E.H.T. and performing many tests is described in the May issue of this magazine. We will supply all the parts given in the parts list on Page 532 (except the item Box Panels, etc.) and the cost is 20/-, post free. Paxolin panels available, 6d. each.

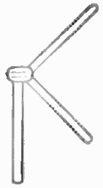
ADDITA—BAND III CONVERTER

Any television receiver, whether superhet or straight A.C. or A.C. D.C., home constructed or factory built, which at present will receive Alexandra Palace will also receive I.T.A., if this converter is added. No modifications at all are necessary to the receiver. Simply plug in the aerial leads and connect to A.C. mains. The convertor is in a neat metal case with provision for fixing to the side or the back of the set. Price **£6 10/-**, or H.P. terms available on request if required.

BUILD YOUR OWN CONVERTER

You can save at least £2 on the above if you build the converter yourself. Price of all components including stove enamelled case and even transfer for the front is **£3 10/-** or **£4 10/-** if mains components also required. Data is included free with the parts or available separately price **2/6**.

THIS MONTH'S SNIP



An interesting aerial, "The Folded V" was described in the July number of this magazine. We tried this and found it to be most efficient, both for interference reducing and increasing reception strength. It is simple to make. We, therefore, offer this aerial as a constructor's kit. The kit comprises alloy elements and connectors, neat plastic centre piece with polythene insulators and saddle for mounting on existing mast or in loft, window frame, drain pipe, etc., etc. Price **8/6**, post 1/6. Construction data free with parts or available separately, price **1/-**.

3 INSTRUMENTS FOR 25/-

THE "ELPREQ" Band III SIGNAL GENERATOR

1. Will provide the signal for tuning to any Band III station.
2. Can be used as a grid-dip meter for checking the frequency of Band III T.V. aerials. Coils, etc.
3. Can be made to give a pattern on T.V. Receiver screen.

This instrument is very easy to correctly calibrate and all the necessary equipment to do this is included in the kit. All the parts including valves, tuning condenser and metal chassis are available as a Kit at 25/- post free. Constructional data free with Kit or available separately, price 2/6.

DEMONSTRATIONS AT ALL BRANCHES

In the ELPREQ F.M. Tuner four valves and two crystals are used. The last valve acts as a limiter so reducing the necessity of exact tuning and at the same time improving interference rejection. Stability is extremely good and tuning most simple.

With only a simple indor aerial made by parting the ends of ordinary flexible cable this tuner works very well at Eastbourne (over 60 miles from London) and we await reports from even greater distances.

Cost of all parts including valves, prepared metal chassis, scale, slow motion drive, pointer, tuning knob, in fact everything needed to make the complete unit, is **£6 12/6**, data is included free with the parts or is available separately, price 2/-.

THE SENSITIVE TWO-VALVER

The circuit and constructional details of a small but useful portable high-gain all mains receiver appeared in the August issue of *Practical Wireless*. To constructors wishing to make this we will supply all parts listed on pages 481 and 482 at a special price of **57/6**, plus 2/6 post.

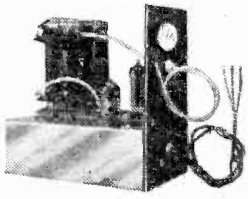
CHASSIS ASSEMBLY

3 colour, 3 waveband scale covering standard Long, Medium, and Short wavebands, scale pan, chassis punched for standard 5 valve superhet, pulley driving head, springs, etc., to suit. Scale size 14½in. x 3½in. Chassis size, 15in. x 5½in. x 2in. deep. Price 15/-, plus 1/6 post.

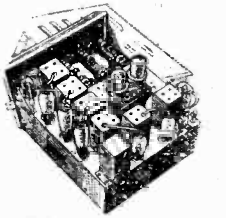
1in. MICROMETER

Exceptional purchase enables us to offer a 1in. precision micrometer at the very low price of **10/-**. A micrometer is an essential part of an engineer's equipment. If you act quickly you can acquire one now at the remarkably low price of 10/-, post free.

THE ELPREQ E.H.T. GENERATOR



This is a made-up unit, power consumption (6.3 volt 8 amp. filament and approx. 59 mA H.T.). contains three BVA valves. Output from 6 kV to 9 kV with normal H.T. rail input but somewhat higher outputs can be obtained with higher H.T. supply. Valve rectification is employed in the output stage. Dimensions are 6½ x 4½ x 7in. Price 69/6, post, packing, etc., 5/-.

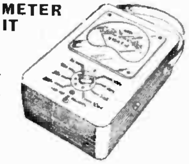


MADE FOR THE JOB

This ex-W.D. 10-valve superhet was designed to receive 200 megacycles transmission so it will require virtually no conversion to receive the commercial T.V. programmes.

These contain 6 valves type SP61, and one each RL7, RL6 and EA50. Six IF transformers 12 Mc/s. band, and hundreds of other useful components. Price 59/6, plus carriage and packing 7/6. These receivers are unused and perfect.

MULTI-METER KIT



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

ELECTRONIC PRECISION EQUIPMENT, LTD.

Post orders should be addressed to Dept. 5, 123, Terminus Road, Eastbourne.

Personal shoppers, however, can call at:

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

High-Q Interference Rejectors

AIDS IN CLEARING C.W. INTERFERENCE ON TELEVISION RECEIVERS

By "Serviceman"

TROUBLE is being experienced in many quarters from C.W. interference arising from general service transmitters in the 90-metre band. These services cover taxi, ambulance and other mobile transmitters and their stationary counterparts.

Where R.F. televisors are used the interference can be particularly troublesome, but even superhet circuits are not free—especially in the case of the popular R1355 combination.

The first steps to be taken in such cases is to check the aerial system and, if possible, to re-orient it against the interference. In this connection it is as well to remember that the "H" aerial shows very little signal loss over a surprisingly wide arc and can be turned so that its back is towards the interfering source. Much the same conditions apply to the "X" aerial.

In severe cases, where the constructor's apparatus is beyond criticism, the Radio Interference Branch of the Post Office can be called in. However, quite often the constructor can cure the trouble himself by the application of a High-Q rejector inserted in the aerial circuit. The cost is negligible and the efficiency can be extremely good.

The rejector described here is simply a section of coaxial, or balanced twin cable connected in parallel with the aerial input circuit. Where the existing installation is coaxial then a length of similar cable should be used and where the existing input is balanced twin, then a balanced twin section of cable should be used.

The scheme is of the utmost simplicity: the length of cable used for the rejector is connected in parallel with the aerial input socket as shown in Fig. 1. The secret of its operation is in knowing the actual length of the rejector cable.

Theory of Operation

A length of transmission line one-quarter of a wavelength long can present a low impedance or high impedance to the frequency to which it is "tuned," according to whether the end of the section is left open-circuited or short-circuited. The reason for this is that the electric wave travelling down the line is reflected in part or in whole, when the line is terminated with an impedance other than the characteristic impedance of the line.

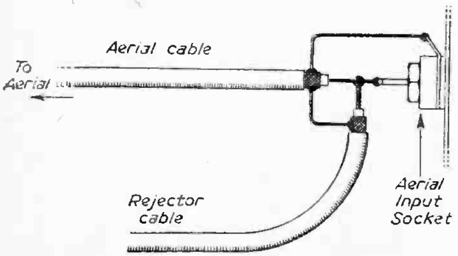


Fig. 1.—Connection of the rejector.

In Fig. 2 we show the voltage and current on a line which is open-circuited at its far end. As the current reaches the end of the line it collapses as it has nowhere else to go. It drops to zero and the voltage rises to maximum. This is what we expect, but what is not always realised is that matters do not halt at that point. The current collapses to zero, and in doing so creates a changing magnetic field which generates a current in the wire in the *opposite* direction to the original.

The current, therefore, travels back up the line in the reverse direction!

A little thought will show that the current travelling back up the line (the reflected current) is out of phase with the original, the degree of the out-of-phase being dependent upon the degree of mismatch at the end of the cable.

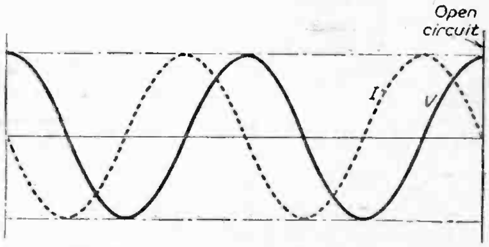


Fig. 2.—Reflected current and voltage.

The current wave does not travel back unaccompanied, of course, but has an associated voltage wave, the two being out of phase with each other.

It is possible to cut the line at any point and to obtain any relation between current and voltage which we require. For example, if the line were cut at point "a" (Fig. 3) we have the condition of rising voltage and falling current; this is if we look at the line from the "a" end. These are the conditions obtained with a capacitative reactance, and the line will, in fact, show capacitative reactance if cut at this point.

The point "a" has been chosen as being one-eighth wavelength from the end of the line.

Let us now cut the line at point "b." Here the voltage is at zero and the current at maximum, as it would be in a short circuit, or very low impedance. If the line were cut at this point, then, it would exhibit very low impedance. Point "b" is one-quarter wavelength from the end of the line.

If the line were to be cut at point "c" it will be seen that, looking at the line from the "a" end, the voltage is falling and the current is rising, which is the condition we get in an inductive reactance. If cut at this point, then, the line would exhibit an inductive reactance. This is at three-eighths wavelength from the end of the line.

At one-half a wavelength we have zero current and maximum voltage (point "d") which is the same condition as at the end of the line. At this point the line would, therefore, exhibit a very high impedance.

From this point back to the beginning of the line the whole process is repeated, one cycle of the conditions being operative over each half wavelength. From this it follows that a line one-half a wavelength long can exhibit any form of reactance which we require, simply by insertion at the appropriate point.

In Fig. 4 we have a line which is short-circuited at its distant end. In this case the current will suddenly rise to maximum as it encounters the short-circuit and the voltage will drop to zero. This condition is the reverse at that of the open-circuited line, but the final result is effectively the same, i.e., reflected current and voltage out of phase with each other, will travel back along the line.

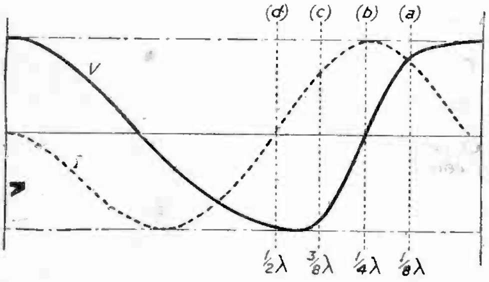


Fig. 3.—An open-circuited line.

Suppose we were to cut the line at "e" then, looking at the line from the "a" end we have a rising current and a falling voltage which is what we would get from an inductive reactance. This is at one-eighth wavelength from the end. At point "f" we have zero current and maximum voltage which is what we would get with a high impedance.

At point "g" which is three-eighth wavelength from the end we have a falling current and rising voltage which is the same as that in a capacitative reactance, while at point "h" we have zero voltage and maximum current which is the same condition as that obtaining at the end of the line.

If Figs. 3 and 4 are compared the following points will be noted : (a) if the line is cut at one-eighth wavelength it will exhibit capacitative reactance if the end is open-circuited or inductive reactance if the end is short-circuited ; (b) if the line is cut at one-quarter wavelength it will exhibit a low impedance if the end is open-circuited, or a high impedance if the end is short-circuited.

It will be clear that a line one-quarter wavelength long can be made to exhibit a high impedance or a low impedance according to whether its end is short-circuited or open-circuited

Now note this most important fact : These conditions apply only at the *frequency to which the line is cut.*

A line which is one-quarter wavelength long at say 90 Mc/s, will exhibit a low impedance to that frequency, if its end is left open-circuited It will not, however, exhibit a low impedance to a frequency of (say) 80 Mc/s.

Herein lies the key to the High-Q rejector. By connecting a length of coaxial cable directly across the aerial input socket, and adjusting its length so that it is exactly one-quarter wavelength long at the interfering frequency, it will act a short circuit to that frequency, leaving the main signal practically unaffected.

Cable Velocity Factors

The physical length in feet and inches, of a wavelength in free space, is not the same as its physical length when travelling along a cable.

Each cable will propagate the signal according to its own particular characteristics, and to arrive at the correct length of cable for any particular frequency it is necessary to multiply the free-space wavelength figure by a constant, which is termed the velocity factor of the cable (Vo).

For most of the cables used for television, both balanced twin and coaxial, we can take the Vo figure as being 0.66.

To cut a length of cable which is one-quarter wavelength long, it is necessary to divide 300,000,000 by the frequency in cycles per second, convert the answer which is in metres to feet and inches, multiply this by 0.66 and this gives the actual physical length of the cable.

Under practical conditions it is simpler to use the formula :

$$L = \frac{309}{f}$$

Where L = length in feet.
f = frequency in megacycles.

Add one foot to this length and then adjust the actual length to the true length by experiment.

Where the interfering frequency is actually known then it is a fairly simple matter to arrange the rejector. All that is required is to cut a one-quarter wavelength section of cable which is resonant to the interfering frequency, and to connect the cable in parallel with the aerial socket.

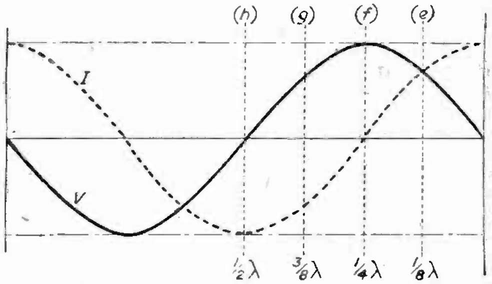


Fig. 4.—A short-circuited line.

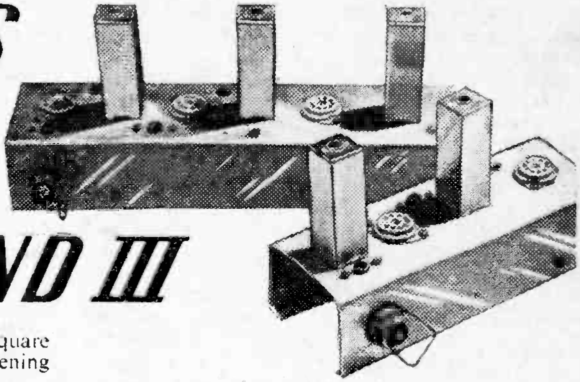
If the actual frequency is not known, but the approximate band in which it is operating is known, then cut the cable for the lowest frequency in that band and connect it in parallel with the aerial socket. Now, by the exercise of patience, it should be possible to adjust it to reject the unwanted signal. Simply cut off 1in. from the end of the cable ensuring that the ends are left open-circuited and note the result on the screen. Repeat the process until the required length is obtained.

When the length of cable approaches that of the unwanted signal the latter will become progressively less and less strong ; a minimum or null point should be reached and if cutting is continued beyond this point the unwanted signal will increase in strength.

CONVERTERS FOR BAND III

THIS MONTH WE DESCRIBE THE CONSTRUCTION OF A FRINGE MODEL

(*Continued from page 122 August issue*)



TO ensure neatness verify that the can is square with the chassis before the final tightening of the bolts.

The I.F. transformer is dealt with in a somewhat similar manner. This is L6. The number of turns will depend upon the local channel and should be as given in Table II. If the televisor has a five-channel switching unit which is easily accessible, then the coil should be wound for the channel to which it is intended to switch the televisor to avoid breakthrough as discussed in a previous paragraph.

To wind L6 a slightly different technique is required. First, wind on the main coil and fit the side wires for this coil. Take a note of the connections of the side wire so that no confusion results when the coil is mounted. If this is not done it may happen that the secondary winding is wired into the anode circuit of V2 instead of the primary winding.

Now fit the remaining two side wires and wind on the small coil. This is two or three turns and it will be found quite an easy matter to thread the wire through the side wires.

The small winding should be wound in the same direction as the main winding and within ¼in. of it.

Having soldered the ends to the side wires the coil must be fixed in position and then the can bolted on top of it.

A single tuning core is required for L6 and for L2.

Wiring

We are now ready to commence the wiring of the unit and the novice is strongly recommended to use the wiring diagram. We would like to recommend the more experienced worker to this diagram also, as the layout must be adhered to.

The golden rule in the wiring is very short leads and good contact with the respective tags before the solder is applied. It is a good scheme to solder each wire as it is placed in position so as to avoid the possibility of dry joints, which may be difficult to trace at a later stage.

Commence work by winding L1. This is done with the coil form in position. 22 s.w.g. bare wire can be used. Slip one end of the wire through the earth tag on V1 holder and wind one complete turn; now slip the wire from the former and make a twist at half a turn. Solder the twist and then replace on the former and wind the remaining turns, taking the top end to L2. Fig. 6 shows the method. The turns should be spaced about ⅛in. to ¼in. apart.

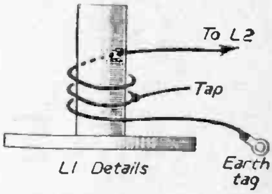


Fig. 6.—Details of coil L1 for both models.

The connection between the centre of the coaxial socket and the half-turn should be made with a piece of stiff straight wire.

Now wire in R1 and C2, followed by R2 and C4. Make the connection from the other side of L1 to the valveholder and then wind L2 *in situ*.

For this coil enamelled wire of the same gauge as used for L1 can be employed.

This coil required five turns of wire spaced at ¼in. Start the winding by soldering the end of the wire to pin 8 of the valveholder winding in a clockwise direction and taking the far end to pin 1 of the valveholder.

The Oscillator Coil

The oscillator coil should be wound at this stage. It is not at all difficult, but the beginner is advised to follow the detailed instructions.

First wire one end of C6 to

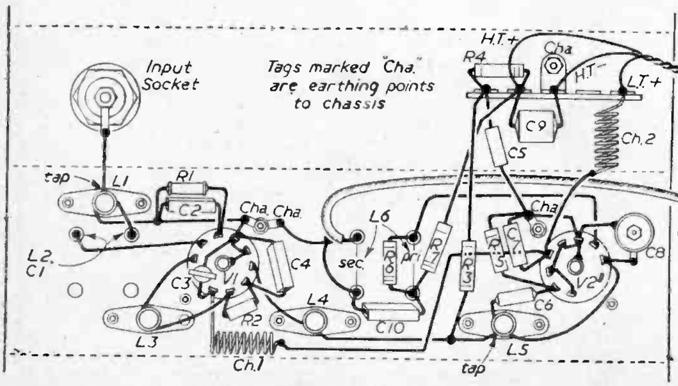


Fig. 7.—Wiring diagram ...

length of wire as possible and hold the pliers on the wire between the tag and the condenser so as to convey away the heat generated by the soldering.

Now cut off the wire at the other end of the condenser, leaving about $\frac{1}{8}$in. of wire from the condenser. On this solder the wire for the coil, which should be 22 s.w.g. and can be bare wire. Now wind on three turns in an anti-clockwise direction (don't bother with the spacing at this stage), and then slightly unwind the last turn and twist the wire so as to form a centre tap. A drop of solder will prevent the twist from unwinding. Now complete

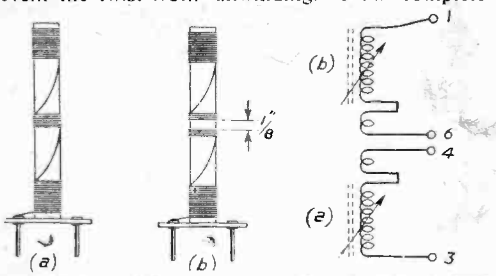


Fig. 8.—Details of the I.F. coils. (a) and (b) windings are identical.

the correct number of turns (five and a half) and take the far end of the coil to pin 8 of V2.

The spacing between turns can now be adjusted so as to be about $\frac{1}{8}$in.

At this point L4 can be wound. Wire of the same type as used for L3 can be employed.

First solder one end of the wire to pin 6 of V1 and then wind three turns of wire spaced at $\frac{1}{8}$in. in an anti-clockwise direction. Actually two and a half turns are required for this coil so the next step is slightly to bend the first turn with the pliers so that the wire starts its winding half-way round the coil form. The top end of the wire can then be taken directly to the centre tap of L5 and it should be found that the coil has now two and a half turns as specified.

Now complete V1 wiring.

Wiring V2

Wiring may now proceed on V2 ; and commence by wiring C7, followed by R5 and the earth wiring. Wire R4 across the tags of the tag strip and follow this by C5, R7 and C9, which is mounted across the tag strip. C10 can be wired and then R3. C8 should be mounted vertically, the centre pin going to the centre section of the valveholder, which should be earthed.

The condenser must be mounted very firmly so that it will not shift.

R6 must be wired directly across the side wires from the coil. The coaxial cable can then be fitted.

The more experienced constructor may regard the detailed instructions on the winding of the coils as superfluous, but nevertheless he is advised to study them as by following this method the wiring up of the circuit will be found much simpler.

TABLE II

	Anode coil	*Coupling coil*
Channel 1 ...	11 turns	3 turns
Channel 2 ...	10 turns	3 turns
Channel 3 ...	9 turns	2 turns
Channel 4 ...	8 turns	2 turns
Channel 5 ...	7 turns	2 turns

If balanced twin cable is required from the output of the converter to feed the televisor, then the small coil of L6 can be wired directly across the ends of the balanced twin cable, no connection being made to chassis.

Check the wiring of the circuit and then solder the ends of a three-core cable to the tag strip. One wire is for the " live " heater, one for HT + and one for earth.

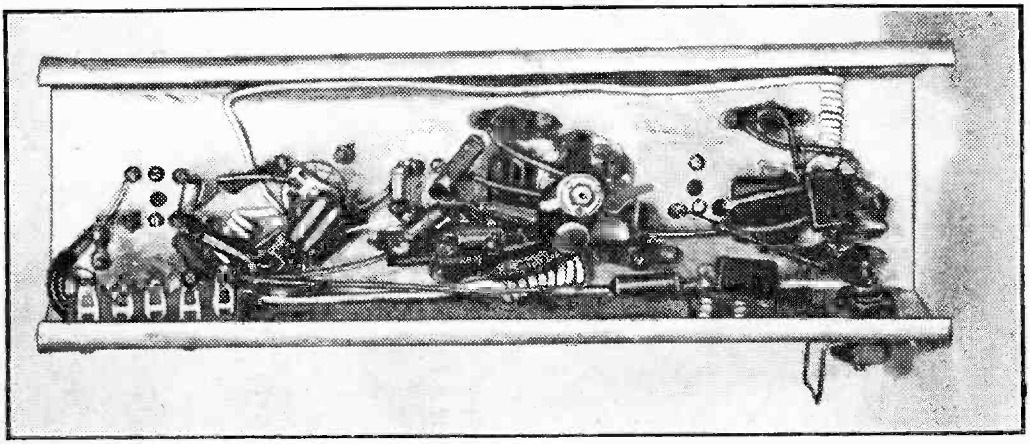
Alignment

Connect a Band III aerial to the input socket and connect the output to the televisor. Confirm that a programme is being transmitted at the time of the test.

Set the cores midway on all formers and if regeneration is experienced adjust L3. Tap the Band I aerial on to the grid of V2 and adjust L6 for maximum response.

Now adjust L5 with C8 set at its mid-position until the signal is received on the televisor. If nothing is heard, then adjust C8 to minimum and try again or adjust C8 to maximum.

When the signal is received adjust L6 for maximum



Underside view of the fringe model.

response and follow this by L4 and L1. If regeneration occurs further adjustments to L3 should cure it.

Now adjust C8 for optimum response between sound and vision and L2 for zero breakthrough of Band I stations.

L3 should normally be set at the mid-position between the two oscillatory points. This is the optimum position for minimum noise.

Note that plenty of time should be allowed for the convertor to warm up and under conditions of future use a minimum of five minutes should be allowed to let it settle down.

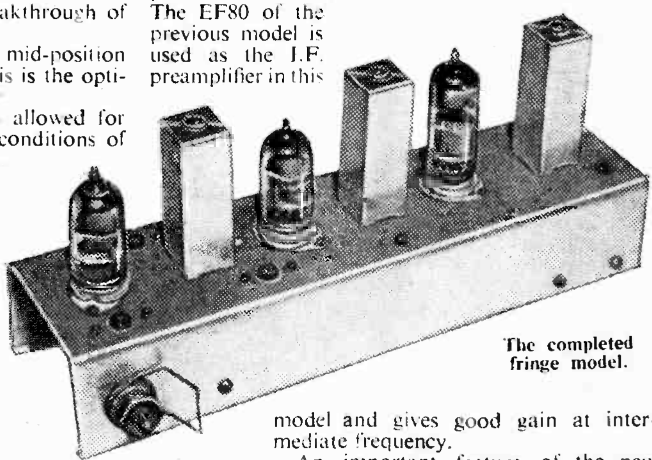
The unit can be fitted inside a television cabinet, the main precaution being to keep it away from excess heat. A console model is ideal as there is plenty of room available.

The Fringe Model

This model is for use on Band III, where the signal is weaker. It *must* be employed with a good aerial system so as to get as great a signal-to-noise ratio into the first stages as possible.

Greater gain has been obtained, first, by use of a separate triode oscillator and the provision of a preliminary stage of I.F. amplification. Amongst the many possible combinations of circuits it was considered that this would provide the best arrangement. Another important factor is that the constructor of the normal service area model can convert to the fringe model if he finds that greater gain is required. There is no wastage of components.

The R.F. stage is almost identical to that of the previous model and uses an ECC81 as the first valve. The EF80 of the previous model is used as the I.F. preamplifier in this model and gives good gain at intermediate frequency.



The completed fringe model.

An important feature of the new design is the use of a triode pentode oscillator and mixer valve. By using a separate triode oscillator greater gain is possible, but the difficulty of such arrangements is that in the avoidance of the use of a separate valve.

The theoretical circuit is shown in Fig. 9. It will be seen that the first stage is similar to the previous model, an ECC81 or 12AT7 being used.

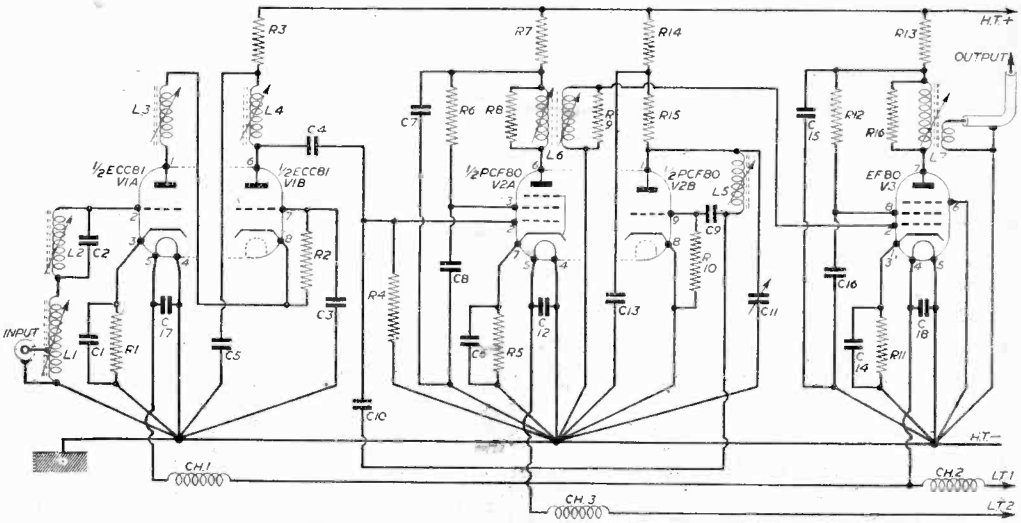


Fig. 9.—Theoretical circuit of the fringe model converter.

LIST OF CONDENSER AND RESISTOR VALVES

Resistors			Condensers		
R1—150 μ	R7—2.2K	R12—1.5K	C1—50pF	C7—470pF	C13—470pF
R2—470K	R8—4.7K	R13—3.3K	C2—10pF	C8—470pF	C14—470pF
R3—1K	R9—6.7K	R14—3.3K	C3—.001 μF	C9—10pF	C15—470pF
R4—4.7K	R10—27K	R15—27K	C4—50pF	C10—2pF	C16—470pF
R5—680 μ	R11—180 μ	R16—4.7K	C5—470pF	C11—0.30pF	C17—470pF
R6—2.2K			C6—470pF	C12—470pF	C18—470pF

The output from this stage is fed directly into the grid of the mixer, which is the pentode section of the PCF80. The oscillator is a standard Colpitts type and follows similar principles to that of the previous model except that injection is made directly into the grid of the mixer by use of a small condenser with a capacity of 2 pF.

The first I.F. transformer is connected in the anode of the pentode section and is a bandpass coil using one of the Haynes coil units. Its output is passed to the I.F. preamplifier V3, which behaves as a normal amplification stage at intermediate frequency.

Output from this stage is taken from the second I.F. transformer, which has a step-down winding so as to match into the coupling cable connecting the unit to the televisor.

A power supply similar to that used for the service area model is employed with the addition of an auto-transformer for providing a 9 volt supply for V2.

The Chassis

This is made from aluminium sheeting according to the diagram given in Fig. 10. The main holes should be drilled before the chassis is bent into shape.

The valveholders should be mounted in position, fitting an earthing tag under one of the bolts at each valve and taking careful note of the way the valve-holder faces.

The aerial socket and the Band III coils L1, L3, L4 and L5 can be mounted in position. The coils are wound *in situ*.

Construction

L2 should be made up first. This is exactly the same as for L2 in the previous model. L7 is made up identically to L6 in the previous model. L6 in this model requires special comment.

L6 is in effect two coils which are coupled together. The coils "a" and "b" should have the turns specified in Table II. The method of winding is as follows:

Use 28 s.w.g. enamelled or covered wire ; roughen the surface of the coil form to ensure that the turns adhere to the surface. This can be done with some fine sandpaper.

The wire is slipped into one of the eyelets at the bottom and then the appropriate number of turns are closewound. The wire is then spiralled up to the approximate centre of the coil form and 5 turns are wound on. From this point the wire is again spiralled to a point where the remainder of the turns as given in the Table can be wound on.

The side wires and top paxolin holder should be fitted and the beginning and end of the winding should be soldered to opposite side wires. Now cut the centre turn of the central winding of 5 turns and take one wire to one side wire and the other wire to the opposite side wire. The position should now be that two separate coils are on the former, one at the top and one at the bottom with a coupling section in the centre. The top section is tuned ; the bottom section is tuned ; the centre section merely forms the couplings between the two coils (see Fig. 8).

Great care must be taken to note which side wires are connected to which coils so that no confusion arises when the circuit is wired. Coil "a" must go to the anode circuit of the mixer and coil "b" to the grid circuit of the output valve.

Wiring

Having made the screened coils wiring can commence. First wire up the heater circuits as shown in the wiring diagram. Now mount the screened coils and proceed with the wiring of the circuit from V1.

L1 should be treated exactly the same as L1 in the previous model. Wire up this coil and L2 and then insert R1, C1, R2, C3. Now wind L3 as follows, using 28 s.w.g. enamelled wire. Solder one end of the wire to pin 1 of V1 and wind on 5 turns in a clockwise direction ; solder the far end to pin 8 of V1.

The next stage is to bolt the small tag strip in position on the side of the chassis above L2 position. Now wind L4 with 28 s.w.g. enamelled wire, taking one end to pin 6 of V1, then where the wire meets the bottom of the former scrape the enamel from

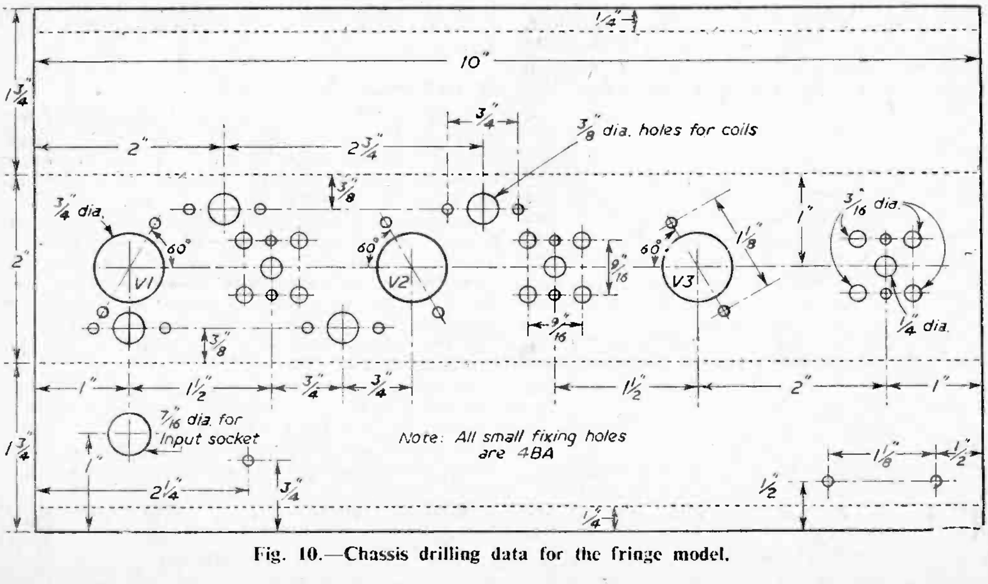


Fig. 10.—Chassis drilling data for the fringe model.

the wire and tin it ready for soldering C4. Continue winding the coil in an anti-clockwise direction with turns spaced about ⅛in. apart. The top end is soldered to the tag strip above the coil; 2½ turns are necessary.

R3, C5 and C6 can be wired and the complete wiring of V1 checked. Now commence V2 circuit.

Wire in R4, R5 and C6. Mount the three-way tag strip adjacent to L6 and wire in R6 and R7 with C7 and C8. Wire in L6 and connect R8 and R9 across the wires of the coil Wire in C12 and follow this by wiring C4 and then start on L5.

L5 should be wound with bare wire 22 s.w.g. Details follow.

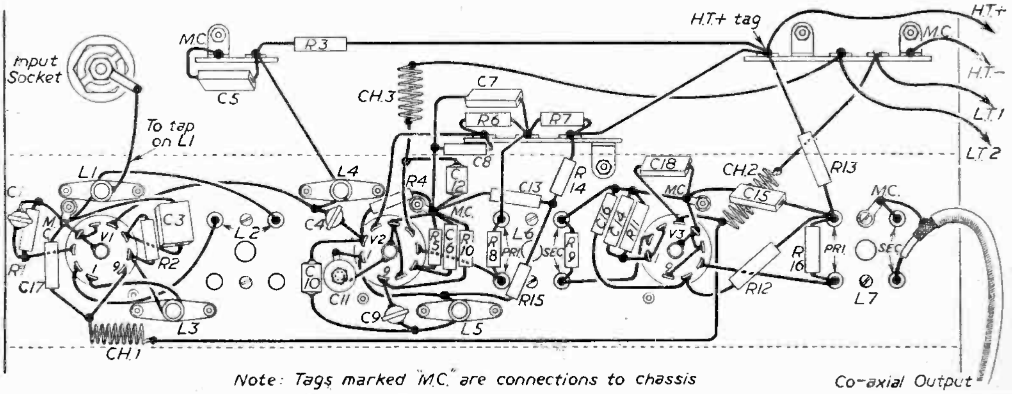


Fig. 11.—Wiring details of the fringe model.

The Oscillator Coil

To wind this coil first solder one end of C9 to pin 9 of V2; cut off surplus wire from the other end, leaving ¼in. of wire, and solder the coil wire to this. Wind on 5 turns of wire in an anti-clockwise direction and take the end to pin 1 of V2. Where the wire leaves the coil solder the end of R9 to it, the other end of the resistor going directly to the H.T.+ tag on the second tag strip.

Now connect C10 and R10 across the valveholder. The final work on this valve is to solder C11 vertically as explained for the oscillator trimmer in the previous model. The condenser must be mounted very firmly.

V3 Circuit

Wire in C13, R11 and C14 and the earth wiring on V3 valveholder. Connect the third tag strip and wire R13 from the tag strip to the side wire of L7 and nsert the decoupling condenser C15. R12 is wired from this point to pin 8 of V3 and the decoupling condenser C16 to earth.

Complete the wiring of the convertor and connect a four way cable from the last tag strip to the plug. This plug should be a four pin plug for fitting into a similar socket on the power pack. A standard octal plug and socket can be used if desired. The plug carries H.T.+, Earth, L.T. 1 and L.T. 2.

Alignment

There is nothing difficult with the alignment. First check L6 and L7 by using the existing televisor. Connect the Band I aerial to the grid of V3 and the output of the converter to the televisor. Now tune L7 for maximum response. Transfer the Band I aerial to the grid (pin 2) of V2 and temporarily short circuit L5. Adjust L6 for maximum response.

The next step is to connect the Band III aerial. Confirm that the Band III programme is being transmitted at the time of the test. Set all other coils so that the cores are midway and remove the short circuit from L5.

Adjust L5 with C11 set to mid-position until the Band III signal is heard. If regeneration takes place adjust L3. Tune in the signal as loud as possible and adjust L1, L4 and L3 for maximum response. Now adjust C11 for optimum response between sound and vision and set L3 at a point midway between the two extreme positions where oscillation occurs.

Adequate time should be allowed for the converter to warm up.

ADDITIONAL COMPONENTS FOR FIG. 9.

Three B9A valveholders.
Four ¼ inch diameter coil forms with cores.
Three Haynes type coil forms with cans.
One Pye aerial socket.
Chassis as per data. Tag strips.
Valves: One ECC81; One EF80; One PCF80.

General Hints

It is possible for two channels to become available in the same area at a later date. Should this happen then C11 can be replaced with a variable condenser, the spindle being extended outside the chassis and equipped with a knob.

In some cases it may be found beneficial to connect a small trimmer of about 0-10 pF between the aerial and the first coil so as to get perfect matching.

If trouble is experienced from oscillator drift then a condenser with a negative temperature coefficient can be fitted in the oscillator circuit. A Dubilier type CTS310 should be suitable. It should be connected across C11.

To prevent tuning drift from the coils a drop of wax can be made on the cores, and the windings can be given a trace of polystrene dope.

In very difficult situations the first thing to do is to improve the aerial system, and when this has been done to the limit it is permissible to fit a pre-amplifier of the special low-noise type in front of the converter.

(*To be continued*)

BAND III AERIALS

CONSTRUCTIONAL DETAILS FOR AERIALS FOR THE NEW BAND

By "Erg"

IT is not possible to forecast what kind of results will be obtained in any particular area on Band III. It has been decided to employ vertical polarisation for the new band and this is a departure from the practice which has been accepted in other countries. New ground is being broken, the temporary Belling-Lee transmitter, at Croydon, being the first to transmit video signals in this band.

Data is being gathered on the performance of different types of aerials under these conditions, but the full facts will not be known until the permanent transmitter is operating at full strength.

It has been established that the attenuation of the Band III signals with distance, is much greater than those of Band I and simple aerials working with every satisfaction at about 30 miles from a Band I transmitter would be useless on Band III, if the two transmitters were of equal strength.

The propagation of these high frequencies is rather unpredictable; we do know that the signal rapidly decreases with increasing distance from the transmitter and we do know that reflections are likely to be a real problem. The higher the frequency the more prone it is to be reflected by static objects; the net effect is the production of one or more ghosts on the screen with possible triggering of the timebases and resultant break-up of the picture.

The simple dipole is likely to be useful only in those districts very close to the transmitter; in districts farther away it appears that a direction aerial is necessary, not only from the point of view of increasing the pick up, but also so as to discriminate as far as possible against ghost reception.

For the constructor who is willing to experiment a simple dipole may prove of value even if it is only to demonstrate the vagaries of the signal strength. Where the use of such an aerial is thought practical then it is worth while "probing" the immediate locality in an effort to find the best signal. It will often be found that the movement of the aerial a mere foot or so produces an appreciable variation in the strength of the signal.

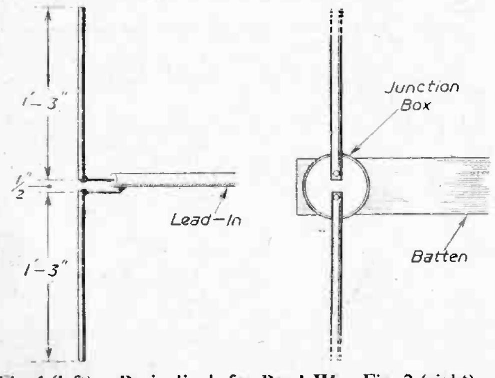


Fig. 1 (left).—Basic dipole for Band III. Fig. 2 (right).—Terminating the dipole.

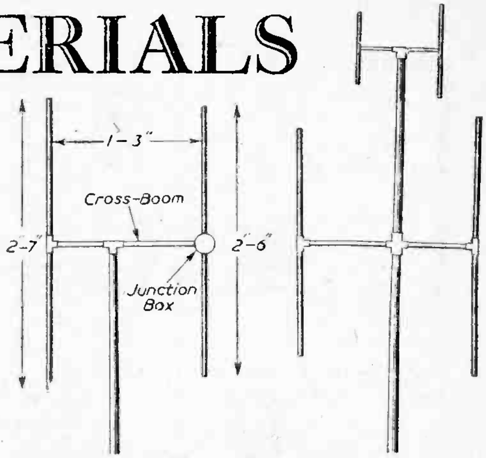


Fig. 7 (left).—An "H" aerial. Fig. 8 (right).—Band I and Band III aerial.

Basic Dipole

A dipole aerial is extremely simple to construct and can be made without the aid of special tools and at a very low cost.

All that is required is two rods fitted in the vertical plane with a connection made at the centre. The rods can be made of copper or duralumin tube ⅜in. diameter according to which is available. Copper is not really suitable for out-door work as it is subject to corrosion; duralumin is better in this case. If copper is used, then it should be well-painted with several coats of good quality paint. Battle-ship grey is a good colour to use as it becomes very inconspicuous against the skyline.

In Fig. 1 will be found a sketch of the aerial. The rods should be 1ft. 3in. long (each) for Channel 8 and 1ft. 2½in. long for Channel 9. Connection is made at the centre as shown in the diagram.

The type of cable used will depend very much upon the type used in the present televisor. It is bad policy to use coaxial cable when the receiver is designed for balanced twin and vice versa.

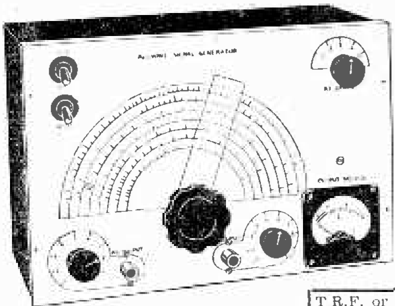
Some television receivers have a separate aerial socket for the Band III aerial, and where this is the case the aerial cable can be plugged in and left. The type of cable is generally indicated on the back of the televisor. A coaxial socket obviously demands a coaxial type of cable and a twin socket, a balanced twin cable.

The two ends of the rods can be brought into a junction box such as is used for electric cables and which is obtainable for a few pence from the multiple stores. The junction box which is circular in shape can be screwed to the end of a piece of wooden batten and the rods bolted through as shown in Fig. 2. The batten can be fitted to a shelf bracket and bolted to a wall or chimney stack.

It is important to keep the dipole clear of gutters, rain-water pipes and the like and also the wall itself. It is recommended that a distance of 3ft. from the wall should be the minimum aimed at.

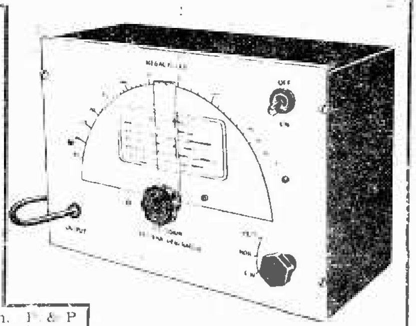
If fitting the dipole to the side of the house do not fit it at the back of the house if the transmitter faces the front, or very little signal will be picked up. In Band I it is often practicable to do this but not so on Band III.

(Continued on page 175)



T.V. CONVERTER

for the new commercial stations, complete with 2 valves. Frequency can be set to any channel within the 186-196 Mc/s band. I.F. will work into any existing T.V. receiver between 42-68 Mc/s. Input arranged for 80 ohm feeder. EF80 as RF amplifier. ECC81 as local oscillator and mixer. The gain of the first stage, RF amplifier 10DB. Required power supply of 200 D.C. at 25mA. 6.3v. A.C. at 0.6 amp. Input filter ensuring freedom from unwanted signals. Simple adjustments only, no instruments required for trimming. Will work into any T.R.F. or superhet. Size 4½ x 2½ x 2in. P. & P. 2/6. £2.19.6. Double wound mains transformer, 200/250v. metal rectifier, and smoothing condenser to suit above. 18/6.



COMPLETELY BUILT SIGNAL GENERATOR

BOTH GENERATORS GUARANTEED FOR 12 MONTHS

Coverage 120 Kc/s-320 Kc/s, 300 Kc/s-900 Kc/s, 900 Kc/s-2.75 Mc/s, 2.75 Mc/s-8.5 Mc/s, 8.5 Mc/s-25 Mc/s, 17 Mc/s-50 Mc/s, 25.5 Mc/s-75 Mc/s. Metal case 10 x 6¾ x 4½in. Size of scale 6½ x 3½in., 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent., modulated or unmodulated, R.F. output continuously variable 100 milli volts. C.W. and mod. switch, variable A.F. output and moving coil output meter. Black crackle finish case and white panel. Accuracy plus or minus 2%. **£4 19/6** or **34/-** deposit and 3 monthly payments **25/-**. P. & P. 4/- extra.

PATTERN GENERATOR

40-70 Mc/s direct calibration, checks frame and line time base, frequency and linearity, vision channel alignment, sound channel and sound rejection circuits and vision channel band width. Silver plated coils, black crackle finished case 10 x 6¾ x 4½in. and white front panel. A.C. mains 200/250 volts. This instrument will align any T.V. receiver, accuracy plus or minus 1%. Cash price **£3.19.6** or **29/-** deposit and 3 monthly payments of **£1**. P. & P. 4/- extra.

PERMEABILITY TUNED T.V. UNIT

Input 300 ohm balanced line, coverage 54 Mc/s—89 Mc/s and 174 Mc/s—217 Mc/s. Vision I.F. :—45 Mc/s, sound 40.5 Mc/s. Uses 6AK5 RF valve, 6AK5 as mixer, and 6C4 oscillator. Provision for auto-gain control. Dimensions 9in. wide, 6½in. deep, 4in. high. 9in. blank-scale. Width including scale-overlap 14in. Four stages permeability tuned. Complete with 3 valves. P. & P. 3/-. **£2.1°.6.**

Used Mazda C.R.M. 123 Cathode heater short aluminised. Complete with rubber mask. Elac P.M. focus unit, scan coils, low line, low frame and frame O/P trans., **£5.10.0.** P. & P. 7/6.

USED 9in. TUBE 22 14C with ion burn. **17/6.** Post paid.

Mazda CRM 92A, used with heater cathode short, guaranteed for 3 months. P. & P. 7/6. **£2.17.6.**

Used Mullard 9in. tube 22 17 & 18 ion burn. **25/-** post paid.

40 watt Fluorescent kit A.C. mains 230/240. Comprising choke, power-factor condenser, 2 tube holders, starter, and starter-holder. P. & P. 3/-. **17/6.**

20 watt A.C. or D.C. 200/250v. Fluorescent kit, comprising trough in white stove enamel, 2 tube holders, starter, starter-holder and barreter. P. & P. 1/6. **12/6.**

Three speed automatic changer by a very famous manufacturer, current model. Will take 7in., 10in. or 12in. records mixed. Turnover crystal head. Cream finish.
VERY LIMITED QUANTITY.
A.C. Mains 200/250. **£7.19.6.** P. & P. 4/6.

Line and E.H.T. Transformer, 9kV. Ferrocart core. EY51 heater winding, complete with scan coils and frame output transformer and line and width control. **£2.5.0** P. & P. 3/-.

As above but complete with line and frame blocking transformers, 4 henry 250 mA. choke, 100 mfd. and 150 mfd. 350 wkg., 380 mA. A.C. ripple. **£2.19.6.** P. & P. 3/-.

Standard Wave-change Switches. 4-pole 3-way, **1/9** ; 5-pole 3-way, **1/9** ; 3-pole 3-way, **1/9** ; 9-pole 3-way, **3/6** ; Miniature type, long spindle 3-pole 4-way, 4-pole 3-way and 4-pole 2-way, **2/6** each. 2-pole 11-way twin wafer, **5/-** ; 1-pole 12-way single wafer, **5/-**. P. & P. 3d.

Senter Cell RM4B 300 mA. 250 v., **15/-**.

USED metal rectifier. 250 v. 150 mA, **6/6.**

R. and A.T.V. energised 6½in. Speaker with O/P Trans., field coil 175 ohms. Requires minimum 150 mA to energise maximum current 250 mA. **9/6.** P. & P. 2/6.

R. and A.M.E. 6½in. with O/P Trans., 440 ohms field, **10/6** plus 2/6 P. & P.

Combined 12in. Mask and Escutcheon in lightly tinted perspex. New aspect, edged in brown. Fits on front of cabinet. **12/6.** As above for 15in. tube, **17/6.**

Line or Frame Oscillator Blocking Transformers. 4/6 each.

Smoothing Choke, 250 mA, 5 henry, **8/6** ; 250 mA. 10 henry, **10/6** ;

Wide Angle P.M. Focus Unit. Vernier adj., state tube. **15/-.**

Ion Traps for Mullard or English Electric tubes, **5/-.** Post paid.

T.V. Coils, moulded former, iron cored, wound for rewinding purposes only. All-can 1¼in. x ¾in., **1/-** each ; 2 iron-cores All-can, 2¼in. x ¾in., **1/6** each.

Dubilier .001 10kV working. **3/6.**

Primary. 200-250 v. P. & P. 2/-.

300-0-300. 100 mA. 6 v. 3 amp., 5 v. 2 amp., **22/6.**

Drop thro' 350-0-350 v. 70 mA. 6 v. 2.5 amp., 5 v. 2 amp., **14/6.**

Drop thro' 250-0-250 v. 80 mA. 6 v. 3 amp., 5 v. 2 amp., **14/6.**

280-0-280. drop through, 80 mA, 6 v. 3 amp., 5 v. 2 amp., **14/6.**

250-0-250 80 mA. 6 v. 4 amp., **14/-.**

Drop thro' 270-0-270 80 mA, 6 v. 3 amp., 4 v. 1.5 amp., **13/6.**

Drop thro' 270-0-270 60 mA, 6 v. 3 amp., **11/6.**

250 v. 350 mA, 6.3 v. 4 a., twice 2 v. 2 a., **19/6.**

Semi-shrouded drop-through 380-0-380 120 mA, 6.3 v. 3 amp., 5 v. 2 amp., **25/-.**

Auto-trans. Input 200/250. H.T. 500 v., 250 mA, 6 v. 4 a., twice 2 v. 2 a., **19/6.**

250-0-250. 60 mA, 6.3 v. 1.5 a., 0-5-6.3 v. 1.5 a., **10/6.**

Auto Trans. Input 200/250. H.T. 350 v. 350 mA. Separate L.T. 6.3 v. 7 a., 6.3 v. 1½ amp., 5 v. 3 amp., **25/-.** P. & P. 3/-.

Heater Transformer. Pri 230/250 v. 6 v. 1½ amp., **6/-** ; 2 v. 2½ amp., **5/-.** Input 210, 220, 230, 240. Sec. 350-0-350 100 mA, with separate heater transformer. Pri. 210,220, 230, 240. Sec. 6.3 v. 2 amp., 6.3 v. 3 amp., 4 v. 6 amp. and 5 v. 2 amp., **30/-.** P. & P. 5/-.

350-0-350 75 mA. 6.3 v. 3 a. tap. 4 v. 6.3 v. 1 a., **13/6.**

500-0-500 125 mA. 4 v. C.T. 4 a., 4 v. C.T. 4 a., 4 v. C.T. 2.5 a., **27/6.**

500-0-500 250 mA. 4 v. C.T. 5 a., 4 v. C.T. 5 a., 4 v. C.T. 4 a., **39/6.**

Chassis mounting or drop-thro', Pri 110/250 v. Sec. 350-0-350 250 mA, 6.3 v. 7 amp., 6.3 v. 0.5 amp., 5 v. C.T. 0.5 amp., 4 v. 4 amp., **32/6.** P. & P. 3/6.

R.F. E.H.T. Oscillator Coil. 6-9 Kv with EY51 rectifier winding, and circuit diagram. **15/-.**

As above, but complete with 6V6, EY51 and associated resistors and condensers. Circuit diagram. **37/6.**

As above, but complete with line O.P. transformer, scan coils and frame O.P. transformer, **£2.19.6.** P. & P. 3/-.

Polishing Attachment for electric drills. ¼in. spindle, chromium plated 5in. brush, 3 polishing cloths and one sheepskin mop mounted on a 3in. rubber cup. Post & pkg. 1/6. **12/6.** Spare sheepskin mops, **2/6** each.

Used A.C. mains 200/250 volts, 4 valve plus metal rectifier, medium wave superhet in polished walnut cabinet, size 11 x 9½ x 7½in., complete with valves 6K8, 6K7, 6Q7 and 6F6. 6½in. PM speaker. Fully guaranteed. P. & P. 7/6. **£3.15.0.**

1,200 ft. High impedance recording tape on aluminium spool. **12/6** post paid.

Valve Holders, moulded octal Mazda and loctal, **7d.** each. Paxolin, octal Mazda and loctal, **4d.** each. Moulded B7G, B8A and B9A, **7d.** each. B7G moulded with screening can, **1/6** each.

32 mfd., 350 wkg.	2/-
16/24, 350 wkg.	4/-
4 mfd., 200 wkg.	1/3
40 mfd., 450 wkg.	3/6
16/8 mfd., 500 wkg.	4/6
16×16 mfd., 500 wkg.	5/9
16×16 mfd., 450 wkg.	3/9
32×32 mfd., 350 wkg.	4/-
25 mfd., 25 wkg.	11d
250 mfd., 12 v. wkg.	1/-
16 mfd., 500 wkg.	3/3
8 mfd., 500 v. wkg., wire ends	2/6
8 mfd., 350 v. wkg., tag ends	1/6
50 mfd., 25 v. wkg., wire ends	1/9
100 mfd., 450 v. wkg. 280 mA. A.C. ripple	3/11
150 mfd., 350 v. wkg., 280 mA., A.C. ripple	4/6
100+200 mfd., 275 wkg	7/6
16/16 mfd., 350 wkg	3/3
50 mfd., 180 wkg.	1/9
65 mfd., 220 wkg.	1/6
8 mfd., 150 wkg	1/3
60+100 mfd., 280 wkg	7/6
50 mfd., 12 wkg	11d
50 mfd., 50 wkg	1/9
Miniature wire ends moulded, 100 pf., 500 pf and .001, ea.	7d.

Where cost and packing charge is not stated, please add 1/6 up to 10/-, 2/- up to £1 and 2/6 up to £2. All enquiries S.A.E. Lists 5d. each.

R. & T.V. COMPONENTS (ACTON) LTD.

23 HIGH STREET, ACTON, LONDON, W.3
(UXBRIDGE ROAD) Telephone: ACOrn 5901

The two rods can be mounted at right angles and an " L " shaped aerial made, as shown in Fig. 4a, or put at an angle of 120 deg., as shown in Fig. 4b. This latter may assist in avoiding reflections.

Folding the Dipole

It is possible that the input to the television receiver on Band III is classified as being 300 ohms. If this is the case then the dipole should be folded and fed with balanced twin cable with a characteristic impedance of 300 ohms.

To fold the dipole, simply add another rod which is the overall length of the dipole itself and fitted at a distance of 2in. from the dipole. The two are connected together by shorting bars at the far ends, as shown in Fig. 5.

With a folded dipole it is possible to weld or braze the aerial to the supporting bracket, as shown in Fig. 6.

The weld is made between the metal supporting bracket and the centre of the folded section. The dipole proper is fitted with the junction box at its centre and the cable run from this along the metal bracket.

Note that in running the cable down to the televisor care should be taken to avoid sharp bends or reflections may occur in the cable itself.

A Directional Aerial

The different types of aerials which can be employed on Band III are too numerous to mention in a short article of this nature and it has been decided to describe the construction of a straightforward " H " type which forms the basis of many arrays.

This aerial is a well-tried favourite, and justly so, as it gives a gain of 3 db. over a straight dipole (half as much signal again) and has good stable characteristics. It is directional but not too directional so as to require careful setting, and it has the additional advantage of functioning over a wide arc, so that the back (the reflector end) can be positioned against a source of interference, whether it be man-made interference or a reflection causing a ghost signal.

Fig. 7 shows the basic constructional principles. The aerial consists of a dipole proper with the addition of another element termed the " reflector." The additional element is simply a straight rod not connected to the aerial in any way. It " reflects " the incoming signal back on to the dipole and thereby increases the pick-up of the dipole.

The rod should be made 2ft. 7in. long for Channel 8 and 2ft. 6½in. long for Channel 9. The spacing between the dipole and the reflector should be 1ft. 3in. for Channel 8 and 1ft. 2½in. for Channel 9.

Construction of the dipole follows the lines given previously. The cross-boom can be of metal or wood and is fastened to the mast at the centre.

It is possible to weld or braze the reflector directly at the cross-boom if the latter is made of metal, and it is permissible to do the same with cross-boom and mast if both are metal.

The cable is run along the cross-boom and down the mast in the usual manner. If the mast is a metal tube it is very tempting to conceal the cable by running it inside the tube. In practice the scheme is not so sound, as when the mast is vibrating in the wind the cable is liable to slap repeatedly against the sides causing a very annoying noise, especially at night time. It is preferable to run the cable down the outside of the mast and to fasten it at intervals of about 1ft. with a good layer of adhesive tape.

As in the case of the straight dipole it may be found that an aerial of 300 ohms impedance is required. The " H " aerial has a dipole impedance of about 60 ohms ; if the dipole is folded as given previously, then the centre impedance will be in the region of 240 ohms which is a reasonable match to 300-ohm cable. The method of folding is exactly as given previously and, if desired, the dipole can be fixed to the cross-boom by welding at the centre of the fold.

The " H " aerial should be mounted as high as possible and at least 3ft. from any Band I aerial. Because of the small size it is practicable to extend the mast of a Band I aerial and to mount the Band III aerial above it as shown in Fig. 8. The distance between any part of the Band III aerial and the Band I aerial should again be a minimum of 3ft.

Note that it is not necessary for the two aerials to be in line as shown in the diagram. Either aerial can point in any direction.

Do not make the additional mast too tall or the array is likely to become unstable. About 6ft. is a good distance at which to aim.

Alternative Fixing

An alternative fixing which can be made when the two transmitters (the Band I and Band III transmitters), are more or less in the same direction, is by mounting a Band III " H " type of aerial within (so to speak) a Band I aerial.

The system is shown in Fig. 9. The dipole and reflector for Band III are made on the same lines as discussed in previous paragraphs and are mounted on the cross boom of the existing H aerial. A separate cable is used for the Band III dipole and the Band I cable must not be connected in parallel with it.

When testing the aerial on the two Bands it should be positioned so as to obtain the greatest benefit from the weakest signal ; this will generally be that of the Band III aerial.

Ghost Prevention

One of the biggest headaches on Band III is the avoidance of " ghost " signals. These high frequencies are easily reflected and tall buildings, gasometers, trees, etc., can reflect the signal back on to the aerial.

Fig. 9 demonstrates the principle. The main signal is received at the house from the transmitter, in a straight line. A subsidiary signal is received from the reflection caused by the tall building at " A." The distance from the transmitter to the house is rather less than from the transmitter to the building and

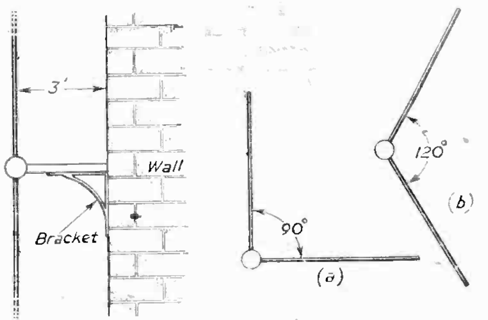
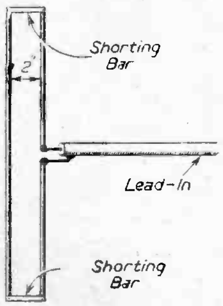


Fig. 3 (left).—Mounting the dipole. Fig. 4 (right).—" L " and " V " type dipoles.

thence to the house and, therefore, the second signal will arrive just after the first one.

On the television screen the result is that two pictures are received, one slightly displaced to the right of the other. The amount of the displacement will depend upon the distance which the reflected signal has to travel.

In some cases it is possible to get a signal which



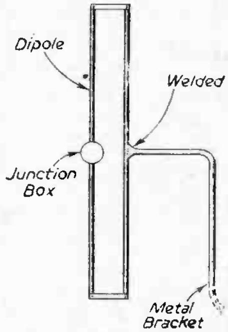


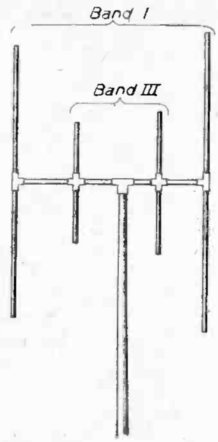
Fig. 5 (left).—A simple method of making a folded dipole. Fig. 6 (right).—Welding the bracket.

is reversed in phase, the blacks appearing as whites, and the whites as black as in a photographic negative.

It is also possible to receive more than one reflection resulting in the appearance of several ghost signals. The picture is often thereby rendered useless.

In such cases a directional aerial such as the " H " must be used and it must be oriented so that the back is, as far as possible, pointing in the direction of the reflection. If the actual source of reflection is not known then the position must be found by trial and error.

Some constructors may find that the reflected signal is rather better than the direct signal and in this case the dipole of the aerial should be pointed towards



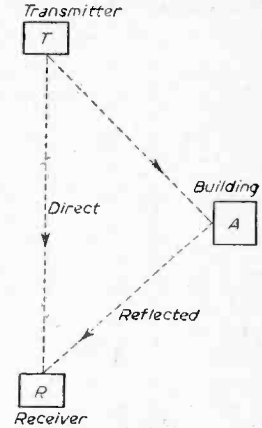


Fig. 9 (left).—A composite aerial for both Band I and Band III. Fig. 10 (right).—Reflected signals.

the reflection and not to the transmitter. Care must be taken when using this method, however ; use of a reflected signal from a gasometer, for example, is liable to disappear when the gas supply is low !

In bad cases then something further than an " H " aerial may be necessary and the constructor may have to turn to Yagi arrays, slot aerials and the like. If such aerials are used it is important to ensure good matching with the cable or the final result may be worse than the original !

RECEIVING THE I.T.A.

(*Continued from page 162*)

very weak until the other coils are tuned in properly. Once the sound signal is heard all the other coils should be adjusted until the sound is at maximum, and at this stage it may be necessary to turn down the Volume control and, in certain cases, the Sensitivity control.

Balancing Sound and Vision

The Brightness control should next be turned up and an attempt made to resolve a picture. As soon as a picture or some form of modulation can be seen on the screen, L1/2 and L4 should be readjusted towards the vision signal and an aim made to balance the sound and vision signals.

L5/6 should also be readjusted for sound and vision balance, consistent with optimum picture quality. Finally, L7 should be readjusted, with the fine tuning set to midposition, for maximum sound consistent with minimum sound interference on vision.

Additional notes on setting up Band Converters and Band Adaptors will be given later in this series.

It should be pointed out that, although the converter circuits described so far incorporated power-units, Band converter units can readily be energised from the power-pack of the Band I receiver as most receivers are capable of supplying the 25 to 30 mA. of H.T. required. Moreover, if the Band I receiver has series-connected heaters—as most have these days—the heater circuit may be broken and the heaters of the Band III valves introduced into the chain ; of course, it will be necessary then to wire the Band III valves in series, and ensure that their heaters match those in the receiver valves.

(*To be continued*).

Air-to-Ground TV

THE BBC recently made successful test transmissions of air-to-ground live outside broadcast pictures. The tests were made in the course of a normal training flight from a Royal Air Force "Varsity" aircraft.

All flying tests made in connection with these television experiments have been during normal R.A.F. training flights.

From Earls Court

BBC Television is to present ten big outside broadcasts from the arena at the National Radio Show. They will include "Double Top"—a two-ring circus programme, "Youth in Command"—provided by 500 young people from youth organisations, "the Commonwealth Show"—an entertainment show representative of many Commonwealth countries, and "Sports Jackpot"—including tests of skill between experts and well-known personalities.

Two ITA Links

THE General Electric Co. Ltd. is supplying the G.P.O. with equipment for two new television links to help extend the coverage of ITA transmissions. The first is a microwave radio link between Birmingham and Lichfield, for which the G.E.C. Ltd. is supplying all equipment, and the second is from Birmingham to Winter Hill, Bolton, for which the company will provide all the line equipment for transmission over a co-axial cable.

Aberdeen Exhibition

ABERDEEN is to stage its own television and radio exhibition in the Music Hall from October 12th to 22nd.

It is hoped that the show will coincide with the opening of the TV transmitter and V.H.F. station at Corehill, Oldmeldrum.

Journalists for Commercial TV

FRANK OWEN, MacDonald Daly and Godfrey Winn, three personalities very prominent in the journalistic field, have signed contracts with Associated-Rediffusion, ITA programme contractors for the London area.

All have had considerable television experience with the BBC.

Flying Start

MR. C. McCOLLOUGH, one of America's outstanding television chiefs, has forecast that commercial TV in Britain will "take off like a jet rocket."

ITA Headquarters

THE ITA which since October of last year has been in temporary offices at Wood's Mews, Park Lane, London, W.1, moved on Friday, 29th July, to its new permanent headquarters at 14, Princes Gate, London, S.W.7. The telephone number there is KNIghtsbridge 5341.

Pye Underwater Equipment

AT a recent international trade fair held in Toronto, Pye underwater TV equipment was featured prominently in a series of demonstrations.

The equipment, which included a Comet-type underwater camera, in conjunction with a standard studio camera and standard 2,000 mc/s Pye micro-wave equipment, was installed on H.M.C.S. *Beaver*, a Royal Canadian Navy reserve ship. The demonstrations were televised on the C.B.C. network.

French Drama

OVER fifty plays have been produced by French television during the past season.

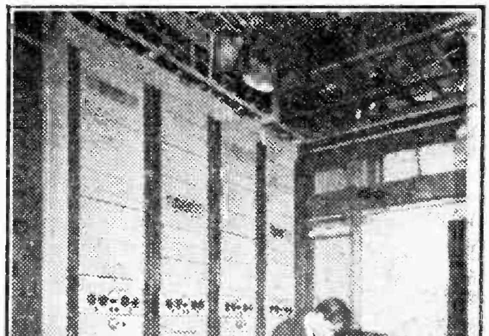
Television Licences

THE following statement shows the approximate number of television licences in force at the end of June, 1955. The grand total of sound and television licences was 14,035,567.

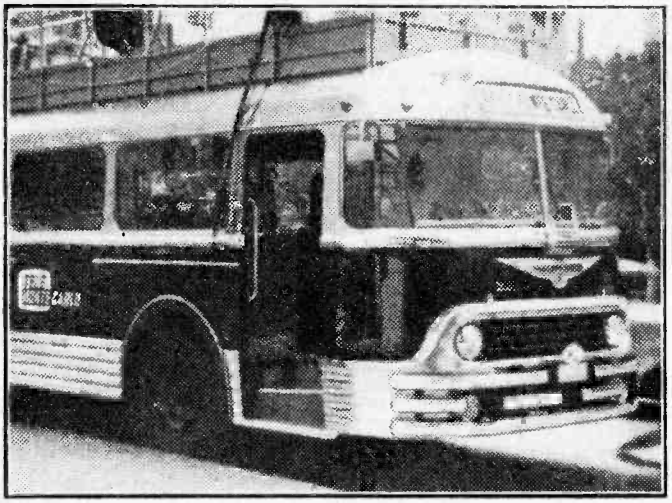
Region	*Number*
London Postal	1,144,590
Home Counties	512,744
Midland	848,091
North Eastern	684,109
North Western	682,740
South Western	265,993
Wales and Border Counties ...	256,066
Total England and Wales ...	4,394,333
Scotland	256,639
Northern Ireland	25,450
Grand Total	4,676,422

ITA News Programmes

THE London ITA station will broadcast two news bulletins and reports per evening when transmissions commence on September 22nd.



An operator uses an oscilloscope to check a panel on a two-channel transmit terminal at Telephone House, Birmingham. (See "Two ITA Links.")



This converted luxury coach is used as a television outside broadcast van by Tele-Monte Carlo authorities in Monaco.

It is not yet known what form these programmes will take.

Polish TV Begins

TELEVISION broadcasts will be transmitted from Warsaw at the beginning of next year.

" Higher " Purchase

TELEVISION and radio sets are among the goods affected by the recent amendment to the Hire-Purchase and Credit Sale Agreements (Control) Order, 1955.

The main change is the increase in the minimum initial deposit from 15 per cent. of the cash price to 33 per cent. for these and other articles. The maximum periods for payment of the balance remain unchanged.

More People Are Viewing

IT is reported that the number of television viewers in this country averaged 12,100,000 over the first quarter of this year, an approximate increase of three million on the same period in 1954.

Government Decree

THE BBC and the ITA have received details of a Government decree which rules that neither may broadcast on sound or television discussions on Bills or topics being dealt with by Parliament for 14 days beforehand.

Good for Business

A SUBSTANTIAL increase in camera sales has been reported by the Photographic Dealers Association.

This is attributed to the interest created by Baron's recent television series entitled " Have You A Camera ? "

Classics for ITA

IN his capacity of dramatic adviser to Associated-Rediffusion, John Clements is to put on five or six classical plays each year at the Saville Theatre, in London.

Then he is to have them filmed for showing on commercial television.

Exclusive Services

RADIO and television comedians who have signed contracts to remain with the BBC include such well-known personalities as Eric Barker, Peter Brough, Fred Emney, Humphrey Lestocq, Ted Ray and Dave King.

Others who have also done so include Gilbert Harding, Raymond Glendenning, Peter Cushing, Wynford Vaughan Thomas and Franklin Engelmann.

British Films for the States

THE J. Arthur Rank Organisation has arranged for a number of top British films made since the war to be shown on American television.

The agreement will earn around two million dollars for the United Kingdom, and the films include "Odd Man Out," " Black Narcissus," and " Kind Hearts and Coronets."

Signals from the Continent

VIEWERS in parts of Kent have reported pictures on their television screens believed to have originated from French and German transmitters.

This is probably due to unusual weather conditions.

Longer Viewing Hours

THE BBC announce that as from September 4th, evening television programmes will commence at 7 p.m. and finish between 10.30 and 11 p.m. On Sundays they will begin at 7.30 p.m.

Afternoon programme hours will be longer, too, and total expenditure as a result will be increased by at least £30,000 a week.

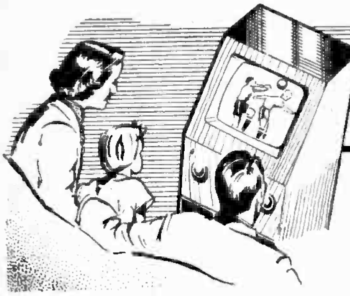
In Japan

IT is estimated that 35,000 people out of a total population of 87,500,000 in Japan watch television programmes regularly.

Colour Receivers Ordered

THE BBC has ordered 12 colour-television receivers from a British firm to be delivered by October.

These are for colour tests to be made by the BBC and there is definitely no chance for some years of a colour TV service for the general public.



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

TV NEWSREELS

I MUST admit that I haven't looked at the BBC News and Newsreel for a long time. Somehow it has lost its appeal. But I am looking forward to the ITA's newsreel, which is being organised by Philip Dorté and edited by Aidan Crawley. I hope that Mr. Crawley will resist the temptation to introduce still photographs, slides, diagrams and pretentious documentary; the original BBC newsreel format was snappy, entertaining and popular, and a return to this style would, I am sure, receive general approval.

FILMED PLAYS

WHAT is the ideal length for a television play? The BBC has had a preference for long plays of 90 minutes or so duration. The TV plays now being stockpiled by the commercial television film makers fall into two precise categories: the long play of 54 minutes and the short play or "feature presentation" of 27 minutes—both timings being exact, the hour and half-hour in each case being made up by commercial announcements. Associated Rediffusion, whose Wembley studio is almost ready for action, have in the meantime been filming quite a number of 54-minute dramas at the Shepperton film studio. Titles include "The Inward Eye," "Summer in Normandy," "The House in Athens" and "A Glorification of Al Toolum," all of which will be released on the ITA programme during the autumn. The Associated Broadcasting Company, operating at Highbury Studios, have concentrated largely on 27-minute productions, and the first series of 39 under the general title of "Theatre Royal" has almost been completed. The next series of 27-minute dramas is to be produced under the title "Sunday at Three," which is the time they will be televised.

THE SHORT PLAY

I HAVE always felt that 90 minutes' playing time is too long for a TV play. Few of them really hold the viewers the whole of the hour and a half. This is the conventional length of a stage play in three half-hour acts which, with two 15-minute intervals, makes an evening's entertainment at the living theatre. The BBC seems to have accepted this convention, substituting a short "tea break" for the lengthy theatrical intervals. The ITA is unlikely to have any time to spare for intervals, and their producers have been instructed to make their productions lively, slick and snappy. I must say that I have a leaning towards the half-hour play. There is no denying the fact that it is much more difficult to write a first-rate short play than a long one. Short plays are like short stories; they require the pen of a master and I haven't noticed very many budding Arnold Bennetts, Somerset Maughams or Noël Cowards up to now.

"THE ROMANTIC YOUNG LADY"

"THE ROMANTIC YOUNG LADY" was a typical 90-minute BBC TV play, adapted by Helen and Harley Granville-Barker from the romantic comedy by Gregorio Marginez Sierra. Here was a comedy that was pleasant enough but whose plot was so gossamer as to be hardly worth bothering about. It moved at a slow steady tempo and had it not been for the pleasant personalities of the players it would have been exceedingly tedious. However, it served to introduce Sylvia Syms, a young repertory actress of great promise who, I note, has already been snapped up by Associated Rediffusion and is playing a leading part in "The House in Athens." Spanish drawing-room comedies of 20 years ago are no different, it seems, from English drawing-room comedies of the same period. The leisurely pace, much-ado-about-nothing, belongs to another age. Shortened by about 30 minutes and with strengthened dialogue and situations, it might have made the grade.

THEATRES FOR TV

THE theatre has been the main source of supply for TV plays for a long time. And now, with so many suburban and provincial theatres closing down, it has become a refuge for television enterprise. Following the pattern of what took place in America at the start of the television service, a large number of theatres and music halls in London are now under consideration for conversion into television theatres on the lines of the BBC's Shepherd's Bush Empire. The Granville Theatre, Walham Green, is now almost ready for use by Associated Rediffusion and the Wood Green Empire by Associated Broadcasting Company. These theatres will be wholly devoted to TV, as will the King's Theatre, Hammersmith, which will be taken over by the BBC. The Embassy Theatre, Swiss Cottage, has been bought by the Granada group for use on somewhat different lines. It will be used as an experimental live theatre for trying out plays on the public, with the ultimate object of regular use as a television theatre when the ITA's northern transmitter at Winter Hill comes into operation next March. I should imagine that quite a lot of snags have to be overcome to make a theatre equally satisfactory for a paying public and for a permanent TV theatre. The problems are quite different from those which are now so expertly dealt with by the mobile TV teams.

Apart from permanent workshops, offices and technical departments, facilities have to be provided for refinements of smooth tracking for cameras in the front of the stage, such construction frequently occupying the whole of the stalls

At the Wood Green Empire, the stage has been extended about 15ft. over the former orchestra pit and a brick-built camera runway has been erected from the back of the theatre up to the front of the stage. Only the circle and gallery are available for spectators. The original stage has been entirely rebuilt.

TRAINING FOR TV TECHNICIANS

IN America the Society of Motion Picture Engineers became so involved in television that it changed its name to the Society of Motion Picture and Television Engineers. I wouldn't be at all surprised if our own British Kinematograph Society does not take the same step sooner or later. It has a growing membership of BBC and other TV engineers and is shaping its programme of lectures and educational courses on lines which have special appeal to these new members. This autumn the B.K.S. has planned a special course of study under the main title "Film Production for Television." Some of the titles of the proposed weekly lectures and the names of the lecturers give an idea of the scope of the course: "Introductory Lecture on the Principles of Television and Kinematography," C. B. B. Wood of BBC Research Department; "Basic Lighting Requirements," W. R. Stevens, G.E.C. Laboratories; "TV Film Processing Requirements," H. E. B. Grimshaw, Kodak Laboratories; "Sound Recording for TV," John Byers; "Cartoons," Peter Sacks. This sounds to me to be a very practical approach by experts in various specialised fields and I should not be at all surprised if there is a capacity attendance.

"PARIS 1900"

I DID not see the original presentation in 1954 of the historical film material collected together under the title "Paris 1900." The English version transmitted last month, with an admirable spoken commentary by Monty Wooley, contained a lot of items from a much later period than 1900. Actually, only a small proportion of the film scenes were photographed in that year and not all of them were in Paris. But the wide range of personalities and places covered made the subject one of the most interesting items of the month. Films of French politicians, English Royalty, international sporting figures, fashions and historic events were edited together in a smooth continuity that made 50 minutes of first-class entertainment. Once more, I noticed, the speed of projection and modern aspect ratio detracted from some of the early material; movements were jerky and the left-hand side of the picture was cropped a little. If this kind of item is to be transmitted regularly—and I hope it will be—then the BBC should find it worthwhile to install specialised equipment for sending it out in the form it was originally photographed. After all, the archives of the British Film Institute are open to the BBC or other organisations as a source of early film material, as are the historical film libraries of the newsreel companies. Most of the early films were shot at 16 frames per second and should be projected at this rate. Alternatively, special prints could be made in which every other frame is printed twice, to bring it up to 24 frames per second, near enough to the 25 frames which is the BBC's standard.

OLD FILMS

OLD films and not-so-old films of feature standard are getting a new lease of life in the U.S.A. Paramount have sold 30 films of pre-1949 release to a TV organisation. In another deal 40 British pictures of importance will be televised under the series title of "The Fabulous Forty." Titles include such popular successes as "The Sound Barrier," "The Captain's Paradise," "Tales of Hoffmann," "Gilbert and Sullivan" and "Outcast of the Islands." A recent surprise deal has been for the rights to televise in America two Korda British films which have only recently been completed: *Richard III*, with Sir Laurence Olivier, and *The Constant Husband*, with Rex Harrison. I wonder if the day will come when the BBC or one of the ITA contractors will transmit a feature American film prior to its release in England?

VARIETY NIGHTS

IT seems that Sunday night is to be Variety Night! At any rate, both the BBC and the ITA seem to be putting on their best possible variety programmes on Sunday nights! Contrast this state of affairs with the monastic type of Sunday programme broadcast in the earliest days of the BBC. On September 25th commercial TV sets the standard with a star programme headed by Gracie Fields from the London Palladium, and on October 9th the BBC will transmit a gala performance of the Grand Order of Water Rats in honour of the 93rd birthday of Fred Russell, known as the "Father of Variety." Tommy Trinder, Flanagan and Allen, Ben Lyon, Max Bygraves and many other stars will appear.

MEDIUM CONQUEROR

THAT first-class entertainer Ted Ray has done it again. Whichever medium he turns his many talents to he succeeds, unlike many stars who have to concentrate their abilities on one medium only.

Ted was a pre-war variety artist but in those days he never got the right breaks necessary to become a household name. For years he appeared frequently on radio variety bills and had only just begun really to establish himself when his big chance came in the form of a radio series of his own—"Ray's A Laugh" and if ever one series boosted a broadcaster's popularity then this one certainly did. The characters introduced by Ted in his show were copied by everyone. In the same programme, Peter Sellers and Kitty Bluett came right to the fore.

Now Ted has become a television star in his own right. His recent series on Saturday nights have been a rip-roaring success and his has that nice distinction between the slower and more sober English humour and the snappier Transatlantic style. When one considers his film appearances as well, one can realise why he is earning a reputation as "a conqueror of any medium."

VIEWING TRENDS

I NOTE from the latest statistics issued by the BBC Audience Research Department that, although the television viewing public is smaller than the sound radio public, television audiences tend to exceed those of sound broadcasting.

This piece of paradox is explained by the BBC Audience Research Department. They state that in the evenings television viewers spend far more of their time in front of their sets than radio listeners spend tuned in.

FIRST-CLASS TELEVISION and RADIO COURSES . .

GET A CERTIFICATE!

After brief, intensely interesting study —undertaken at home in your spare time—**YOU** can secure your professional qualification or learn Servicing and Theory. Let us show you how!

FREE GUIDE

The New Free Guide contains 132 pages of information of the greatest importance to those seeking such success compelling qualifications as **A.M.Brit.I.R.E., City and Guilds Final Radio, P.M.G. Radio Amateurs' Exams., Gen. Cert. of Educ., London B.Sc. (Eng.), A.M.I.P.E., A.M.I.Mech.E., Draughtsmanship (all branches), etc.,** together with particulars of our remarkable Guarantee of

SUCCESS OR NO FEE

Write now for your copy of this invaluable publication. It may well prove to be the turning point in your career.

FOUNDED 1885—OVER 150,000 SUCCESSES.

NATIONAL INSTITUTE OF ENGINEERING
(Dept. 462), 148, HOLBORN, LONDON, E.C.1.

VALVES

SAME DAY SERVICE

All Guaranteed New and Boxed

1.4v. midget, 1R5, 1S5, 1T4, 3S4, 3V4, DAF91 DF91, DK91, DL92, 7/3 ; any 4 for 26/6.

1A7GT	11/6	6P25	14/6	B36	16/6	EL91	5/-
1C5GT	11/6	6P28	19/6	CL33	12/6	EY51	12/-
1D5	11/-	6Q7GT	9/-	D1	3/6	EZ40	8/6
1H5GT	11/6	6SN7GT	8/6	DAC32	11/6	GZ32	15/-
1N5GT	11/6	6U4GT	17/-	DCC90	10/6	KT63	7/6
1R5	7/3	6V6G	7/6	DF33	11/6	KT66	11/6
1S5	7/3	6V6GT	7/6	DH77	8/6	MU14	8/6
1T4	7/3	6X4	7/6	DK32	11/6	N78	14/6
3A5	10/6	6X5GT	6/9	DK92	7/6	P61	3/6
3Q5GT	11/6	7B7	8/6	DL33	11/6	PCC84	10/-
3S4	7/3	7C5	8/6	DL35	11/6	PCF80	10/-
3V4	7/6	7C6	8/6	EB91	6/3	PEN46	8/6
5U4G	8/6	7H7	7/6	EBC33	7/6	PL33	11/6
5Y3GT	7/9	7S7	8/6	EBC41	10/-	PL81	11/6
5Z4G	9/-	7Y4	8/6	EBF80	10/6	PL82	9/6
6AL5	6/3	10C1	12/6	ECC40	15/6	PL83	12/6
6AM5	5/-	10F1	10/-	ECC81	9/-	PY80	9/6
6AM6	6/3	10P13	10/-	ECC83	10/6	PY81	10/-
6AT6	8/6	10P14	12/6	ECC91	7/-	PY82	7/9
6BA6	7/6	12AT7	9/-	ECH35	11/9	PZ30	17/-
6BE6	6/6	12AU7	9/-	ECH42	10/-	T41	13/-
6BW6	7/6	12J7GT	10/6	ECH81	10/-	U24	17/6
6BW7	7/6	12K7GT	9/6	ECL80	9/6	U25	12/-
6C4	7/6	12K8GT	10/6	EF37A	11/6	U50	7/9
6C9	8/6	12Q7GT	9/6	EF39	6/6	U78	8/6
6F6G	7/6	20F2	11/6	EF40	17/6	U281	10/-
6F14	12/-	20L1	10/-	EF41	8/6	U404	9/-
6J6	7/-	20P1	15/-	EF42	17/6	UBC41	9/-
6J7GT	7/6	25Z4G	9/-	EF50	7/6	UBF80	10/6
6K7G	6/-	35L6GT	8/6	EF80	10/-	UCH42	9/9
6K7GT	6/-	35Z4GT	8/6	EF86	17/6	UF41	8/6
6K8G	8/6	35Z5GT	8/6	EF91	6/3	UF42	13/6
6K8GT	9/-	50L6GT	8/6	EF92	5/-	UL41	9/9
6K25	11/9	30	8/6	EF95	10/6	UU6	10/6
6L6G	9/6	AZ31	10/6	EL38	22/6	UU9	17/-
6LD20	9/6			EL41	11/6	UY41	9/-
						W77	5/-
						Y63	7/6
						Z66	19/6
						Z77	6/3

Postage 4d. per valve extra.

READERS RADIO
24, COLBERG PLACE, STAMFORD HILL, LONDON, N.16. STA. 4587

NEW-MAX ELECTRONICS LTD.

307, EDGWARE ROAD
(JUST PAST THE MET.)
Tel. : PAD. 5607

London's Best T.V. and Radio Bargain Store

Special Offer : T.V. Tubes—All Sizes : 9in., £4 : 12in. from £4/10/- : 14in., £6 ; 15in., £7 : 17in. from £9/10/-.

Every tube guaranteed.

Callers can see picture before purchase.

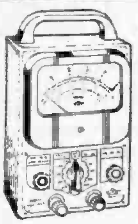
We have just completed a large purchase of used and H.P. repossessed T.V. sets—all types and all sizes—to be sold at knock-out prices. Special item : 1807 H.M.V. 10in. chassis adapted to be used with Mazda 12in. tube. £19/10/-, including tube. These chassis are very easily tuned to the Hessary Tor transmitter. Also large selection of used radios, gram chassis, instruments, amplifiers, tape recorders, etc.

SPECIAL OFFER. 6-valve 5 waveband Radiogram Chassis includes R.F. stage. Beautiful, superbly made chassis complete with 8in. speaker and ready to work; inc. P.P. £9/-/-. Size : 12½in. long, 8½in. high, 8in. wide.

RADIO AND TELEVISION COMPONENTS

All parts in stock for :
Viewmaster, Soundmaster, Teleking, etc.
Easy Terms available.
2½d. stamp (only) for Catalogue.

JAMES H. MARTIN & CO.
FINSTHWAITE, NEWBY BRIDGE, ULVERSTON, LANCS.



PULLIN

SERIES 100

TEST METER

AC/DC 10,000 Ω/V

21 RANGES

100μA to 1000 V

COMPLETE IN DIE-CAST CASE WITH TEST LEADS CLIPS AND PRODS

FULLY GUARANTEED

SENT POST FREE FOR **£2.10s.** DEPOSIT AND ELEVEN FURTHER MONTHLY PAYMENTS OF £1. CASH PRICE £12.7.6.

Frith RADIOCRAFT *Ltd* PHONE 58927
69-71 CHURCH GATE LEICESTER

ALUMINIUM, LIGHT ALLOYS, BRASS, COPPER, BRONZE,

IN ROD, BAR, SHEET, TUBE, STRIP, WIRE, ANGLE, CHANNEL, TEE

3000 STANDARD STOCK SIZES

H. ROLLET & CO., LTD.
6, CHESHAM PLACE, LONDON, S.W.1.
SLOane 3463

Works :
36, ROSEBERY AVE., LONDON, E.C.1.

Branches at Liverpool, Manchester, Birmingham, Leeds.

"No Quantity too Small"

Are You Making Your Own Radio or Television ?

We can make the cabinet for you in any shape, design or finish you require. Work executed by expert craftsmen.

Call or send drawings for quotation.

B. KOSKIE (Dept. C)
72-76, Leather Lane, HOLBORN, E.C.1.
Phone : CHAncery 6791/2.

HR

QUALITY TELEVISION COMPONENTS

SCANNING COILS
6/10 kV. R.F., E.H.T. UNITS
E.H.T. and OUTPUT TRANSFORMERS
LINE FLY-BACK E.H.T. UNITS

Write for illustrated list (Publication 75)

HAYNES RADIO Ltd., Queensway, Enfield, Middlesex.

AERIALITE AERIALS for Band I/III Reception on "EP"

(To calculate deposit, add 10% to the Cash Price shown and divide by 9. Balance by 8 monthly payments of the same amount. WE PAY CARRIAGE).

Model 800—Giving three element performance on Band III. Chimney lashing. Complete with filter box ...	£4	12	6
Model 801—As above, but giving five element performance on Band III	£5	7	6
Model 802—As Model 800 but is cranked arm wall mounting ...	£3	10	6
Model 803—As Model 801 with cranked arm wall mounting bracket ...	£4	14	6
Model 804—"H" Band I folded Dipole Band III section. Complete with filter box, cranked stand off arm, chimney lashing ...	£7	10	0
Model 805—As Model 804 but with five element Band III section ...	£8	5	0
Model 806—As Model 804 but with 10ft. by 2in. alloy mast and double chimney lashings ...	£11	2	6
Model 807—As Model 806 but with five element Band III section ...	£11	17	6
Model 808—Single Dipole Band I and giving three element performance on Band III ...	£5	2	6
Model 809—As Model 808 but with folded dipole and three directors for Band III ...	£5	17	6
Filter Box Part No. 184 ...		17	6
Junction Box Part No. 183 ...		14	6

"LAFCO" (Desk 203)
3, CORBETTS PASSAGE, ROTHERHITHE NEW ROAD, LONDON, S.E.16
Telephone : BERmondsey 4341 Ext. 1

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 K/B. HF40

SIR,—*Re* the remarks of P. F. Harrington, E.11, and his K/B. HF40 in the August issue.

The common cause of frame cramping at the bottom is due to falling off of the two RM3 metal rectifiers placed side-by-side next to the RM4.

It will be noted that these two rectifiers supply H.T. to the sound O.P. and frame O.P. valves and should your reader not have a suitable test meter I would suggest that he disconnects the H.F. feed to the sound O.P. transformer and looks to see if the frame still cramps; if there is no alteration these rectifiers require changing.—I. S. EDMONDS (TV Engineer, Croydon).

FOREIGN TRANSMISSIONS

SIR,—In reply to G. Little, N.W.5, on Foreign Transmission in July issue, on July 19th during Children's Television, I noticed patterns on the screen. I attempted to resolve same but Wenvoe was too strong. Programme having ended, at 6 p.m. I tried all channels but five was best. I succeeded in obtaining a picture of what appeared to be animal stills. Later an announcer, three-quarter length, appeared. Sound was bad, an occasional burst of music and a few distorted words which seemed French. Picture was negative, i.e., reversed blacks and whites, and faded slightly but locked in quite strong. Programme shut down at 6.30 p.m.

My set is an Ekcovision T.221. Standard H aerial 15ft. high.—B. SNOOK (Somerset).

RADIO AND TV INTERFERENCE

SIR,—Having studied Mr. J. Rayner's letter in the July issue, I feel that he is a little confused over the regulations and the way in which the Post Office carries out its investigations. My own experience of the Post Office regarding TV interference with sound radio is quite the opposite of what Mr. Rayner states in his letter.

About two years ago the Post Office representatives called on my wife during one afternoon and asked if they might test my TV set, a home-built Televisor with R.F.E.H.T. They found that the line timebase was causing very bad interference with long-wave Light Programme reception in a neighbour's house on the opposite side of the road. My wife asked them to call and see me the same evening. They came as arranged, and together we quickly eliminated the interference, to the complete satisfaction of my neighbour and myself. Incidentally, the suppression circuit, a choke-capacitor filter supplied by the Post Office, is inserted in the mains line at the points of entry into the mains transformer primary, and its action is two-way. Not only does it prevent line pulse entry into the mains, but it suppresses odd interference which is mains borne. As a result of this my picture was cleaner and more noise-free. I cannot remember the exact cost, but it was well under ten shillings. I was told that a large number of TV sets, both commercial and home-built, were bad offenders with the long-wave Light Programme, as 200 Kc/s is a harmonic of 10 Kc/s, the line frequency, and the Post Office is kept quite busy with this problem.

Mr. Rayner should also note one more point. Now that F.M.V.H.F. is with us more listeners will be using this band for sound reception, and it is subject to the same forms of interference as TV.

In conclusion the P.O. engineers told me that it was very rare indeed to meet with obstruction and refusal to co-operate over interference, once a polite request with a concise explanation was given.—H. G. DINES (Godalming).

A COLOUR IDEA?

SIR,—To my mind the problem of colour television is quite a simple one. But then I am a practical man and not a very good mathematician.

And such a simply good idea going to waste.

The simple idea is to imagine the spot of a spot-wobble outfit oscillating at the frequency of the individual colours and/or vibrating within the bandwidth of each colour, the latter giving depth.

Now let us take, for instance, the colour red (red being the slowest frequency), the frequency of which is 380-480M Mc/s, or shall we say 380-480 billion cycles per second.

And this is where the snags pile up.

What formulae can one use for oscillatory circuits in such circumstances?

And what valve can handle such frequencies?

And it was such a *simple* idea.—S. WINDOW (Manchester).

CHOICE OR HABIT?

SIR,—Are we getting the television habit these days or do we view our entertainment instead of just listening through choice?

I am tempted to ask this because of the case of my young son who has just left school and started work for the first time. When the Test matches are being broadcast simultaneously on radio and television, he arrives home at 6.30 p.m. at the close of play too late to watch any cricket itself but in good time to hear 10 minutes or so of summing-up of the day's play. For this, he has two options. Switch on the TV set and look at Peter West's face while he describes the play, or, alternatively, tune in to the radio and just listen. He has nothing to gain by choosing the TV yet he always does. Is this choice, Sir, or habit?—H. G. ROSS (Sevenoaks).

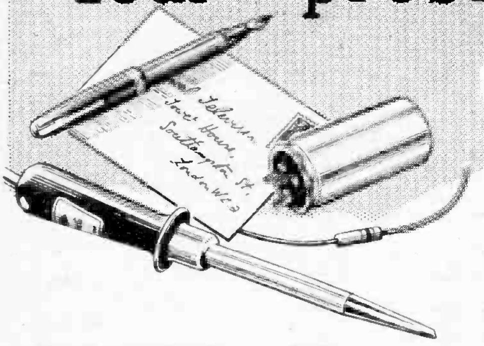
TEST CARD C

SIR,—If other readers were to do what I have just done with my "Argus" receiver, they would certainly have a shock.

The set has given me good service for over two years and to myself and my family the picture has always looked well up to standard, that is considering focus, height and width, etc. Now I have had occasion to be at home in the morning during the test transmission period when Test Card C and film sequences are transmitted for the benefit of the trade and less knowledgeable amateurs like myself.

I switched on and was amazed at the irregularity of the Test Card C pattern. Although blacks, whites and greys were all right, the shape of the whole pattern was "terrible" to say the least. It is well to give your receiver this test every few months or so, it seems.—I. RICHARDS (Tooting).

Your problems solved



Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 191 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

H.M.V. 1808

My problem is : I bought, second-hand, an H.M.V. television, model 1808, A.C./D.C.

Switching on for testing I found no raster so I decided to connect aerial to find if sound section was O.K.

I then found I had sound, also a picture, but line-hold control was at end of its travel and would not lock—timebase giving me multiple picture. I tried all service hints given in September, 1954, issue of "Practical Television"—all to no avail, but on insertion of approximately a 10 K resistor in parallel with the 25 K variable horizontal hold I now have picture which I can hold. Have you any suggestions ?—R. Smith (S.W.11).

Although you say you have carried out all the hints advised, we would put the following possible causes :

1. Defective B36 (most likely).
2. 330 kΩ resistor on tag panel near KT36 valve base gone high.
3. 25 kΩ line-hold slider element open circuit (E.M.I. or Colvern).
4. Check brightness control (50 K. front panel). Also Parallel 47 kΩ resistor.

VIEW-MASTER

I have recently completed a View-Master as a 12in. console model. The tube is a Mazda 123, aluminised, with E.H.T. boost circuit. The frame amplitude is all right, but the recommended alterations to the line-circuit still does not have any appreciable effect and the scan is approximately 1in. too narrow.

A second fault which I cannot overcome is foldover at the left-hand side of the screen of about ½in. width.—J. W. J. Hurnen (Billingham).

The first fault is undoubtedly caused by the second. The linearity components of the line output and boost circuit should be tested and checked to ensure that they are all as recommended. It would appear that the line-output transformer is not matched properly with the line-scan coils or that a component failure is causing such a mismatch.

SIMPLEX

I have carried out modifications as page 341 January issue : normal type aerial, high, cleaned EF50 valve pins and fitted retaining clips. Result—picture perfect. No sound (with brass core in L2 only, other cores iron-dust). Replaced L2 with dust-core—perfect sound, no trace of picture. The only adjustment necessary to obtain sound from vision is to replace L2 as previously stated ; no need to touch any other cores. Cannot seem to compromise with regard to core of L2, which seems to be the deciding factor.

Any advice would be gratefully received, as I am puzzled by the inability of covering sound plus vision, although either is perfect alone.—V. F. Cooper (Norwich).

It would appear that L2 is not tuning broadly enough. Try taking one turn from primary and secondary, and then set L1 to compromise between vision and sound.

ARGUS

I am at present starting to build the "Argus" TV receiver.

On looking through your publication of February this year, I find that you give modifications of the "Argus" receiver for using the tube VCR511A. A friend has offered me a tube VCR511B.

I am unable to find the difference between the VCR511A and the VCR511B.

Perhaps you could let me know what difference, if any, exists.—Gordon B. Melville (Cambridge).

The only difference between the two tubes is in the screen. The "B" type can be used, but the screen has a slightly longer persistence than the "A" type.

MARCONI VT62DA

I have a Marconi table model television, No. VT62DA. This now requires a new tube. Is it possible to fit one of the new 16 or 17in. daylight viewing tubes ? If so, what modifications would be necessary and is the circuit worth rebuilding the timebases, etc. ?

Can you suggest a circuit for modification ? I was wondering if it would be possible to use something like the one described for the wide-angle View-Master.—D. Farr (Caerphilly).

We cannot supply details of the involved mechanical alterations which you require. The increase in picture size would not be appreciably greater and the brilliance obtained with the original type of tube in good order is sufficient for daylight viewing. We regret we cannot advise you further.

H.M.V. 2808

This model is arranged to work on the Midland wavelength and I now wish to use it on the London wavelength. Could you please advise me what parts must be changed to enable me to use it in the London area ?

Could this be done by using the converter mentioned

(*Continued on page* 191)

"RADIO UNLIMITED" offer: Band 3 Conversion Gear: Coilsets, incl. circuits and data, **15/-**; c'plete kit for converter, incl. drilled chassis and valves, **35/-**, with power pack, **52/6**; valves **EF80, 11/-**; drilled chassis only **4/6**; Mullard Amplifier, exact to spec., kit, incl. valves, **9 gns**; complete **11 gns**. High-grade 3-stage Gram./Mic. Amplifier kit, incl. valves, **59/6**. T.R.F. receiver kit, incl. valves and cabinet, **82/6**. Valves, 5U4, EL32, 807, **6/9**; 6BE6, **6/-**; 6V6 Metal, **8/-**; EF37A, **9/6**; 1A3, 3A4, EY91, ML6, 8D2, 9D2, 4D1, **3/9** ea. New lists available. RADIO UNLIMITED, Elm Road, London, E.17. (KEY 4813.) Also at 50, Hoe Street, E.17. (LAR 6377.)

BATEL OF PRESTON. Service Sheets and Components for Radio and Television. S.A.E. enquiries, please. 171, Norris St., Preston, Lancs.

RADIO-GRAM CHASSIS, 29/9, including 8in. speaker, 5 valve s/het, 3 w/band, A.C mains. Complete, less valves. Tested, guaranteed: carr. **4/6**. Set of Knobs to suit, **1/6** extra. DUKE & CO., 621, Romford Road, Manor Park, E.12.

SPEAKERS, 10/9. 8in. P.M. standard 3-5 ohms: guaranteed: post 1/9. DUKE & CO., 621, Romford Road, Manor Park, E.12. (GRA 6677.)

RADIO-GRAM CHASSIS, 14/9. A.C. or Universal, s/het, 3 w/band, 465 I.F.s, less dial, electrolytics and valves; otherwise believed to be working; carr. 3/6. DUKE & CO., 621, Romford Road, Manor Park, E.12.

BRAND NEW RF Units 26 or 27, **27/6**; 24, **10/6**; 25 soiled, **10/6**. Receiver 161, 160/220mcs., valves 1/CV66, 2 EF54, 1 EC52, **17/6**; I.F. Amp. for this (16.5mcs.), type 178a, 8 valves, **22/6**; post each above 2/6. R1355, new type, simplified switch, metal condensers, new, **37/6** (carr. **7/6**. TR1196, less xtals, **45/-** (carr. 8/6). Cash with order: s.a.e. list/enquiries; immediate despatch. W. A. BENSON, 308, Rathbone Rd., Liverpool, 13.

WINWOOD FOR VALUE. Complete kit for Band 3 Converter: Coilset, drilled chassis, valves, etc., everything to the last nut and bolt, **49/6**, with power pack, **67/-**; AC-mains 3-stage Amplifier Chassis, c/plete kit, incl. valves, **47/6**; Valve Sets, 6K8, 6V6, EBC33, 6K7, 5Z4, **31/-**; 1T4, 1S5, 1R5, 3S4, **29/6**; EL32, **4/9**; 6SN7, 6SL7, **7/6**. Lists. WINWOOD, 12, Carnarvon Road, London, E.10. Mail only.

DIRECT T/V REPLACEMENTS offer the most complete Handbook of T/V Components and Rewinds, price **1/-**. T/V Components for all kit sets in stock. "Nuray" heater booster isolator for 2-volt C.R.T.s, just plugs in, **27/6**, plus 2/- packing and postage. 134-136, Lewisham Way, S.E.14. (TIDeway 3696-2330.)

INDOOR TV. AERIAL, revolutionary design, latest slot technique using curtain rail, details **2/6**. P.O. R.M.S., 60, Portway, Warminster.

VIEWMASTER, expert constructed, new 12in. Console chassis, lined up sound and vision, Holme Moss; all specified parts, speaker and valves; mains 3-pin plug, 2-pin aerial socket; guaranteed perfect; demonstrated: **£20**. 34, Garswood St., Liverpool, 8. (LAR 3013.)

R.F. OSC. E.H.T. COILS

TYPE "D" 2-9 kV 25/-
WITH RECTIFIER ASSEMBLED 54/-
TYPE "F" 9-14 kV 30/-
WITH RECTIFIER ASSEMBLED 59/-

Current available, 1-2 mA. Ideal for oscilloscopes and television. Dimensions 3½in. x 1½in. dia. Wave wound winding. Complete with circuit. *Terms: C.W.O. Post orders only.*

THE WATSON WATCH CO.
29, LEIGH ROAD, LONDON, N.5

RATES: 4/- per line or part thereof, average five words to line, minimum 2 lines. Box No. 1/- extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Television," Tower House, Southampton St., Strand, London, W.C.2.

T/Vs IN PERFECT ORDER. Many sets from **£15**, sets requiring attention from **£7**. Send S.A.E. for lists. TUNERS: Thirteen Channel; suitable for wiring into receivers with full instructions, **£6**. When ordering state Sound and Vision I.F. and Osc. Freq., or make and Model No. of set. Band Three external type just plug in for commercial programmes, **£9/10/-**. Delivery is from six to eight weeks on some types. Orders are dealt with in strict rotation. HIGH ST., RADIO, 284-6, High St., Croydon, Surrey. (CRO 8030.)

TV SIMPLEX COILS, 21/-; TV 3in. Canned Formers, 2/3 ea. BEL, Marlborough Yard, Archway, N.19. (ARC 5078.)

TV WITHOUT MAINS—Absolutely first-class picture, plus DC circuit for lighting; as supplied to the B.B.C. Special AC/DC "Chorehorse" Generators, self-starting, compact, and complete, AC 220/250 volts, 50/60 cycles, 250/350 watts AVC. Will run radios, vacuum cleaners, small tools, etc., **£47/10/-**, plus 10/- delivery. Below:—

STORAGE BATTERIES, 12v. 75AH heavy duty, 19 plates, separate cells in hardwood cases; finest possible specification, **£5/17/6**, 9/6 delivery; 12v. 22AH, almost similar specification, surprisingly powerful, **£2/14/-**, delivery 5/6. TEDDINGTON ENGINEERING CO., LTD., Dept. "C," High St., Teddington, Middx. (KINgston 1193-4.)

LOUDSPEAKERS repaired promptly. MODEL LOUDSPEAKER SERVICE, Bullington Rd., Oxford.

17IN. T.V. CABINETS, 39/-, de luxe boxed, brand new, latest design, ex famous manufacturer, complete mask, glass, fret, speaker baffle mounted in front. Size 19in. w., 20in. h., 16in. d. Large purchase enables us to offer these magnificent cabinets at only **39/-**, p. and p. 5/-. Ditto, 14in. size, 17in. w., 17½in. h., 16in. d., **35/-**, p. and p. 5/-. High Flux Elliptical Speakers, 7in. x 4in., to fit above, **16/6**, unused. TECHNICAL TRADING CO., 181, Lake Rd., Portsmouth.

H AERIALS, COMPLETE, 35/-. All channels, famous manufacture, original wrappings, listed approx. £4/5/-, all chimney lashings and mast included. Please state if for small or large chimney; carriage 4/- extra. Tested Valves, EF50, **4/6**; PY31, **4/6**; SP41, **2/6**. 15in. CR Tubes, guaranteed CRM 152, **£5**; 16in. metal, **£5/10/-**; 17in. square, **£7/10/-**. TECHNICAL TRADING CO., 181, Lake Rd., Portsmouth.

BAND III Converter Kit

(FOR T.R.F. OR SUPERHET)

Complete kit of parts, including: Ready Drilled Chassis, 7in. x 3in., (2) Miniature Valves, Ready Wound Coils, etc.,

£2-8-0 Postage 1/6.

(Supply voltages required: 250 v. at 20 mA., 6.3 v. at .6 a.)

Can be seen in operation at

TELEKIT SUPPLY
104, High Street, Beckenham, Kent.
(BEC 3720.)

R.F. UNITS, Types 26 at 27/6, 25 at 12/6, 24 at **11/-**; brand new with valves; post 2/6. E.W.S. CO., 69, Church Road, Moseley, Birmingham.

SERVICE SHEETS, Radio, TV, etc., from 2/3 p.p. List of 4,000 models avail., 1/-. TELRAY, 11, Maudland Bk., Preston.

PREMIER TELEVISION (½ Picture) in cabinet; Magniner; spare Tubes; **£6**, o.n.o. LADD, Buckland Cres., Windsor.

VALVES

GUARANTEED VALVES, Boxed: PCC84, PCF80, U25, 20P4, 20P3, U251, **10/-**; PL81, 20F2, U282, **9/-**; ECL80, EF80, EBF80, U281, 10C2, 10F1, PY81, 6K8, X150, **8/6**; 6SN7, 6V6, ECC81, U22, **7/6**. W. FEWELL, 19, Mapledene Road, Dalston, E.8.

WANTED, Valves CF13, 6F15, 6U4, EY51, 5Z4, ECL80, KT61, 25A6, etc.; prompt cash. WM. CARVIS LTD., 103, North Street, Leeds, 7.

ALL TYPES OF VALVES REQUIRED for cash. State quantity and condition. RADIO FACILITIES LTD., 38, Chalcot Road, N.W.1. (PRImrose 9090.)

WANTED

PROMPT CASH offered for your surplus brand new Valves, Loudspeakers, Components, etc. Send list and prices to R.H.S. LTD., 155, Swan Arcade, Bradford, 1.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64, inclusive, or a woman aged 18-59, inclusive, unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

ALL DISTRICTS. An opportunity exists for Television Technicians to establish a business of their own. The business can be commenced in first instance in spare-time, showing an all the year round increasing income. Write, giving particulars of age, training, test equipment, experience, to TELEPATROL LTD., Federation House, Epsom.

HEARING AID Service Mechanics required at once. Knowledge of L.F. amplification and miniature circuits essential. Good wages and conditions. Apply Box No. 179, c/o PRACTICAL TELEVISION, or phone W.J.S., Welbeck 8247.

MAINS RADIO require men with good knowledge of Radio as Radio and Television Testers; good working conditions; staff positions. Please apply to the Personnel Officer, MAINS RADIO GRAMOPHONES LTD., 359, Manchester Road, Bradford, 5.

TESTERS REQUIRED for Television Production Line. Apply in writing, giving details of experience and rate required to PERSONNEL MANAGER, McMichael Radio Ltd., Wexham Rd., Slough, Bucks.

EDUCATIONAL

BUILD YOUR OWN T/V and learn about its operation, maintenance and servicing. Qualified engineer-tutor available while you are learning and building. Free Brochure from E.M.I. INSTITUTES, Dept. PT53, London, W.4. (Associated with H.M.V.)

TELEVISION COMPONENTS

in stock for the
P.T. LYNX, P.T. SUPER-VISOR, TELE-KING
VIEWMASTER, E.E. TELEVISOR
and wide angle modifications

Price lists available on request to:
J. T. FILMER, Maypole Estate, Bexley, Kent.
Tel.: Bexleyheath 7267

LYONS RADIO Ltd.

3, GOLDHAWK ROAD, Dept. M.T., SHEPHERDS BUSH, LONDON, W.12.

Telephone : SHEpherds Bush 1729.

RADIO EXHIBITION.—Once again we are holding our SPECIAL SALE, starting August 24th, to coincide with the commencement of the Radio Exhibition. Our premises are only a little over a mile from Earls Court, so if in town why not pay us a visit and secure some of the many bargains which will be displayed at CLEARANCE PRICES. Examples : T.1154 chassis, less meters, from 5/6. Chassis incorporating A.C. mains Power Packs from 25/-. Chassis for break-down from 2/6. Receivers type R.1155's, models " A " and " B," and literally hundreds of others. Despatch of purchases gladly arranged. Please DON'T write or 'phone for further details as we must restrict this SALE to PERSONAL SHOPPERS.

BAND III CONVERTER.—Complete coil kit by Teletron Co. with circuit, point to point wiring diagram, alignment instructions, etc. Provides the basis for an efficient, easy to make, two-valve converter for use with TRF. or Superhet Band I T.V. receivers. PRICE 15/-, post 6d. Metal chassis ready drilled, PRICE 3/9, post 6d. Instructions leaflet only 5d., post paid.

ELECTROSTATIC LOUDSPEAKERS.—Designed to reproduce the higher frequencies and when connected across an existing speaker of the moving coil type combines to produce that high quality reproduction essential when receiving F.M. transmissions or reproducing high quality recordings and T.V. sound. Type LSH75 size 3 x 3 x ⅞ins. for output up to 6 watts. PRICE 12/6. Type LSH100 size 5 x 4 x ⅞ins. for outputs up to 20 watts. PRICE 21/-.

FLEX.—Twin, flat, P.V.C. insulated, conductor 14/36 tinned copper. Suitable for 250 volt electrical and radio work, wiring extension speakers, telephones, bells, etc. Price 6/6 for 25 yards, 11/6 for 50 yards, 21/- for 100 yards, inc. postage.

YOU can become a First Class RADIO ENGINEER

We can train you to earn good money in your spare-time, start a radio business of your own or qualify for well-paid employment. Our Home-Study Courses in Radio, Television and Mathematics are up-to-date and easy to understand. The fees are very reasonable and can be paid by instalments.

T/C RADIO COLLEGE

ESTABLISHED IN 1933

Send for free details, which will be sent in plain sealed package. Simply write your name and address inside the flap of an unsealed envelope (postage 1½d.) or on a postcard (postage 2d.) and address it to the Principal :—

R. HEATH BRADLEY,
DUART HOUSE (T), ASHLEY ROAD,
NEW MILTON, HANTS.

THE VALVE SPECIALISTS

Bentley Acoustic Corp. Ltd.

38, CHALCOT ROAD, N.W.1.

PRImrose 9090

1st grade goods only. No seconds or rejects.

0Z4	6/-	6V6GT	7/6	7193	2/6	KT44	7/-
1A5	6/-	6X4	7/6	9002	5/6	KTW61	7/-
1D5	10/6	6X5	6/6	9003	5/6	KTW62	5/-
1D6	8/6	6Y6	10/-	9006	5/6	KTZ41	6/6
1E7	6/6	6Y7	15/-	AC/HL	6/6	KTZ63	6/6
1G6	6/6	6Z4/84	8/6	ACP4	8/-	LN152	10/-
1L4	6/-	7AN7	11/-	ACVP1(7)		LP2	4/6
1LD5	6/6	7B7	7/6		10/6	MH4	5/6
1LN5	6/-	7C5	8/-	AP4	7/6	ML4	6/6
1S5	7/-	7C6	8/-	ARP3(A)	5/-	MU12	8/6
1T4	7/-	7D8	6/-	ATP4	3/-	N77	7/6
2C26	4/-	7H7	7/6	AZ31	10/6	N78	11/6
2D21	8/6	7Q7	8/-	B309	9/-	N150	10/6
2X2	4/6	7R7	8/6	B319	11/-	OM5	7/6
3A4	7/6	7V7	8/6	BL63	7/6	OM5A	10/6
3D6	2/6	8A8	11/-	CK505	6/6	OC3	9/-
3Q5	9/6	8D2	2/6	CK523	6/6	OD3	8/6
3S4	7/-	8D3	6/6	CK525	6/6	PCC84	11/-
3V4	7/-	10C2	10/6	CY31	11/6	PCF80	11/-
5U4	8/-	10D1	4/6	D77	6/-	PCL83	12/6
5V4	10/-	10F1	10/-	DA90	8/6	Pen 25	6/6
5Y3	7/6	10LD3	9/-	DAF91	7/-	Pen 46	7/-
5Z4	8/6	10P13	10/-	DF91	7/-	Pen 1340	
6A8	10/6	12A6	6/6	DF92	6/-		6/-
6AB7	6/-	12AH7	12/6	DH77	8/-	PL81	10/-
6AB8	10/-	12AH8	11/-	DK92	7/-	PL82	9/6
6AC7	6/6	12AT7	8/-	DK96	8/6	PL83	11/6
6AG5	6/6	12AU7	[illegible]	DL2	15/-	PM12	4/-
6AG7	12/6	12AX7	9/-	DL72	7/-	PM12M	6/6
6AK5	7/6	12BE6	6/6	DL93	7/6	PM256	6/6
6AL5	6/-	12BH7	12/6	DL94	7/-	PP225	7/6
6AM5	6/6	12E1	30/-	DL810	10/6	PY80	9/6
6AM6	6/6	12H6	3/-	E1148	2/-	PY81	10/-
6AQ5	8/6	12J5	6/-	EA50	2/-	PY82	7/6
6AT6	8/-	12K8	8/6	EA76	9/6	PY83	10/-
6B4	6/-	12SC7	7/6	EAC91	9/-	QP21	7/6
6BA6	7/6	12SG7	5/6	EB34	2/-	QP22B	12/6
6B8G	4/-	12SJ7	8/-	EB91	6/-	Q895/10	
6B8M	4/6	12SK7	6/-	EBC3	12/3		10/6
6BE6	6/6	12SQ7	8/6	EBC33	7/6	QS150/15	
6BJ6	6/6	12SR7	7/6	EBC41	10/-		10/6
6BR7	9/-	14R7	10/6	EC91	7/-	QVO4/7	9/6
6BW6	7/6	18A5	9/6	EC52	5/6	RL37	6/-
6BW7	10/-	17Z3	10/-	ECC32	10/6	S130	8/-
6BX6	10/6	19H1	10/-	ECC33	8/6	SD6	7/6
6C4	7/6	19Y3	8/6	ECC35	8/6	SP4(7)	8/6
6C6	6/6	25A6	8/6	ECC81	9/-	SP6	6/6
6C8	8/-	25L6	8/6	ECC82	10/6	SP61	2/6
6C10	10/-	30	7/6	ECC83	10/6	TP22	8/6
6CH6	6/6	35L6	8/-	ECC91	7/6	U16	12/-
6D6	6/6	35Z4	8/6	ECH35	11/6	U17	7/6
6F6G	7/6	35Z5	8/6	ECH42	10/-	U19	10/6
6F6M	8/-	42	8/-	ECH81	10/-	U25	12/-
6F8	7/-	43	8/6	ECL80	10/-	U50	7/6
6F12	6/6	50C5	10/-	EF22	9/-	U52	8/-
6F13	12/6	50L6	8/-	EF36	4/6	U78	7/6
6F16	9/-	50Y6	8/6	EF37A	10/6	U142	9/-
6F17	9/6	57	8/6	EF39	6/6	U150	9/-
6F32	6/-	58	8/6	EF41	9/-	U153	10/-
6F33	9/6	61BT	12/6	EF50(A)	8/-	U329	10/6
6G6	6/6	61SPT	15/-	EF50(E)	5/-	U404	9/-
6H6G	2/6	62DDT	10/-	EF54	5/-	UBC41	9/-
6H6M	3/6	62TH	10/-	EF55	12/-	UCH42	9/6
6J5G	5/-	62VP	9/-	EF73	10/6	UCH81	12/6
6J5M	6/-	64ME	10/6	EF80	10/-	UF41	8/6
6J6	7/6	66KU	9/-	EF85	10/-	UL41	9/6
6J7G	5/-	67PT	10/6	EF91	6/6	UL46	10/-
6J7GT	5/6	72	4/6	EL32	6/6	UU9	9/-
6K6	7/-	75	8/6	EL41	10/6	UY41	9/-
6K7G	5/-	76	7/-	EL84	11/-	VLS492A	
6K7GT	5/6	77	8/-	EL91	6/6		£3
6K7M	6/-	78	8/6	EM34	10/-	V986	6/-
6K8G	8/-	80	8/6	EY51	11/-	VMP4G	10/6
6K8GT	8/6	85A2	10/6	EY86	12/-	VP2(7)	8/6
6L7	7/6	121VP	9/-	EY91	7/6	VP4(7)	8/6
6LD3	10/-	141TH	10/-	EZ40	9/-	VP13K	8/6
6N7G	7/6	210LF	3/-	EZ41	9/-	VP23	6/6
6N7M	8/-	301	10/-	EZ80	9/-	VR53	5/-
6Q7	8/6	311SU	9/-	H30	5/-	VT501	6/-
6SA7	8/-	451PT	10/-	HL2	3/-	W42	11/-
6SC7	10/-	807	7/6	HL13C	7/6	W150	9/-
6SG7	6/6	808	25/-	HL23	5/6	X66	7/6
6SH7	6/-	813	70/-	HL23DD		X150	10/-
6SJ7	8/-	832	25/-		6/6	XFW10	6/6
6SK7	6/-	866A	15/-	HL41	7/6	XFY10	6/6
6SL7	8/-	885	10/6	HVR2A	7/6	XFY12	6/6
6SN7	8/6	956	3/6	KBC32	8/6	XH(1.5)	4/-
6SS7	7/-	1203	7/6	KF35	9/-	XSG1.5	4/-
6U5(UX)	7/-	4022AR	5/-	KK32	10/6	Y63	7/6
6U5(10)	7/6	4033X	7/6	KL35	9/-	Z77	6/6
6V6G	7/-	5763	9/6	KT2	5/-	Z719	10/6

CRYSTAL DIODES.—OA71, GEX34, CG6E, M1, CG10E, all 7/- each.

All boxed and guaranteed. Post 6d. each. Same day service. Shop hours 8.30 to 5.30. Sats. 1 p.m. Why not 'phone or wire that urgent order for immediate despatch C.O.D.? Complete list free S.A.E.

COVENTRY RADIO

189, DUNSTABLE ROAD, LUTON, BEDS.

Phone : Luton 2677

The Quality Component Specialists offer you Kits of Parts for the following :—

	Manual
Osram " 912 " Amplifier ...	3/6
Mullard 10-watt Amplifier ...	3/6
The Coventry 2-watt Amplifier ... / 4-watt Amplifier ... / 6-watt Quality Amplifier	1/-
The Coventry A.M. Tuner Unit	1/-
Denco F.M. Tuner Unit ...	1/6

Complete Component Price Lists will be supplied with each Manual.

Have you had a copy of our 1954/5 60-page illustrated Component Catalogue, price 1/- plus 3d. postage ?

BAND III CONVERTERS

TYPE 30

For Band III reception with any type of receiver. A sensitive beautifully-designed unit completely enclosed with its own power supply. Price ... **£8.5.0** complete.

TYPE 32 SWITCH UNIT

A remote control for mounting in or on the television receiver permitting switching from B.B.C. to I.T.A. programmes with the Type 30 converter unit mounted in any convenient position. Price **£1.5.0** complete.

TYPE 33 CONVERTER

A sensitive low noise converter unit as the Type 30, but including remote switch panel for One Band I and Two Band III stations. Price ... ... **£10.2.6** complete.

Leaflets with pleasure on request.

" STAND 211 at the Radio Exhibition."

Spencer West Ltd.

QUAY WORKS, GT. YARMOUTH.

in the June number of "Practical Television," so I could get the new I.T.A. programme as well?—E. C. Philbrow (New Malden).

To obtain Channel 1 (London) only, change four small capacitors and retrim oscillator and aerial circuits. 22 pF now *across* oscillator coil change to 30pF; 22 pF now fitted from pin 6 of X78 to oscillator coil change to 50 pF. Wire 15 pF from pin 5 to pin 6 on V1 (Z77). Wire 10 pF from pin 1 on V1 to chassis.

A "channel" or "Pam" or similar converter may be used as suggested with the output I.F. tuned to Midland frequency. This may well be the better plan, so as to avoid breakthrough from London BBC on ITA programmes.

SOBELL 17

Quite recently I have bought a "Sobell 17" television set (the latest model) which embodies a 12-channel tuner, and according to booklet supplied with the set, it should, by providing the requisite aerial, or a combined one, be capable of receiving the I.T.A. programme on Band III.

During the last two or three weeks I have had an aerial—made from information in your book—in the loft, then outside, but although I have turned the tuner to each number in tune and adjusted fine tuning knob, I have not been able to secure any indication whatever of the test card—just a blank screen all the time—and I wondered if there was some minor adjustment that had to be made before this test broadcast could be received.—Cyril Spruce (Harrow).

If the oscillator adjustments do not resolve a picture on position 9 the aerial and feeder should be checked. What type of aerial is being used? Depending upon the immediate locality and remembering that the test signal is only 1 kW, an efficient installation is essential and the use of low loss cable is most desirable. The height of the aerial is extremely important.

BAND III AERIAL

My TV aerial is at present fixed in the loft of my house.

I now wish to install a separate Band III aerial and I would like to know if it is possible to use one feeder cable for both aerials.

If it is possible, then I should be obliged if you would let me have any necessary information as to how it can be done.—S. Baker (Sanderstead).

The feeder cable from each aerial may be taken to junction box, specially designed for this purpose, and a single cable then taken to the receiver. These boxes are known by various names, e.g., splitter boxes, crossover units, etc. They may be obtained from any recognised dealer.

G.E.C. BT1093

The above had only a very faint grey picture with contrast and brilliance full on.

Raster alone is very faint and width is normal. E.H.T. seems sufficient.

I shorted cathode to heater on the tube, and in that condition it produced a better black and white picture, though very inferior. When brilliance was turned full on picture had a "negative look" with bright fly-back lines.

I notice that with and without cathode to heater "short," a bright spot appears on screen when set is switched off. When set was in good working order I used to see a dull 1in. by ½in. spot on switching off.

I hope I have given adequate information to enable you to suggest the cause of the fault.—B. Kennedy (N. Woolwich).

The anode load resistor of the video amplifier appears to have decreased in value and in doing so would cause loss of contrast and decreased brilliance due to a higher D.C. voltage being applied to the tube cathode. Also, the C.R.T. would appear to be failing on emission and it may be, if the load resistor referred to above is in order, that this is responsible for the whole fault condition.

McMICHAEL 909

I have a McMichael Model 909 console TV which has been in service approximately three years (tube two years). The picture is perfect in every way but for the fact that I cannot get enough black into it.

When the contrast control is advanced beyond a certain point fly-back lines appear.

The same thing happens when the brilliance control is advanced; in fact, the only way to obtain a reasonably black picture is to run with no brilliance at all.

There is another point; the width control will not reduce the picture sufficiently to show the broken black line at edge of screen—although the circle in test card "C" can be made round with the height control. All the other controls appear to be in order.

Hoping you will be able to help me with this problem. Thanking you in anticipation.—H. N. Stretch (Manchester).

V6 video amplifier may be slightly "soft" and drawing excess current, thus reducing the C.R.T. cathode D.C. potential. If the valve is in order check main chassis: R22, 5.6 K; R49, 68 K; R48, 100 K; power pack R83, 5.6 K; also C62, .5Ω F and R69, 680 K. Excessive width is often caused by R79 15 K dropping in value.

DECCA 131

I would be pleased if you could help me with a fault that has developed in my Decca 131 projection receiver. The top half of the picture is very dark, the bottom half crimped. The frame height control is at its maximum: any adjustment on this control makes matters worse. The line width seems to be O.K., plenty of adjustment still left. The power pack has just been recently overhauled, new condensers and rectifier GZ32 being fitted.—S. Scales (Oldham).

It is not stated whether the upper part of the scan is distorted. However, since it is dark, it is assumed so. The frame output components should be inspected, especially the cathode bias by-pass condenser, which is a large capacity electrolytic.

QUERIES COUPON

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

PRACTICAL TELEVISION SEPTEMBER, 1955

Published on the 22nd of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and printed in England by W. SPEAIGHT & SONS, Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A'sia), LTD. South Africa: CENTRAL NEWS AGENCY, LTD. Subscription rate including postage, for one year: Inland and Abroad 13s. 6d. (Canada 13s.) Registered at the General Post Office for the Canadian Magazine Post.

RADIO SUPPLY CO. (LEEDS) LTD.

Dept. N., 32, THE CALLS, LEEDS, 2.

Post Terms C.W.O. or C.O.D. NO C.O.D. under £1. Postage 1/- extra under 10/-: 1/6 extra under £1 ; 2/- under £3. Open to callers 9 a.m. to 5.30 p.m. Sats. until 1 p.m. S.A.E. with enquiries, please. Full list 5d. ; Trade List 6d.

R.S.C. MAINS TRANSFORMERS (FULLY GUARANTEED)

Interleaved and Impregnated. Primaries 200-230-250 v. 50 c/s Screened.

TOP SHROUDED, DROP THROUGH

260-0-260 v 70 ma. 6.3 v 2 a. 5 v 2 a ... **16/9**
350-0-350 v 80 ma. 6.3 v 2 a. 5 v 2 a ... **18/9**
250-0-250 v 100 ma. 6.3 v 4 a. 5 v 3 a **23/9**
350-0-350 v 100 ma. 6.3 v 4 a. 5 v 3 a **23/9**
350-0-350 v 150 ma. 6.3 v 4 a. 5 v 3 a **29/9**

FULLY SHROUDED UPRIGHT

250-0-250 v 60 ma. 6.3 v 2 a. 5 v 2 a Midget type, 2¼-3-3in. **17/6**
250-0-250 v 100 ma. 6.3 v 4 a. 5 v 3 a ... **26/9**
250-0-250 v 100 ma. 6.3 v 6 a. 5 v 3 a. for R1335 Conversion **31/-**
300-0-350 v 100 ma. 6.3 v 4 a. 5 v 3 a ... **27/9**
350-0-350 v 100 ma. 6.3 v 4 a. 5 v 3 a ... **27/9**
350-0-350 v 150 ma. 6.3 v 4 a. 0-4-5 v 3 a **31/6**
425-0-425 v 200 ma. 6.3 v 4 a. C.T. 6.3 v 4 a. C.T.. 5 v 3 a **49/9**

FILAMENT TRANSFORMERS

All with 200-250 v 50 c/s Primaries : 6.3 v 1.5 a. 5/9 : 6.3 v 2 a. 7/6 : 0-4-6.3 v 2 a. 7/9 : 12 v 1 a. 7/11 : 6.3 v 3 a. 9/11 ; 6.3 v 6 a. 17/9.

CHARGER TRANSFORMERS

200-250 v 0-9-15 v 1½ a. 11/9 : 0-9-15 v 3 a. 16/9; 0-9-15 v 4 a. 19/9 : 0-9-15 v 6 a. 22/9.

OUTPUT TRANSFORMERS

Standard Pentode 5.000 to 3 ohms **4/9**
Standard Pentode 7/8.000 to 3 ohms **4/9**
Small Pentode 5.000 to 3 ohms ... **3/9**

E.H.T. TRANSFORMERS 200-230-250 v 2,500 v 5 ma. 2-0-2 v 1.1 a, 2-0-2 v 1.1 a for VCR97, VCR517 ... ... **37/6**

SMOOTHING CHOKES

250 ma 3 h 100 ohms **11/9**
100 ma 10 h 200 ohms Potted ... **8/9**
80 ma 10 h 350 ohms **5/6**
60 ma 10 h 400 ohms **4/11**

BATTERY SET CONVERTER KIT

All parts for converting nay type of Battery Receiver to A.C. mains 200-250 v 50 c/s. Supplied 120 v 90 v or 60 v at 40 ma. Fully smoothed and fully smoothed L.T. of 2 v at 0.4 a to 1 a. Price including circuit 48/9. Or ready for use 8/9 extra.

SELENIUM METAL RECTIFIERS

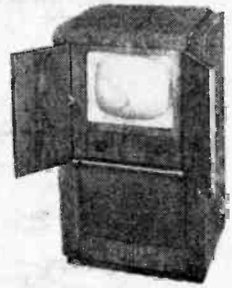
RM4 250 v 250 ma. **11/9** ; G.E.C. 300 v 250 ma. 12/9 ; 120 v 40 ma. 3/9 ; 6/12 v 1 a F.W.. 5/9 ; 240 v 50 ma. 5/9 ; 6/12 v 2 a F.W.. 8/9 ; 250 v 80 ma. 7/9.

ALL DRY RECEIVER BATTERY SUPERSEDER KIT.—All parts for the construction of a unit (metal case 5¼-4½-2in.) to supply Battery Portable receivers requiring 90 v. and 1.5 v. Fully smoothed. From 200-250 v 50 c/s mains. Price. inc. point-to-point wiring diagrams. **38/9**. Or assembled and tested at 45/6.

TV. CONSOLE CABINETS

Handsome well constructed with beautiful figured walnut veneer finish. Size 40in. high. 24½in. wide, 20in. deep. For 15in. or 17in. Tube.

Limited number at only **9 GNS.**
Carr. 30/- (10/- returnable on case).



TV. PREAMPLIFIER.—For Fringe Areas. Brand New. Complete with 6F13 valve. Only 22/6.

CO-AXIAL CABLE ¼in.

75 ohms 14/36 ... ... **7d. yd**
Twin-Screened Feeder ... ... **10d yd**

EX-GOVT. SMOOTHING CHOKES.—

100 ma 10 h 500 ohms Tropicalised **6/9**
150 ma 10 h 150 ohms **11/9**
250 ma 10 h 150 ohms **14/9**
250 ma 10 h 50 ohms **14/9**

EX-GOVT. MAINS TRANSFORMERS

Primaries 230 250 v 50 c/s. 48 v 1 a. **9/9** ; 400 v C.T. 150 ma 4 v 6 a. 6.3 v 6 a. 6.3 v 0.6 a. 4 v 6 a. 4 v 3 a. 5 v 3 a. 4 v 3 a. 5 v 2 a. **22/9** ; 300-0-300 v 120 ma 4 v 1 a. **17/6**.

EX-GOVT. E.H.T. SMOOTHERS

.02 mfd 8.000 v 1/11 ; 25. mfd 4.000 v (Block). **4/9** ; .5 mfd 3.500 v. **3/6**.

BATTERY CHARGER KITS.—Consisting of attractive Green Crackle Case. Transformer. F.W. Rectifier, Fuse. Fuseholder. Tag strip, Grommets. and Circuit. For mains input 200-230-250 v .50 c/s 6.2 a. **25/9** ; 6 v or 12 v. 2 a. **31/6** ; 6 v or 12 v, 4 a. **49/9**. Any type assembled and tested for **6/9** extra.

R.S.C. 6v or 12v BATTERY CHARGER

For normal A.C. mains input 200-230-250 v. 50 c/s. Selector panel for 6 v or 12 v charging. Variable charge rate of up to 4 **AMPS**. Fused, and with meter. Well ventilated case with attractive crackle finish. Guaranteed for 12 months. **69/6**. Carr. 2/6.

BATTERY CHARGERS.—For mains 200-250 v 50 c/s. Output for charging 6 v or 12 v at 1 amp. In strong metal case. Only **19/9**. Above can also be used for electric train power supply.

R.F. UNIT TYPE 26.—Brand new. Cartoned. **29/6**. plus carr. 2/6.

SOLDERING ?

You can't beat a

PRIMAX !

70/- post free

Balanced grip soldering gun in unbreakable case

Can be used semi-continuously without overheating. Easy soldering on hard-to-reach jobs. Ready for action in 6 seconds. Permanent alloy tip — lasts indefinitely with normal use and care. Weighs only 24 ozs. Special loop for hanging. Available in 110, 200/220, 220/250 v. for A.C. only. 50/60 cycles (60 w.).

The ideal tool for any Radio—TV—Telephone Mechanic or Amateur. One Year's Guarantee

Sole Distributors :—

S. KEMPNER LTD.

(Dept. P.T.), 29, Paddington St., London, W.1

Phone : HUNTER 0755

VIDEO ELECTRONICS

Head office : **27, Bacon Street, London, E.1.**

Works : **16/22, Bacon Street, E.1.**

Telephones : Bishopsgate 0419/0410.

T.V. Tubes

Cheap, reliable high grade seconds and reconditioned C.R.T's, as supplied to the trade and leading Television Insurance Companies, prices from £3.

Valves

Send at once for our useful list of cheap valves which will save money, we are the cheapest in the trade.

Condensers

Electrolytics, bias, coupling, etc., etc., at give-away prices. All types stocked.

Resistors

A fine stock of these at very low prices.

Radiograms

A few brand new salvaged table Radiograms, modern all wave, single player at £9. Cannot be repeated.

Send for stock list of speakers, valves, components and T.V. and Radio Spares.

All goods are guaranteed.