SIMPLIFIED TV SERVICING

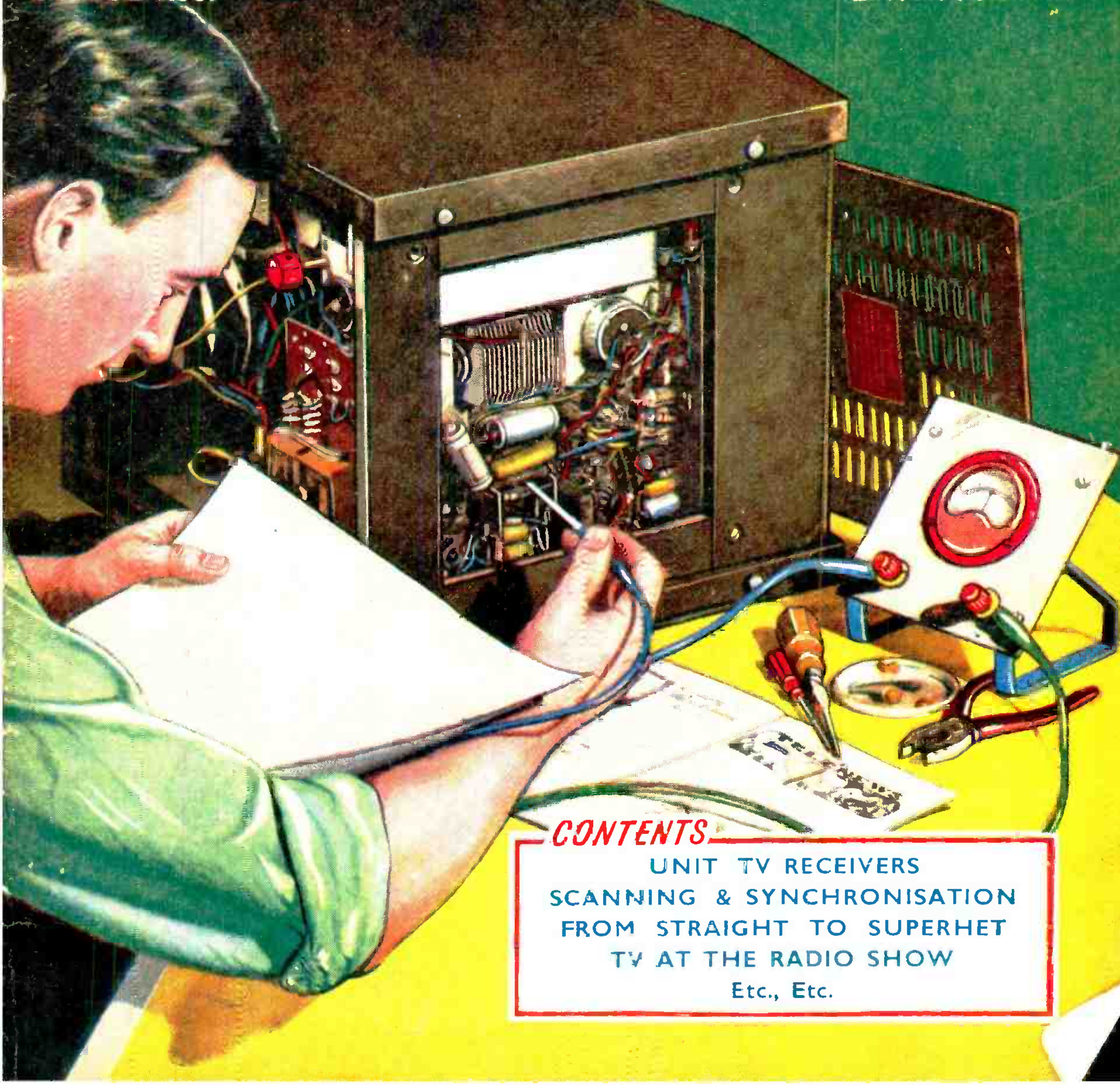
Practical Television

1/3

AND TELEVISION TIMES

OCTOBER 1957

EDITOR: F. J. CAMM



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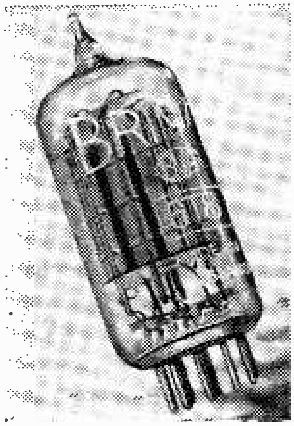

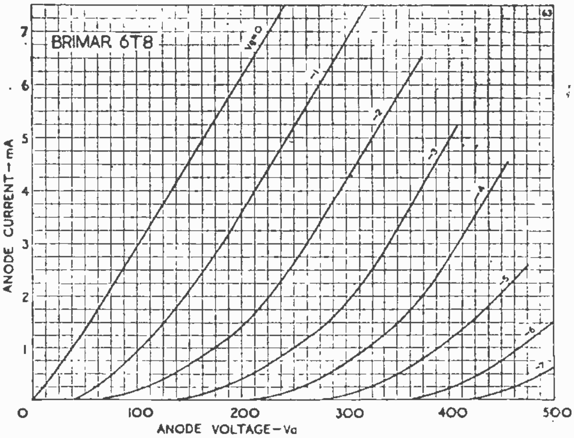

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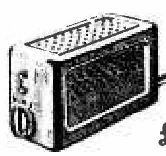

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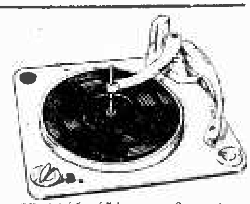

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CONTENTS :

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

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

TELEVIEWS

TV COMES OF AGE

THIS year's Radio Show marks the 21st Anniversary of the BBC Television Service, and it was significant, though accidental, that this year the 21in. tube made its appearance on a much larger scale than hitherto. The 17in. set is still extremely popular, and the demand for sets with smaller tubes is waning. For most small homes, the 17in. tube is adequate. The larger tube requires a greater viewing distance and is therefore suitable only for fairly large rooms. The 17in. set, in fact, now accounts for 67 per cent. of the sales, the average cost being £76 10s. with tax. This is about £4 cheaper than similar sets last year. It was noteworthy that sets have become smaller, and shallower from back to front, due to the more general use of the wide-angle tube. Even the 21in. sets are no larger than a 12in. set of a few years ago. The bulbous extrusion at the back to accommodate the tube's projection, a device introduced to give the illusion of a shallow back to front cabinet, is passing. This year, a larger number of portable room to room TV sets were offered, and these are increasing in demand, no less than 10 firms now producing portable models. One of these receivers weighed only 17 lb. and most of the others about 30 lb. They, of course, use smaller tubes than the table and console models.

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Our next issue dated November will be published on October 22nd.

Scanning & Synchronisation

2.--SAWTOOTH VOLTAGE GENERATORS

By G. K. Fairfield

THE second class of circuitry is a variation on that described last month, where the positive feedback extends over the entire scanning circuit. In this case the outgoing sawtooth current is translated back into a potential waveform by means of the driver section preceding the E to I conversion stage.

With the third system no attempt is made to first produce a sawtooth potential and instead the current sawtooth is obtained directly from the generator. The principle was shown in Fig. 6 where an inductance L is connected in series with a low-impedance valve V which is kept non-conductive during the retrace period by means of a large negative pulse applied to its grid. At the beginning of the scan period T the grid is returned to cathode potential and the valve conducts heavily. Due to the retarding effect of the inductance in the anode circuit the current does not immediately assume its maximum value, but rises gradually at a rate governed by the time-constant L/ra, where ra is the conducting impedance of V. This rise is exponential in form and if only about 7 per cent .of the peak value is used before the valve is cut off once more, then a fairly linear current sawtooth is obtained (Fig. 7).

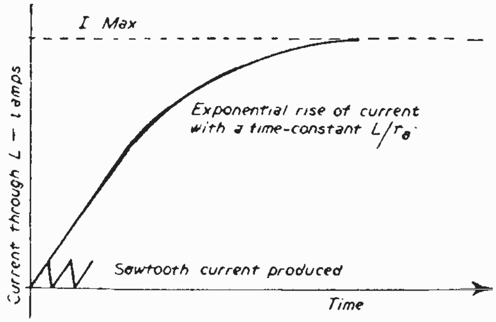


Fig. 7.—Variation of current through L.

Linearity of Generated Waveform

Whichever method of scanning current production is used, especial care will have to be taken to produce a linear waveform, for any non-linearity will vary the velocity of spot-traversal across the screen and result in obvious distortion of the picture. Translated into practical terms this means that unless extremely inefficient scanning methods are tolerated, then waveform correction will prove necessary in the completed design. A large part of the effort spent in the design of scanning circuits is used in devising such linearity arrangements and a number of these will be described later in appropriate sections of this series.

In the preceding article of this series it was seen that one common method of sawtooth scanning current production is to precede an E-to-I conversion stage with a sawtooth voltage generator. Generally this sawtooth potential is obtained from the repetitive charge and discharge of a capacitor, as illustrated in Fig. 8. Consider the capacitor C to be charged from a potential E via a large resistor R. The potential (v) developed across C will be found to increase with time, following an exponential law:—

$$v = E.(1 - e^{\frac{-t}{CR}}) \quad \text{where, } e = 2.718$$

as shown in Fig. 9. If the capacitor is short-circuited by switch S, after the voltage has increased to some 7 per cent. of the maximum value E, then a fairly linear sawtooth is obtained. (This is similar to the inductive current generator mentioned in the previous article.)

All that is necessary, then, to produce our time base is a rapid-acting switch across C, operating at the required repetition rate.

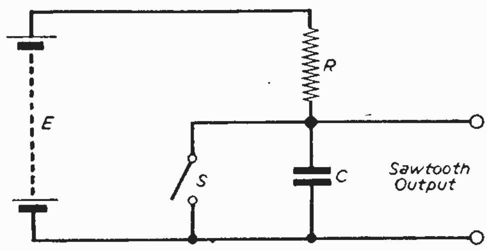


Fig. 8.—Simplified circuit of sawtooth voltage generator.

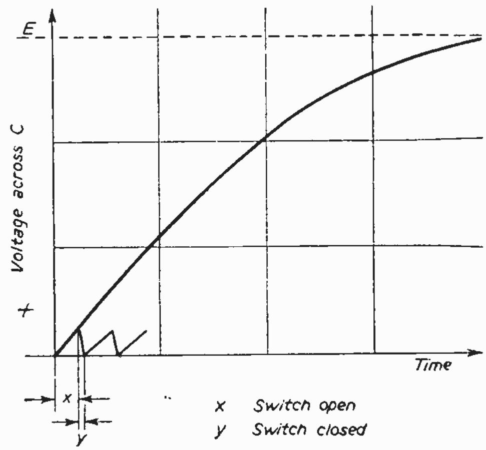


Fig. 9.—Graph showing variation of voltage across C with time.

Gas-filled Valve Circuits

This switching is done electronically and the simplest and oldest method is the use of a neon stabiliser (Fig. 10) connected across the capacitor. When the voltage across C reaches a certain value the neon gas ionizes and C is rapidly discharged. De-ionization occurs when the voltage has reached a sufficiently low level and the circuit is then ready to produce the next sawtooth cycle. This scheme is not very flexible for television purposes as the ignition and extinction voltages are fixed, and also synchronising difficulties are present. The use of a gas-filled valve (Thyratron) overcomes these difficulties and a suitable circuit is shown in Fig. 11. Here the ignition voltage is set by the value of grid bias used and synchronisation is easily affected by a small positive pulse applied to the grid. These "soft-valve" circuits are used for television purposes, but as their performance begins to fall off at line frequencies and also due

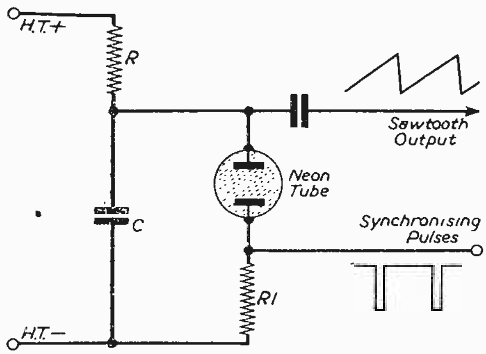


Fig. 10.—Simple neon-tube timebase.

to "firing jitter" affecting interlace when used in the frame circuit, they are seldom found in commercial equipment, their place being taken by "hard valve" circuits.

The Blocking Oscillator

The most popular of these is the blocking oscillator shown in Fig. 12. This circuit is slightly different from the preceding ones in that C is charged rapidly through the valve and allowed to discharge slowly through a high resistance R. The result is the same, however, and gives rise to a sawtooth potential across C.

The transformer is connected to give positive feedback from anode to grid and upon switching on the circuit oscillates vigorously and the grid begins to draw current which rapidly charges C to a large negative potential. This is sufficient to prevent the flow of anode and grid currents and with the valve cut-off, C gradually loses its acquired charge at a rate governed by the CR time-constant (Fig. 13).

Thus it is seen that the valve conducts only during the flyback or retrace period and this fact is made use of in the practical line oscillator circuit shown in Fig. 14. In this circuit the cathode, grid and screen-grid function as a triode oscillator and allow a pulsating anode current to discharge at C1 at regular intervals determined by the time-constant CR. This enables a rapid flyback to be obtained, as no inductance is now included in series with the second capacity circuit.

Synchronisation is obtained by applying a negative pulse to the screen-grid circuit slightly before it is due to conduct.

A suitable transformer design is shown in detail in Fig. 15. The windings can be pile-wound with enamelled wire between cardboard cheeks. A

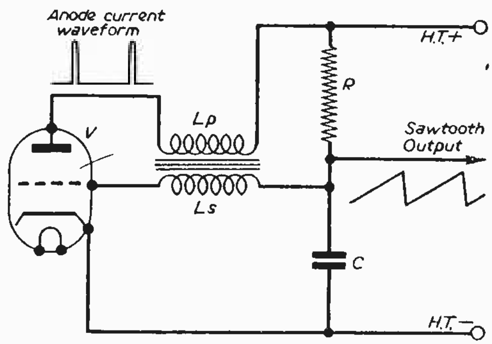


Fig. 12.—Blocking oscillator-simplified circuit diagram.

layer of oiled silk is inserted between primary and secondary and also over the completed windings. Any silicon-iron laminations of the approximate dimensions given can be used. These can very often be cut from a large mains transformer or choke stampings, as only about 20 pairs of U and T shapes are required. Impregnation in molten ozokerite wax is advisable to prevent ingress of moisture and also serves to anchor rigidly the lead-out wires.

The Multivibrator Circuit

An alternative to the blocking oscillator is the multivibrator, and this is often used for the frame oscillator due to the larger inductance value and size of transformer required at frame frequency. A practical circuit will be given in Fig. 16 and is a D.C.-coupled multivibrator having the advantage that the output amplitude remains constant as the

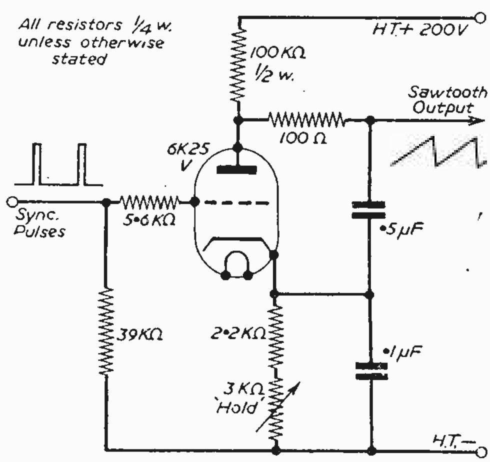


Fig. 11.—Thyratron timebase (for frame scanning).

frequency is varied so that the circuit may be used either for line or frame frequency merely by changing the value of C. To describe the operation of this circuit let the quiescent conditions be assumed with the grid of V2 at earth potential. Upon switching on the grid of V1 goes positive by an amount dependent on the setting of the

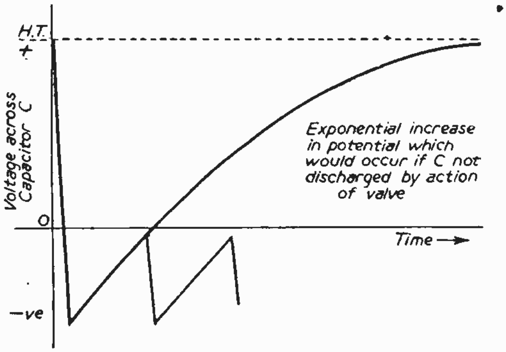


Fig. 13.—Variation in potential across C during the scanning cycle.

potential divider R1, R2, R4. V1 conducts heavily and a large positive potential is developed across the common cathode resistor R5. This is sufficient to cut off V2 cathode current and allows C to charge through R towards H.T. potential. When the potential across C reaches cathode potential, VK, then V2 conducts and reduces the grid potential of V1. The current through V1 and hence VK is then reduced, causing V2 to pass yet more current, reducing the V1 grid potential still further. The process is cumulative and V1 becomes quickly cut-off while V2 conducts heavily and discharges C to almost zero potential, thus completing the sawtooth cycle.

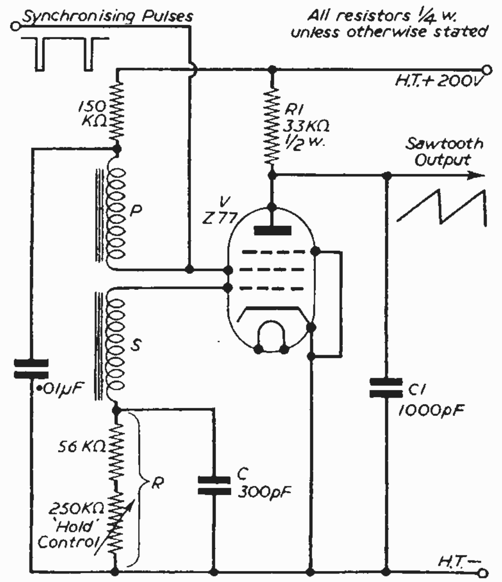


Fig. 14.—Practical line blocking oscillator circuit.

By varying V1 static bias by adjustment of potentiometer R1, then VK and hence sawtooth amplitude can be varied. With the values given in Fig. 16 a maximum output of about 60 volts (p-p) can be obtained.

Linearisation

Although in these circuits we have assumed a linear rise of potential across C this cannot always be arranged as the figure of 7 per cent. quoted earlier for the fractional rise in potential will often have to be exceeded in order to obtain a sufficient output. A useful method of linearity correction will be shown later. The charging capacitor C is split into two series capacitors, Ca and Cb, and an auxiliary charging circuit Rc and Cc, having a time-constant much larger than RC, is connected across one of them.

In operation the effect of this time-constant is to produce a lagging of the charging of Ca and

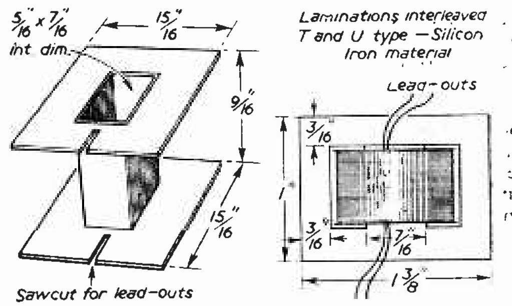


Fig. 15.—Transformer constructional details.

Winding Details

Primary : 200 turns .0092 enamelled copper wire.

Secondary: 400 turns .0092 enamelled copper wire.

Windings pile-wound with two layers of oiled silk between primary and secondary and over complete winding.

to develop a parabolic correction waveform across Cc. The output across AB will then be the sum of an exponential and parabolic waveforms produced across Cb and Cc respectively and, as will be seen, add to give a linear sawtooth output. The values given are applicable to the frame time base and if required Rc can be made variable to provide a linearity control.

(To be continued)

UNIT CONSTRUCTION

A READER'S DEVELOPMENT WHICH WILL ASSIST OTHERS IN PLANNING A LAYOUT By G. T. Layton

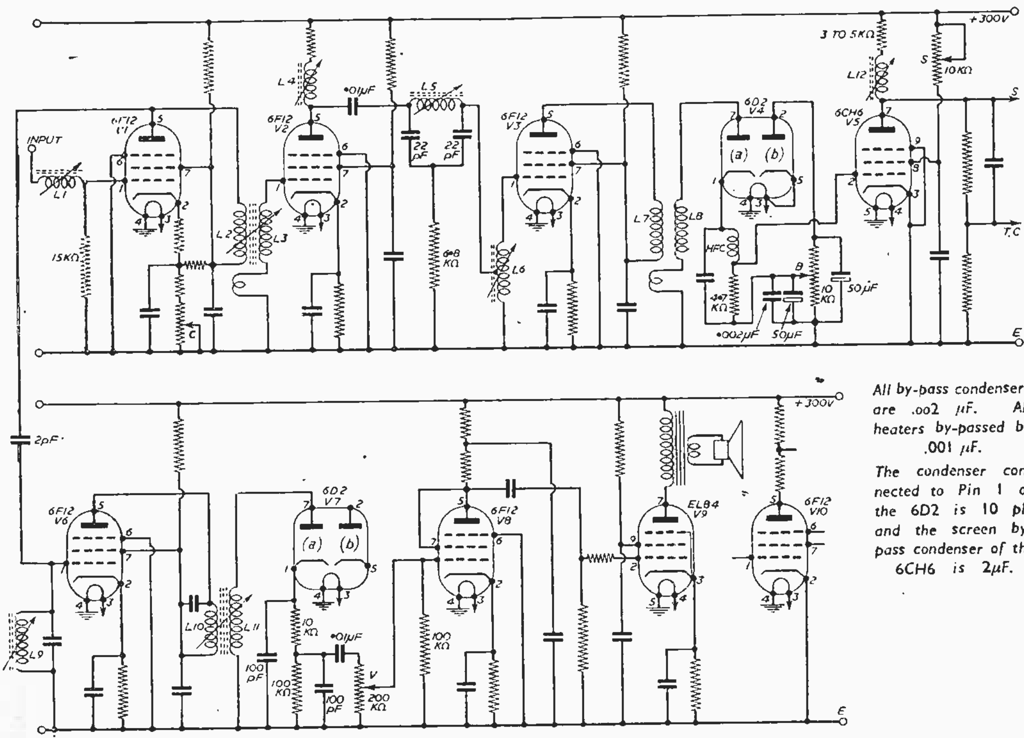
SOME renewed interest has been shown recently in the subject of unit receivers and the writer has been a strong advocate of, and user of such for five years at least. The design of the Viewmaster receiver showed the way in the use of a detached sound and vision strip, and the logical development was to separate the power pack and timebases.

After some considerable experiment I have settled down to the form of a layout that most easily fits under a CRT: looking from the front I place a frame timebase 8in. × 5in. on left, a similar size line timebase on right, and sync. separator 5in. × 4in. in the middle. At the rear crosswise behind the CRT supports is the sound-vision strip, 10in. × 5in., and the two-channel converter is mounted elsewhere, as is also the power pack.

This arrangement permits the use of plugs and sockets for power supplies and unit interlinks, and it will be noted that the sync. separator conveniently takes its input from the vision strip and similarly feeds the sync. signal each side to the timebases. Again, the timebases are conveniently placed for leads with plugs from the scan coils to connect to them. One note of warning is that high voltage exists in the line scan coils and the ordinary insulated plugs and sockets will break down to chassis unless mounted on a further insulated strip. Given a CRT and base board with flying leads for power, any variety of circuits can be tried out on the units used. The only limitations are that with a tube with a given make of scan coils the frame and line output transformers must match.

An Example

As an indication of possibilities, I at present use a miniaturised Viewmaster sound and vision strip working at 35/40 Mc/s and incorporating many minor variations. The sync. separator is by Haynes and is arranged by switching so that it can take a positive or negative input. The frame timebase consists of a blocking oscillator feeding into an output valve with Allen transformers, the line timebase consists of a blocking oscillator feeding into a line output stage with Allen line transformers. The line blocking oscillator is



All by-pass condensers are .002 μF. All heaters by-passed by .001 μF.
The condenser connected to Pin 1 of the 6D2 is 10 pF, and the screen by-pass condenser of the 6CH6 is 2μF.

Fig. 1.—The vision and sound strip.

arranged as shown in the Haynes booklet and the output as the Teleking. The foregoing is merely stated to illustrate that with the unit system a section can be replaced by an alternative in a few minutes and thus experiments are easily carried out.

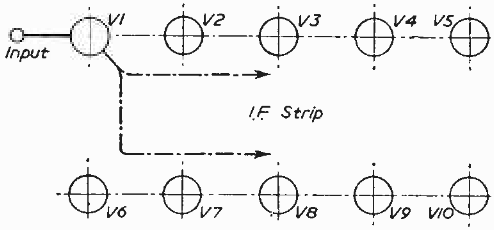


Fig. 2.—Top plan line-up.

Sound-vision Strip

It may be of interest to describe the sound-vision strip. This is fundamentally of the Viewmaster design, with many minor variations. The chassis is only 10in. × 5in., using glass-based miniature valves. The modifications as described in this journal last year are included and in addition there is bias for the video from heater supplies, variable screen control on video, separate diodes in place of diode triodes, all as shown on Figs. 1 & 3. In this diagram values are only given where varying from the Viewmaster and the accompanying table gives the remaining data. I have found this unit to give a very high overall gain, and by careful adjustment the response curve can be perfect, but with the high gain instability will occur when anode and grid coils resonate, this disappearing with the normal stagger tune.

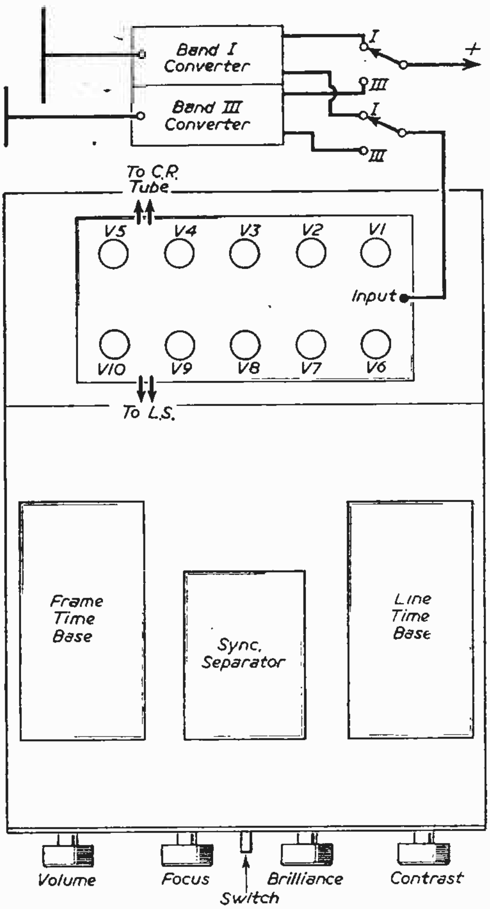


Fig. 3.—A block schematic diagram of the set.

COIL DATA

No.	Valve	Freq.	Turns	Resis.	Cap.
L1	V1g	35.00	15½	15k	—
2	V1a	37.75	15½	—	—
3	V2g	35.50	13½	22k	—
4	V2a	37.50	15½	33k	—
5	V3a(r)	38.15	—	—	—
6	V3g	35.50	13½	22k	—
7	V3a	37.50	15½	33k	—
8	V4g	35.00	21	—	—
9	V6g	38.15	9½	—	10pf
10	V6a	38.15	16½	—	10pf
11	V7g	38.15	18½	—	—
12	V5a	3 Mc/s.	160	—	—

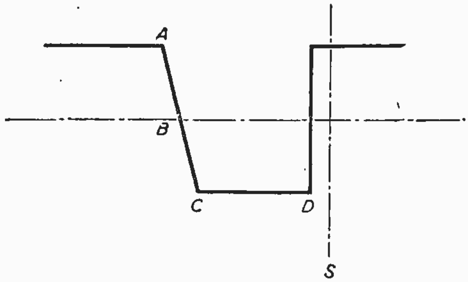
All 28 s.w.g. on ¼in. formers, except 12 which is 36 s.w.g.

On examining the circuit diagram certain points need amplification. It will be seen that the noise limiter on sound and picture is not included. The reason is that to achieve any limiting a certain amount of degrading of picture and sound is inevitable, and if they are adjusted almost out of action they might as well not be there. Also, in most areas the ratio of signal to noise is now so high that the nuisance is much less than years ago. It will also be noted that V7b and V10 are not used. The space was available on the chassis and this diode and pentode are available as required. In particular they are suitable for a sync. separator of the common type of pentode gate followed by diode normally used before blocking oscillators. In this case a separate chassis is used for sync. separator to aid flexibility.

One small practical note is that due to the restricted space it is essential to use small components and to wire in layer fashion. First all earth and heater connections, then all cathodes, then all screens and finally coil wiring.

The screens shown are easily soldered to the B7G bases, tag 4 being straightened to suit and the tinplate cut to profile and soldered to centre pin and pin 4. A series of small holes drilled at the top assist in fixing and soldering the resistors and condensers.

Studying the circuit diagram, controls C and V are on the main baseboard, controls S and B are on a vertical end plate on the I.F. chassis.



The potentiometer in the middle of this end plate is not in the circuit as shown, but is available for the balancing resistance for the sync. separator if incorporated later.

In conclusion it should be stated that the assembly of a chassis of such compact design does need reasonable skill to achieve good results, but it is not extremely difficult given a degree of patience and care.

Fig. 4.—The response curve obtained with the tuner referred to.

PREFABRICATING COILS

A SIMPLE METHOD FOR MAKING UP S.W. COILS

By C. A. Oldroyd

WHEN making up a small aerial matching unit it was intended to wind the coils in position, after mounting the formers on the chassis. This proved far from easy, as there was little room; and the first attempt looked rather impressionistic. Why not prefabricate the coils and slide them on the formers, with the ends cleaned and tinned for easy soldering?

The formers used were salvaged from radar equipment and had a diameter of half-an-inch. As a first attempt, a coil was wound on an ebonite tube of the same diameter, using considerable tension when winding. When tried in position this coil was too slack on the former. A new winding former was made up; this is shown in Fig. 1. A $\frac{3}{8}$in. outer diameter brass tube was built up by winding a strip of notepaper on it and gluing it in position; the final diameter was slightly less than that of the coil former. After winding, the coil was expanded to give spacing between turns and sprung over the former turn by turn. Now the coil gripped the former tightly and required no cementing in place.

Encouraged by this method of prefabricating coils, other coils were wound on a half-an-inch Whit. brass bolt. Here the threads provide the spacing between turns, as indicated in Fig 2, and

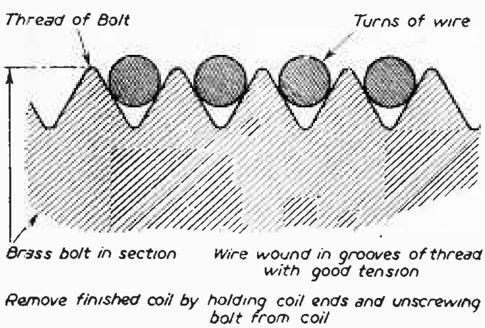


Fig. 2.—Using a screw on which to wind the coil.

similar coils can be made up quite easily. Before winding, stretch the wire by clamping one end in the vice and, gripping the free end with pliers, give a steady pull. This will provide a straight length of wire. After winding, the coil is removed from the bolt by holding the projecting ends and unscrewing the bolt from the coil.

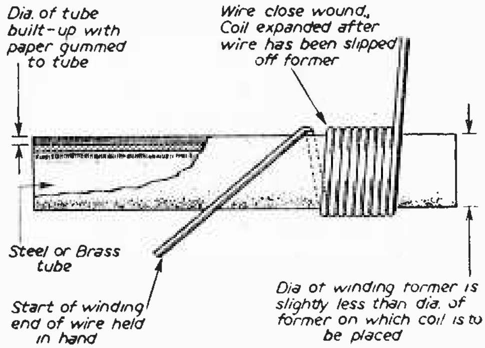


Fig. 1.—Details of the coil referred to by the author.

As expected, a coil wound on a half-an-inch bolt proved too small in diameter to be slid over the former. For other purposes, where a self-supported coil is called for, this method of making up coils is ideal. To increase the winding diameter of the coil a thin cord was

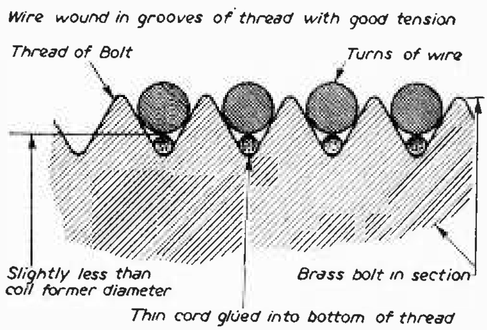
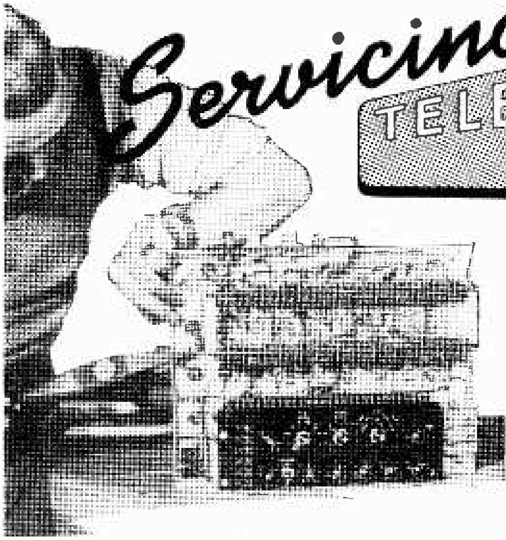


Fig. 3.—Increasing the diameter by means of a piece of wood.

wound into the groove of the thread and glued in position; as indicated in Fig. 3. Wound on this modified former, a coil was obtained which had the same spacing of turns, but a greater internal diameter.

Servicing Television Receivers



No. 33.—THE K.B. KV35 INCLUDING NOTES ON SERIES-CONNECTED HEATERS

By L. Lawry-Johns

THIS is a 14in. table model, suitable for connection to either A.C. or D.C. mains—which is a break from the normal K.B. practice of "A.C. only."

It is fixed tuned to one channel only, although most of those in use have probably been modified by the installation of a K.B. tuner or the addition of an add-on converter. The tube fitted is either a Brimar C14FM or a Ferranti T14/13. The former (Brimar) tube has a 12.6v. heater, whilst the latter has a 6.3v. More will be said of tube replacement later. The I.F.s are 16 Mc/s vision and 19.5 Mc/s sound.

A 500mA fuse is fitted in series with the heater chain and a 250mA in series with the H.T. line to the line output stage only.

The chassis—complete with tube—is easily removable by pulling off the two control knobs, removing the rear chassis fixing screws and the speaker wire plugs from the right side rear output transformer. The complete chassis can then be withdrawn. The receiver must not be operated without a speaker connected or the volume control turned down to its minimum position. High voltages will appear across the primary winding of the sound output transformer if these precautions are not observed. A conventional line flyback EHT system is used to supply some 11.5 kV. to the C.R.T. final anode, the first anode deriving its 330v. (approximately) from the boosted H.T. The actual booster diode fitted in original production versions was a 25U4GT (V15). This was altered to a PY81 in later production models, but original models modified were fitted with an adaptor to take a PY83. If it is desired to replace a PY83 with a PY81, a resistor should be fitted in series with the heater chain to compensate for the different heater voltages. This resistor should have a value of 25 ohms 5 watts.

The circuit employs one common R.F. amplifier (V1, 6BW7), a mixer/oscillator (V2, 6AM6), two stages of vision I.F. amplification (V3 and 4, 6AM6), two stages of sound I.F. (V8 and V9, 6AM6), two 6AL5 valves, V5 and V10, for vision and sound detection and noise limiting, a 6AM6 as video amplifier (V6), another as sound output (V11), whilst the remaining valves are V12 sync

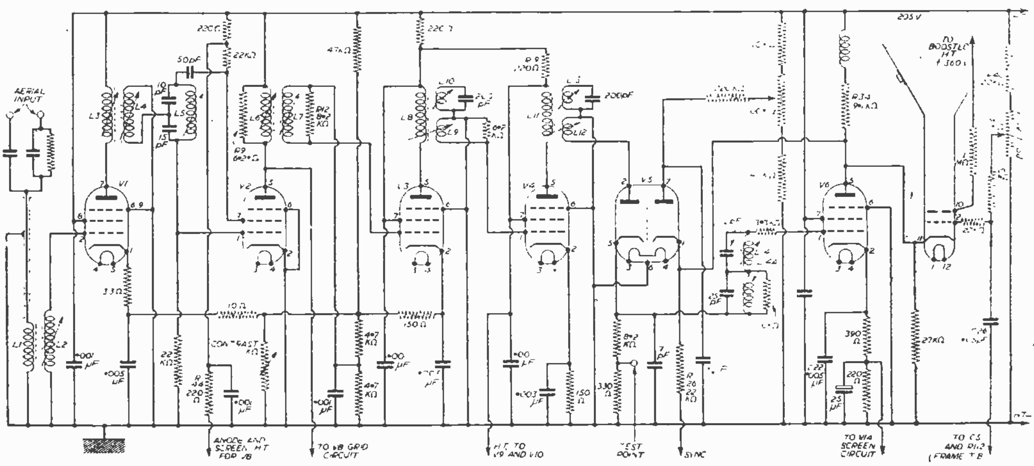


Fig. 1.—The vision strip showing H.T. supplies and biasing arrangements. Note: The aerial input capacitor and shunt resistor should connect to chassis, i.e. bottom of L1, not top as shown.

sep. and limiter (12AT7). V13 frame and line oscillator (12AU7). V17 frame output (9BW6). V14 line output (50CD6G). V15 booster diode (or reclaim rectifier) 25U4GT and V16 EHT rectifier (R19). The metal rectifier is a RM4 and the thermistor (R106) is a CZ1.

The main smoothing electrolytic capacitors C27/C28 are of 200μF each and the 85Ω smoothing resistor (R99) wired between them is shorted out when the voltage selector plug is placed in the 225v. D.C. position.

Common Faults

In an A.C./D.C. receiver, where all valve heaters are wired in one chain, the failure of one heater will, of course, result in a complete stoppage of current, thus, "one out, all out." This, however, assumes that the defective valve suffered only from an open-circuited heater, and that the remaining valves are in good order. The symptom of "some alight, some out," immediately indicates that one of the valves has a heater/cathode short. Assume, for example, and this often happens, the V12 12AT7 develops a heater-short. The cathodes are strapped to chassis and thus the whole heater current will be passing through V14, V15, V17, V13, V6 and V12 (in that order) only, whereupon it is conducted to chassis, thus by-passing the remaining valve heaters. The problem is, which valve is at fault?

Removal of any of the above mentioned valves will cause the current to stop flowing and put all the heaters out. Therefore, if the details of the heater chain are not known, the valves will have to be tested in turn. In actual fact, this is hardly necessary, since the line output, booster diode, frame output and line and frame oscillator valves are nearly always "first" in heater chain, and thus one of these could hardly be at fault if one or more of the right side valves are lighting up. So if the diagram is at hand, reference will show that the last valve in the chain to light up is the 12AT7 and that this should be immediately suspected, whilst if a diagram is not to hand, common sense (or should we say experience) will direct attention either to V12 or V6 without hesitation. Things become more complicated when one of the 6AM6 valves in the sound or vision circuit develops a heater/cathode short due to the presence of a bias resistor. The value of the resistor determines, in conjunction with the number of valves following in the chain, the extent to which the heater current will be diverted and, incidentally, how long the resistor will last due to overheating.

In the case of V8 or V9 (sound I.F. valves) where the cathode resistor is only 47 ohms, and seven heaters follow, the life of the resistor will be extremely short and inspection will show not only the burned resistor but the location of the defective valve.

On the other hand, should V10 become defective, one of two things will happen, depending upon whether the detector or noise limiter cathode is affected (V10, 6AL5 double diode). If the detector section is at fault, the symptom will be: no sound and no vision, the tube heater being by-passed due to pin 1 being virtually at chassis potential. If, however, the noise limiter section is defective (pin 5 being the cathode in this case) the tube heater will not be affected due to the presence of the 2.2MΩ cathode load resistor. The symptom in this case is a loud hum on the sound, varying with the operation of the volume control. The effect on the screen of a defective vision valve varies according to which valve is at fault. The

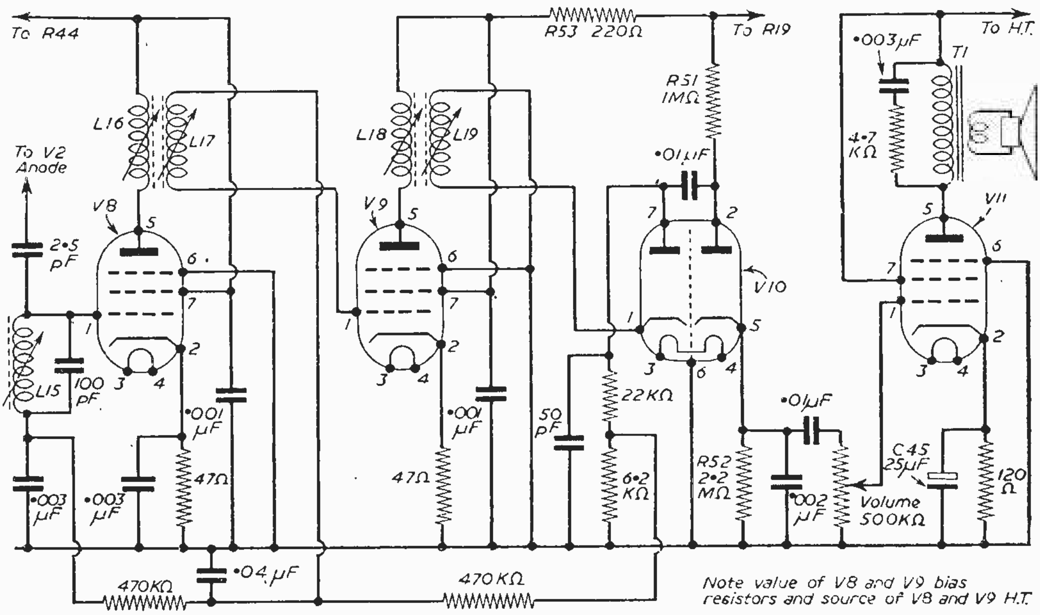


Fig. 2.—The sound strip.

equivalent to hum on the sound is the appearance of hum bars on the picture. When the lower part of the picture is darker than the top and reversing the mains plug (or leads) reverses the bands, it may be assumed that V3 or V4 is at fault. The picture will become weaker, as will the sound, due to the shunting effect of the bias resistor upon the remaining valve heaters and the 150Ω resistor itself will quickly overheat and smoke. Thus, diagnosis is not too difficult. In the case of V5 (6AL5) the symptoms of a heater/cathode short are more startling. In the event of the detector developing a short between the heater and pin 5, the symptoms are, loss of picture; screen divided black and white, before quickly fading altogether. The sound will also be lost, as the heater of the V10 will go out with that of the tube. This is not too bad. It is when the vision limiter section develops a short that things begin to happen. From the diagram it will be seen that pin 1 is joined to pin 5 of the video amplifier, which is, of course, the anode. Therefore, two things will happen: R34 will be virtually connected from the H.T. line to chassis (via the V5, V10 and tube heaters) causing it to overheat, whilst at the same time the tube cathode (which is also connected to pin 5 of V6) will also be at chassis potential.

This gives rise to the symptom of uncontrollable brilliance, or the brilliance control will appear to work in the reverse direction.

This latter effect is due to the grid of the tube being at a higher potential than the cathode, thus causing a heavy beam current that the flyback EHT system cannot cope with. It is, therefore, quite obvious that similar symptoms obtain when the tube itself develops a heater/cathode short. We do not wish to appear too gloomy, but it is pointed out that in the event of a heater/cathode short in one of the valves, the excess current passing through those which occur earlier in the chain may well cause one of these heaters to fail, thus putting the whole chain out. Thus, when the valve with the o/c heater is replaced, it may be necessary to refer to the above described symptoms in order to locate the primary cause of the trouble!

This, of course, applies to any A.C./D.C. receiver, and in some, especially those employing Mazda valves, more than one heater chain may be in use. For example, a .1 amp. chain may be used in parallel with a .2 amp, both converging to feed one or more .3 amp. heaters in series. However, to return to the KV35.

Picture Faults

Lack of width, with perhaps a degree of loss of focus and compression of picture in a vertical sense, may well denote a failing RM4 metal rectifier. This is quite simple to replace and is indicated in the under chassis diagram. If the H.T. line voltage measures over 200 volts, however, the cause should be looked for elsewhere. The line timebase valves should be tested. The setting of the horizontal linearity control has a profound effect upon the picture width in general, as well as the left-to-right relationship. This is, of course, in addition to the width control itself, in the rear of the line output transformer.

Loss of Height

Check V17 (9BW6) and then the R73 (470 KΩ) which is wired from the height control to the junction of a .1μF capacitor, a .04 μF capacitor and the secondary of the blocking oscillator transformer as shown in the under chassis diagram.

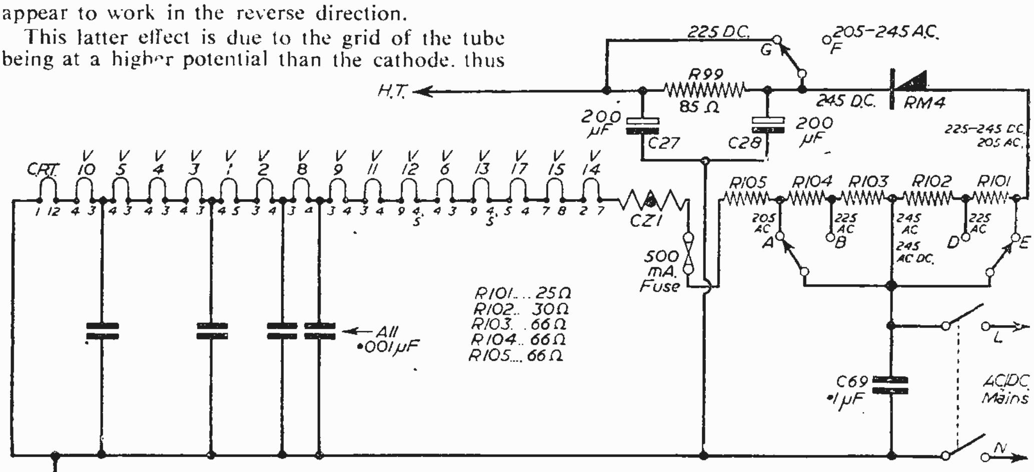


Fig. 3.—Power supply and heater circuit.

Loss of Framehold

Check the resistors wired either side of the vert. hold control (1.5 MΩ and 470 KΩ).

No Height (White Line Across Centre)

Check V17, V13, height and hold controls and then the frame blocking oscillator transformer windings for continuity.

Poor Focus

Picture "blows up" and fades as brilliance is advanced: change EHT rectifier V16 (R19), this being mounted on the front end of the line output transformer.

(To be continued)

I.T.A. IN THE WEST

HOW TO PREPARE FOR THE NEW TRANSMITTER

By "Engineer"

WHEN a new television transmitter is opened there is usually a last-minute struggle on the part of viewers to have new aerials erected and receivers modified. There does seem to be a general lack of preparedness in these matters and the consequence is that dealers are overwhelmed with rush orders and find themselves unable to cope.

Local newspapers give fair warning which appears to be mostly disregarded, or if regarded at all it is treated as propaganda to give work to the trade.

A little reflection shows that this is not so. The number of conversions and new aerials is a limited figure; a little foresight assists the trade and also ensures that the viewer will not find himself a long way back in the queue when the rush starts.

The same principle applies to the home constructor. Now is the time to get working on conversions and aerial rearrangements so that the whole rig is ready for the grand opening.

The Aerial System

Unless the televisor is one fitted with 12- or 13-channel switching it is fairly obvious that something will have to be done at the receiver end. What may be in doubt is the aerial system and this not only includes the type of aerial to be fitted but also if an aerial is really necessary.

The new transmitter to be erected in South Wales, covering the main centres of population in this area and the Bristol Channel, is to work on Channel 10. Now Wenvoe itself works on Channel 5 and there is some affinity between the two channels.

The carrier of the vision signal on Channel 5 is at 66.75 Mc/s. The carrier of the vision signal on Channel 10 is 199.75 Mc/s. Simple arithmetic shows that $66.75 \times 3 = 200.25$ Mc/s which is only 0.5 Mc/s greater than the actual Channel 10 frequency.

In other words, the Channel 5 aerial caters for a multiple of the Channel 10 frequency. It is only reasonable to anticipate that many existing Wenvoe aerials will cater for the new I.T.A. transmitter without modification.

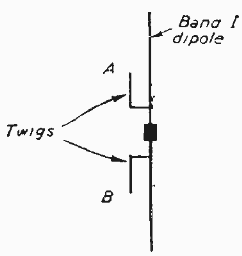


Fig. 1.—Fitted "twigs."

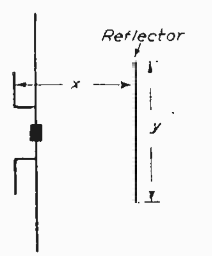


Fig. 2.—Adding a reflector.

This is likely to be true within the service area and amateurs who are actually in this area may be well advised to consider this fact. Where good signals are received from the existing Wenvoe transmitter then it is probable that good signals will be received from the I.T.A. transmitter.

Note that this covers only the area within the proximity of the transmitter. It does not necessarily follow that because one can receive Wenvoe on an ordinary dipole the same aerial will receive the I.T.A. transmissions.

In the lucky localities where this sort of reception can be obtained no alteration is necessary to the aerial or to the feeder—no expense is involved!

Where conditions are not quite so good, then the next obvious step is to fit "twigs" to the existing dipole. This is shown in Fig. 1: the "twigs" tune out inaccuracies in the matching. They can be made each as long as one-quarter the wavelength of the desired frequency and in this case they can be made 1ft. 1in. long clipped to the base of the existing dipole about 2in. away from it. They can be shortened a little under field trial conditions to ensure a good match.

If this is found to be insufficient then a reflector can be added. Fig. 2 shows the scheme. The reflector should be 2ft. 3¼in. long (y) and should be spaced from the twigs at 11¾in. (x).

As before there need be no other alteration made to the feeder cable or connections.

When the transmitter is working at full strength an array of this type will probably be found sufficient for most situations within 10 miles of the transmitter. Beyond this distance then something more elaborate is necessary.

Band III signals are a little more tricky than those on Band I and while it is true that we now have some practical knowledge of their behaviour when vertically polarised there is still a great deal to be learned. The home constructor is advised to try out these aerial systems during the trial transmissions as he can then easily modify the array or build a new one should conditions require it.

There is not much point in building a high-gain array where signal conditions are good.

One further point. It must not be forgotten that a high signal-to-noise ratio is the most desirable object. If one lives in what is anticipated to be an area of good signal strength, yet local interference is also high (such as being adjacent to a main highway) then the proper thing to do is to build a high-gain aerial to obtain as large a signal-to-noise ratio as possible, and if the signal is found to be too great at the receiver, simple attenuators can be fitted.

A simple "Pi" attenuator, giving a drop of about 10db, is shown in Fig. 3. It consists of four resistors arranged in the standard formation. R1 and R4 are 68 ohms and R2 and R3 are 33 ohms. Quarter-watt resistances can be used.

One side of the attenuator is connected to the aerial feeder and the other to the aerial socket of the receiver. The whole can be enclosed in a little box and need take up but very little room. Commercially produced attenuators can be used if desired.

The attenuator is used simply to cut down the signal voltage when it is too great, and where a high-gain aerial must be used to give a good signal-to-noise ratio. A secondary purpose, as mentioned previously, is to try to ensure a near balance between a Channel 5 signal and Channel 10 signal so as to avoid too great an alteration of the manual control (contrast and/or sensitivity) when changing from one transmitter to another. In this case the attenuator should be fitted in the aerial feeder of the transmitter which gives the strongest signal before the two aerials reach their common feeder.

Yagi Aerials

A useful general purpose aerial for Band III is the five-element Yagi. This is shown in Fig. 4. It has a good gain, is quite light and has little wind resistance.

The length of the dipole is the same as that given for the "twigs" in Fig. 1 and the length of the reflector as given in Fig. 2.

The dipole is folded (that is, turned back on itself) to obtain correct matching. The overall length of the dipole will be 2ft. 2in.

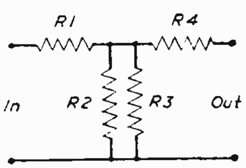


Fig. 3.—A simple "Pi" attenuator for reducing the gain where overloading takes place.

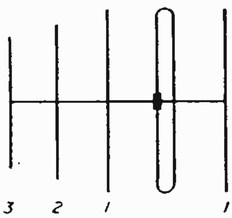


Fig. 4.—A five-element array.

In front of the dipole is mounted a director system comprising three directors. No. 1 is 2ft. $\frac{3}{4}$in. long; No. 2 is 1ft. 11$\frac{1}{2}$in. long; No. 3 is 1ft. 10$\frac{1}{4}$in. long. all the elements are spaced at 11in.

Constructional details of similar aerial systems have been given previously in these pages and so we will not go into them in detail here.

This aerial is a general utility type and should be found suitable in most places which now use an "X" or "H" aerial for Wenvoe. At more distant localities something more elaborate is required.

Directors can be added to the simple Yagi shown and by making each 5 per cent. shorter than its predecessor and spacing it 11in. in front, up to eight directors can be fitted. The array will have to be supported in the centre and it is useful to have an off-set mast so as to keep the elements clear.

An array of this nature will give a gain of about 12db.

Another useful aerial array is the double Yagi. This is an array similar to Fig. 4 but doubled. That is two arrays as that in Fig. 4 are mounted side by side, the two arrays being spaced half a wavelength (or the length of the dipole) away.

Constructors sometimes get confused about the method of connecting such aerials. Fig. 5 shows typical connections. Two identical lengths of cable are connected to each folded dipole and are connected together and to the main feeder at "B." The length "A" to "B" must be exactly the same as "C" to "B."

To ensure good matching the lengths "A" to "B" and "C" to "B" should be of 105 ohm cable and that from "B" to the receiver should be normal 80 cable. The two short lengths of cable can be connected to the main feeder at the head of the mast.

Aerial Feeders

The cable from the televisor to the aerial should be of the low-loss type. There is now available on the market some air-spaced coaxial cable which has very low-loss properties on Band III frequencies. Where one is in a strong signal area then normal cable can be used, but where the signal is weak, then low-loss cable is advised.

As an example it will be found that a standard coaxial cable used for Band I may have a loss of up to 8db on Band III while a low-loss cable will only have a 2db loss.

Where the viewer is sufficiently close to the transmitter to be able to use his existing Wenvoe aerial then the losses are not so important, but at points where an aerial such as is shown in Fig. 4 has to be used, then it is worth while considering the use of low-loss cable.

This becomes even more important where a long lead from the aerial to the televisor is imperative. In these cases always use low-loss cable.

Combiner Units

Where signal conditions are likely to be good, then a single feeder for the two aerials can be used. Both aerials are led into the combiner unit at a convenient point (often on the mast serving both aerials) and from there they use the common feeder to the receiver.

These units can be obtained commercially and are sold under the name of "Diplexers," etc.

The basic principles of the system are shown in Fig. 6. The combiner is simply two filters mounted within the same case. One filter is a high pass filter and the other a low pass filter. In effect the high pass filter allows the Band III signal to pass through it but blocks the Band I signal. The low pass filter works in the reverse way, blocking the Band III signal and allowing the Band I to pass through. The net result is that neither aerial interferes with the operation of the other.

Where it is necessary to erect a separate aerial for the Band III transmitter then the use of a combiner unit is very convenient. It can be fitted on the communal mast or it can be fitted at the televisor end, where it has been found necessary to provide two aerial cable feeders.

Note that in some commercial receivers a separate aerial socket has been provided for the Band III aerial and in these cases a combiner unit is not necessary.

Balanced-twin Feeders

A question which often arises is whether balanced-twin or coaxial feeders should be used.

Practically, there is little to choose between them. Coaxial cable seems to be that most generally favoured, but in some cases it will be found that the televisor is fitted with sockets for balanced-twin cable.

As a general rule, use cable of the type which is shown on the receiver. That is, if the aerial socket shows balanced-twin input then balanced-twin cable should be used.

It is possible to use coaxial cable in input circuits designed for balanced-twin cables, but losses and mismatch will result.

Ghosts

The BBC transmitter at Wenvoe has already proved what was feared at its inception, that is, ghost signals are very troublesome in the area, especially in the mountainous districts of South Wales. Reflections from the mountains and hills produce multipath signals resulting in "ghost" pictures appearing on the screen.

A ghost picture is a picture which is identical to the main picture, usually a little weaker than the original and displaced a little to the right of it. It is possible for more than one ghost to be received with the result that a multiple picture is received on the screen, rendering it almost useless.

The higher the frequency of the signal the more nearly does it conform to the behaviour of light and the more easily is it reflected. It has been proved that Band III signals are very susceptible to ghost troubles and in areas where the Wenvoe transmissions suffer from this effect it is likely that the I.T.A. programmes will be similarly affected.

In Band III it has been found that ghost signals are often difficult to deal with. The simplest answer is to use a double array as described earlier. This is effective where the signal comes from the side of the receiving point (the ghost signal, of course). The array can be turned a little so that the ghost signal is at 90° to the aerial array.

Where the ghost comes from a forward direction, then a multi-director array using eight or more directors is often the answer.

In these cases it will be found that the aerial is highly directional and needs very careful orientation. The best method is to employ the actual signal itself rather than a compass bearing. Adding a slight tilt to the aerial may also have some effect in getting rid of the ghosts.

Where a ghost is very strong it may sometimes pay to turn the aerial in the direction of the ghost rather than towards the transmitter. This has proved quite effective in certain cases experienced with Wenvoe.

One of the best aerials which can be used against ghost reception is the slot aerial. This aerial has been fully described in earlier issues of this journal. It has proved of real value in many cases where ghosts are troublesome.

There is a useful commercially produced aerial using the skeleton slot principle which has been specially designed for Band III. This is the "J-Beam" Slot Aerial.

Slot aerials are very easy to build for Band III. They can be designed on the "skeleton" principle and can be fitted with directors and reflectors.

It is wise to build such an aerial exactly according to instructions given, or difficulty may result from mismatching. To obtain the best results from these aerials they must be correctly matched to the feeder.

Preparing the Televisor

Most modern television receivers are equipped with 12- or 13-channel switching devices. Some of them—especially those using turret tuners—are not equipped to cater for Channel 10, and in this case coils will have to be obtained for them.

Most turret tuners are easily equipped with new coils, usually three will be required, one for the R.F. section, one for the mixer section and one for the oscillator.

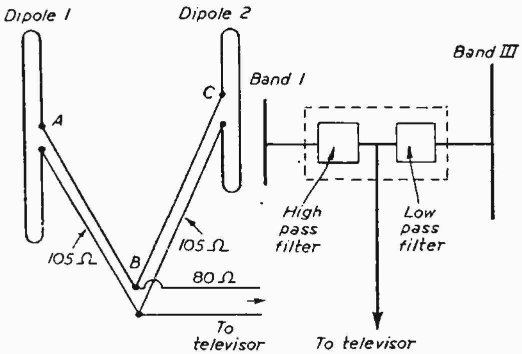


Fig. 5.—This diagram shows the method of connecting two folded dipoles.

Fig. 6.—Block diagram of a combiner unit.

The method of fitting the new coils will depend upon the type employed and detailed instructions cannot be given to cover all types. Generally speaking the tuner unit will be found easy to get at and the job is not really complicated, no wiring having to be moved.

The home constructor who has the necessary knowledge may like to modify coils existing in a channel which he cannot at present use. The simplest method is to take a Channel 8 coil and to open out the spaces between turns. If the turns are left a little slack then final trimming can be done and when the transmitter has been accurately tuned in a spot of P.V.C. dope can be used to fix the coils permanently.

Note that ordinary dope such as is used for model aircraft is *not* suitable. It causes losses in the coils.

Tuners which employ ganged switches will not normally need touching as the new Channel 10 is already catered for on them.

Note that it may pay to adjust slightly the trimmers in the tuner unit so that maximum results are obtained on Channel 10. The Band I transmissions on Channel 5 will not be seriously affected.

Converters

It is possible to employ Band III converters with every success. There are many commercial designs available and some practical designs have been published in these pages from time to time.

Generally, it has been found that a converter provides more noise than that obtained from a switched tuner system. This is especially noticeable in the fringe areas though the gain of them is quite high.

If building a converter it is advisable to adhere strictly to the published design. Small alterations can make a very large difference in performance. This is especially true of the tuning arrangements and although the tuning may often be found to be quite flat (except for the oscillator) it is very easy to tune right outside the desired band and so not get any signal from the transmitter.

Converters are most successful with superhet circuits and least successful with straight receivers. This does not mean to imply that they cannot be used with straight receivers, but the results are often disappointing, especially in the fringe areas.

Where a converter is used with a straight receiver, Band I breakthrough is often troublesome.

Perhaps the best method of catering for the situation is to convert the existing straight receiver into an I.F. strip and to employ a modern tuner unit.

One snag with converters is that it is very easy to cause interference on neighbouring receivers when setting them up. Every care should be taken to avoid the converter going into oscillation and re-radiating over the aerial system.

Re-radiation can be minimised by thoroughly screening the converter and (in some cases) the receiver. The connecting cable between the converter and the receiver can also be screened. Where a separate Band III aerial system is used, a Band I filter can be fitted into the aerial circuit.

While on the subject of interference some mention of the "Windscreen Wiper" effect may be made.

This effect is in the form of a vertical bar which drifts backwards and forwards across the screen. It takes place usually on a receiver tuned to Band I where there is a Band III receiver operating near by. Usually it can be cured by fitting a small inductor in the cathode of the booster valve in the line timebase EHT circuit.

A simple inductor can be made by winding 25 turns of wire (about 30 s.w.g.) on to a pencil and then slipping it off. The inductor should be closewound.

If further difficulty is experienced then it is best to consult the Post Office Radio Interference Branch, who are always ready to assist in these matters.

Reception in Fringe Areas

When Band I was opened it was found that it was possible to receive signals at a far greater distance than was at first anticipated. We have now got more or less used to this feature and modern circuitry and aerial systems have set the fringe areas at considerable distance from the transmitter.

The same effect has been noted in the case of Band III, though the area covered by a transmitter in Band III is generally rather less than that covered by the same powered transmitter in Band I. To offset this the transmitters have been fitted with high-gain aerial systems and the effective radiated power is very high.

However, except for points where conditions are other than normal, the effective range of the Band III transmitter is rather less than that of the equivalent Band I transmitter, and viewers who are at the moment in the fringe reception area of Wenvoe may find difficulty in obtaining a usable signal from the new I.T.A. station.

One important feature of the higher frequencies is that the aerial arrays are very small and consequently an elaborate Yagi array can be used quite safely, where such an array would be unwieldy and even dangerous to erect on a chimney in the case of the BBC Band.

As always, the important point is to erect an effective aerial system. A double Yagi array using three directors, folded dipole and reflector in each array can be easily erected, and further gain can be obtained by mounting two more Yagi arrays in parallel with the first.

Height is all-important, and better results are obtained with the four separate Yagis mounted on the same plane, rather than the more orthodox method of mounting them one pair above the other.

Connecting multidirector arrays in parallel is not so effective as the elements of the two sets of arrays tend to affect each other.

Always use low-loss cables for feeders where the signal is weak and aim to obtain the maximum height for the aerial system. Height is even more important on Band III than it is on Band I.

Pre-amplifiers can be used with effect, but their use is limited to a greater degree than on Band I. Low-noise pre-amps of the grounded-grid type are recommended. In Band III valve noise becomes much more troublesome than that in Band I.

About the maximum gain obtainable from pre-amps is when two cascode pre-amps are connected in tandem. Beyond this, valve noise overwhelms any increase in signal obtained with the pre-amp.

Where fading is experienced, then some form of automatic gain control is recommended. Modern televisors have A.G.C. incorporated, but it may be considered worth while to add this useful feature where it does not already exist. Even the simplest form of A.G.C. will prove of assistance to counteract the very often rapid fading which occurs in the fringe areas of Band III transmission.

FROM STRAIGHT TO SUPERHET

SOME DETAILS OF THE BASIC PRINCIPLES OF CONVERSION

By B. L. Morley

THERE are very many home constructors who have built straight TV receivers to standard published designs and even to their own designs. In these days of multi-channel reception straight receivers are outmoded and are being superseded by superhets. Commercially, straight receivers are things of the past.

So far as standard reception is concerned. straight receivers have some advantages, both from the simplicity of construction and from the quality obtainable. The biggest difficulty is that they are not easily converted from one channel to another, and since the inception of Band III working the difficulties have increased further.

To enable Band III transmissions to be received it is necessary to use a converter. This may also be applicable to some of the older TV receivers which have not 12 or 13 channel switching. but the difficulties of operating a straight receiver with a converter are often greater than when a superhet is used.

Breakthrough difficulties from the Band I local station are quite common. while problems of re-radiation are experienced by many. Re-radiation takes the form of radiating the converted Band III signals so that the neighbours may receive the Band III signals superimposed on their own Band I picture.

A further difficulty is that a converter can add instability, so that the quality is poor and difficulty is encountered in preventing self-oscillation.

There is no doubt that a channel switching device is a very attractive proposition. It makes for ease of operation and cleans up the layout.

Multi-channel tuners can be purchased for quite reasonable prices and there are many models on the market. All that is necessary to use them is to ensure that the necessary power supplies are available. and to convert the existing straight receiver into an I.F. strip.

Outline of Principles

The layout of a typical straight receiver is shown in Fig. 1(a). In this example the aerial feeds into a common R.F. stage which tunes to sound and vision. The sound and vision are then separated by selectively tuned circuits, and two sound R.F. stages feed into the sound

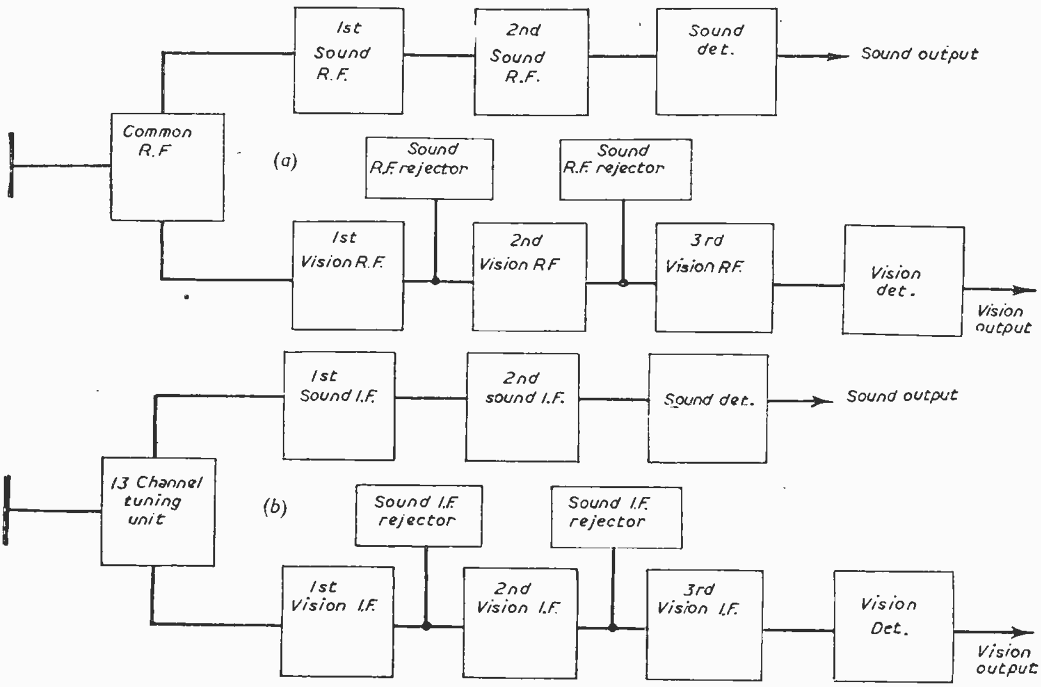


Fig. 1.—The top illustration is a block diagram of a straight receiver, and the lower one of a superhet receiver.

detector while three vision R.F. stages feed into the vision detector.

One of the simplest methods of converting such an arrangement is to take out the common R.F. stage and use its power supply for the 13 channel tuner. The tuned circuits of the sound and vision R.F. stages are then modified to operate at the intermediate frequency given by the tuner unit.

The sound rejectors must not be forgotten. In the straight receiver they were designed to reject the R.F. sound signal from the vision receiver. In the converted receiver they are altered to reject the sound I.F. signal.

Essentially, the tuner unit is connected up, the R.F. coils converted to I.F. coils, and the receiver is retuned.

Unfortunately it is not so simple as that. The major difficulty is determining the modifications necessary to convert the coils from operating at, say, 45 Mc/s to 35 Mc/s—or whatever intermediate frequency is given out by the tuner unit.

Principles of TV Tuned Circuits

Television signals are radiated in the Very High Frequency Band (V.H.F.) and therefore the inductance and capacitance of the tuned circuits are very much lower in value than those used for the normal broadcast bands.

As an example, a coil designed for tuning to 45 Mc/s may have about 8 or 9 turns of wire wound round a miniature coil former about ⅜in. in diameter, while a coil for the long-wave Light programme needs hundreds of turns on a coil over an inch in diameter.

Again, the tuning condenser of a broadcast receiver has its capacity measured in microfarads, while the tuning capacity for a 45 Mc/s coil is one millionth of this, being measured in micro-micro farads (commonly termed Picofarads or pF.s).

If two wires are run close together then there is a certain amount of capacity between them. Two wires running close together in a V.H.F. tuned circuit may have sufficient capacity between them as to affect the tuning of the circuit.

Even the electrodes in the valves themselves have a certain amount of capacity between them, and this has to be taken into account when designing tuned circuits for such high frequencies.

In standard designs all this is taken into account. The input and output capacitances of the valves, the proximities of the wires, and the actual layout of the components—all affect, to some degree, the frequency to which a circuit will tune at V.H.F.

This is one reason, for example, why constructors find that a television receiver originally designed for use with the SP61 valves fails to tune in the transmitter when the valves are changed to EF50s. This is because the wiring has to be altered: in the one case we have the grid wire connected to the top cap of the valve, while in the other the grid wire is connected to a pin at the base of the valve.

Alteration of wiring, alteration of valve capacitances—all can have their effect upon the tuned circuit.

Under these conditions it is not possible for us to provide straightforward instruction to convert a straight receiver into a superhet, using a tuning unit. To be sure of success it would be necessary to check every design which has been published and to make field trials in each case.

There is another aspect of the case to consider. There are many television receivers which are operating at the older I.F. of around 13 Mc/s, and it is desired to convert them to the later I.F. figure of around 35 Mc/s, using a tuner unit. It would be obviously impracticable to give full constructional details of the methods of accomplishing such conversions for every case.

What can be done is to show the basic *practical* principles which can be applied to almost any type of straight receiver. The effort of conversion will involve some trial and error, but should be within the scope of most readers.

Determining the Intermediate Frequency

The different tuners which are available on the market have different I.F. outputs. The first step is to find out what the I.F. output of the particular unit under question really is. The next step is to modify the coils of the receiver.

Methods of coupling the output of the tuner unit will depend upon the design of the unit itself, and here the supplier should be able to provide the necessary details. Some units incorporate their own I.F. output coil, while others are designed so that the H.T. feed to the last valve in the tuner unit is fed from an I.F. coil situated in the television receiver.

No set standard can be laid down; consult the supplier, or buy a tuner which has the necessary data given with it.

The next step to consider is the feed to the heaters. The 6v. supply is common to most home-constructed TV receivers, and where the tuner employs 6v. valves, then a supply can be fed in parallel from the existing supply. Some tuners, however, employ valves with awkward heater voltages, and unless alternative supplies are envisaged then it would be as well to buy the unit less valves, and to convert to 6v. valves. Most of the valves used now have their 6v. equivalents.

Modifying the Coils

The coils in the straight receiver have been designed to operate at the frequency of the television signal and the number of turns of wire on the coils is determined by the channel to which the televisor is tuned. A little arithmetic is necessary to find out how many turns are needed in the modification, so a simple example will be chosen.

Figures used in this example are given for illustration only and we have therefore picked very simple ones so as to keep the working perfectly clear.

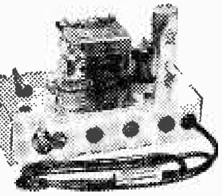
Now, supposing our televisor has been designed for channel 4, which is 60 Mc/s. Further, suppose that the vision tuning coils have three turns each. It is obvious that each turn on the coil represents about

$$60 \div 3 = 20 \text{ Mc/s}.$$

Now this is not strictly accurate, as capacitances come into play, but it is near enough, practically, for our purpose.

Let us assume that our tuning unit provides a vision signal at 35 Mc/s. We have to convert from 60 Mc/s tuning to 35 Mc/s. If each turn

(*Continued on page 121*)



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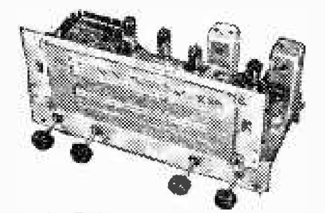

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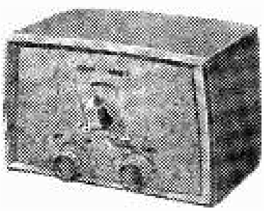

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of the coil represents 20 Mc/s then a turn *added* to the coil would make the coil tune to somewhere round about 40 Mc/s. A further half-turn *added* would make the coil tune to about 30 Mc/s.

This means that our original coil of three turns must now have between four and four-and-a-half turns. It is always easier to take a turn off a coil

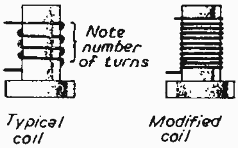


Fig. 2.—Comparison between R.F. and I.F. coils.

than it is to add one, so at the onset it would be as well to add two turns.

Each coil should be treated in a similar fashion and then, when the vision receiver has been finished, attention can be turned to the sound receiver. This should be treated in a similar fashion.

It will be found in most cases that the sound-rejector coils fitted in the vision receiver are similar to the sound coils fitted in the sound section, and they can therefore be modified accordingly. If, however, they should be made differently, then the same principles should be applied, counting the turns, dividing the number

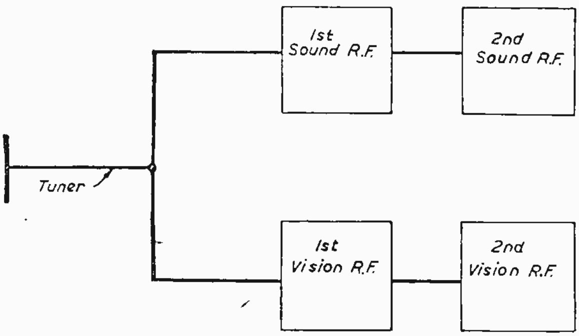


Fig. 3.—An alternative arrangement.

of turns into the frequency of the sound channel, which will then give a figure of frequency per turn. *Add* the number of turns required to tune the coil to the lower frequency.

Coupled Coils

Where coupled coils exist on the same coil former then we have two possible cases. The first is where a step-up or step-down ratio is used and the second is where the coils are equal.

If the coils have an equal number of turns then the same arithmetic and procedure should be applied to each coil. Where the coupling coil is small then it is as well to leave it with the same number of turns as it had originally.

A simple example encountered in many receivers is where an aerial coil has one or two turns. A more complicated example is where an intermediate frequency of about 13 Mc/s exists. It may be found that one coil has 7 turns (say) while the other has 9 turns. In this case, use the simple arithmetic given to determine the new number of turns.

The R1355

There are literally thousands of these useful units in operation. They can be converted in a manner similar to that described for other receivers. Generally, about 26 turns of wire will be found on the I.F. coils and these should be stripped right off, new wire being used for the new I.F.

When converting to an I.F. in the region 30-40 Mc/s, then use a heavy gauge wire about 18 s.w.g. If converting to about 13 Mc/s then use about 34 s.w.g. wire. In this latter case it is best for the wire to be enamelled and silk covered.

Position of Turns

As a general rule, when converting a straight receiver from a Band I tuned circuit to one in the 30-40 Mc/s region, use the same spacing between turns as in the original and use the same grade of wire.

When converting from a Band I straight receiver to an I.F. in the 13 Mc/s region then use a smaller gauge wire for the sake of convenience, and accommodating the number of turns on the coil form. The turns can be close-wound, i.e., adjacent turns can touch. Never wind them in random manner on top of each other or the tuning will be thrown right out, and efficiency will be lost; keep to the original method where possible.

Alignment

This is the point where plenty of patience will be required. In some cases results are immediate; in others time has to be spent.

First check that the power supplies are correct and that all connections have been made. Check also that all the coils have been converted and replaced. Where possible the conversion should have been done with the coils *in situ* so as to disturb the existing wiring as little as possible.

After the check the power can be switched on and the aerial connected. Allow a little time for warming up before commencing the alignment.

Note that in most tuners preliminary alignment has been completed at the manufacturing stage, and beyond varying the oscillator trimmer, or "Fine Tuner" as it may be labelled, then nothing further should be altered. Consult the instructions carefully beforehand and if any trimming has to be done do it precisely as stated in the instructions.

If all is well, swinging the fine tuning control should produce a picture on the screen of some sort. Don't forget to check that the channel

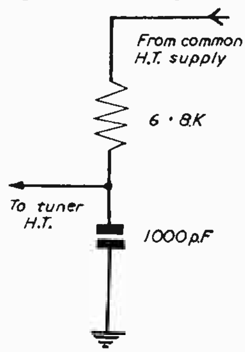


Fig. 4.—Circuit of an H.T. filter.

switch is turned to your local channel.

Assuming that some sort of picture is seen and that sound is heard then set the trimmer to maximum sound. Now adjust the sound I.F. cores for maximum sound. reducing the volume control and/or sensitivity control as this is done.

With sound at maximum. turn the tuning control so that vision is at maximum and ignore the sound. Trim all vision I.F.s to maximum vision and then turn back the fine tuning control to maximum sound. Finally adjust the tuning of the vision I.F.s by staggering them so as to obtain optimum picture quality. This latter is best done on a fairly still picture or. better than this. at a time when Test Card C is being radiated.

Adjust the sound rejectors so that maximum picture brilliance is obtained and so that sound breakthrough on vision is nil.

Some Problems

If sound and no vision is received at first. or vision and no sound is received, the very first thing to do is to continue operating the fine tuning control. as in many cases an alternative position of this trimmer will be found.

If this operation is unsuccessful then adjust the trimmer (the fine tuning control) so that either maximum vision or maximum sound is received, according to whichever is present. Next tune in the I.F. coils of the section where the signal is missing. If no amount of tuning will bring in the signal. try widening the spacing between the turns. Still no signal? Then close up the spacing between turns.

Should all this fail then take off one turn from each coil and repeat the process.

Where no vision and no sound is received then a rough check on the operation of the tuner can be obtained by tapping a short circuit across the aerial socket. This should produce a click on the loudspeaker and in some cases a flash on the screen. If all is in order so far, then concentrate on either vision or sound (sound, perhaps. is the better) and adjust the coils as given above.

If the click is not heard then there may be trouble in the tuner and the most likely source is poor seating of the valves.

A rough check on the operation of the I.F. stages can be made by connecting the I.F. input to an ordinary aerial. Static or some obscure transmissions may be heard, proving this section is in order.

If a low intermediate frequency is being used in the region of 13 Mc/s then it is often possible to couple the output of the tuner unit to a broadcast receiver and to receive the signal on that. Some commercial broadcast receivers do cover this band when based on partial communication-principle receivers.

Many amateur communication receivers can also be modified to cover this section. Swinging the oscillator trimmer (the fine tuner) may enable such a check to be made. The method is, however, rather uncertain.

Adjusting for Band III

Having got the tuner working on Band I then there should be no difficulty in changing to Band III by simple operation of the band switch. One point must be noted, however. Most receivers have some form of Automatic Gain Control and this avoids the necessity of altering the contrast or sensitivity control when changing from one band to the other.

Most straight receivers have no such facility and it is therefore necessary to adjust contrast and/or sensitivity when changing from one channel to another. The provision of A.G.C. adds further complication and is beyond the scope of an article of this nature.

The home constructor may, if his circuitry permits, try a simple modification to enable a crude form of A.G.C. to be obtained. This is by preventing D.C. restoration at the C.R.T.

As an example. a measure of A.G.C. may be obtained where a D.C. restoring diode is used at the grid of a tube employing positively earthed EHT such as the PRACTICAL TELEVISION Argus. It is done simply by removing the D.C. restoring diode.

The net effect of such a step is that the picture tries to retain an average overall brilliance and provides a very crude form of A.G.C. The overall brilliance of the picture may be lost and there will be a loss of tonal range between the high lights and shadows of the picture.

The final result may be such that the gain does not outweigh the loss and it is better then to operate contrast and sensitivity controls manually, rather than to resort to this method.

Removal of the D.C. restorer should not be carried out at the sync separator stage or sync will be lost and there will be real difficulty in holding the picture however strong the signal.

Aerial Attenuators

It is always good policy to have as good an aerial as possible. Where separate Band I and Band III aerials are employed and work into the televisor with a combiner unit. then attenuators can be fitted to whichever aerial is producing the greatest signal. Usually they can be accommodated within the housing of the combiner unit.

While on the subject of aerials note that for Band III you will. generally speaking, require a high gain aerial as compared with that used on Band I. If the two transmitters are situated at about the same distance then an X aerial used for Band I will mean that an aerial with three or four directors is required on Band III.

Power Supplies

Where the tuner supplants a common R.F. stage, then in most cases the power supply feeding that stage can be used to feed the tuner.

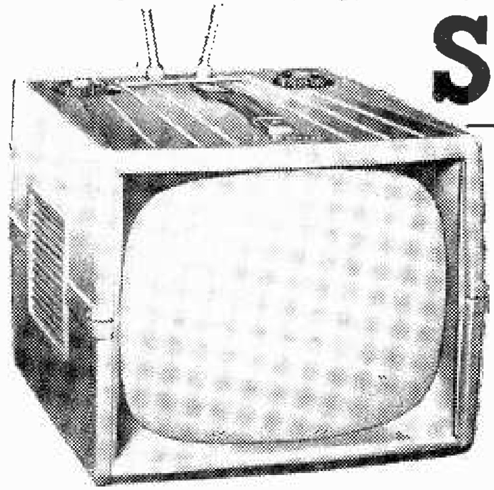
If the valves of the tuner use a heater voltage other than that used in the televisor, then either modify the tuner to use similar voltage valves or provide a separate heater supply.

In the case of D.C. connected heater chains where all heaters are in series, then, it is possible to insert the valves of the tuner in the heater chain. provided the current flowing through the chain is the same as that taken by the valves.

(To be continued.)

TV at the National Radio Show

A REPORT ON THE TRENDS OF DESIGN OF THE MODERN TELEVISION RECEIVER AS SEEN AT THIS YEAR'S EXHIBITION



PORTABILITY was probably the greatest feature at this year's show, and the general trend of the portable followed more or less stereotyped lines. The sizes of the screens used varied from 9in. to 14in., whilst as may be seen from the accompanying illustrations, the general appearance was developed round the full face of the tube. The early design, where the control knobs occupied a strip below the screen has been superseded, and the control knobs which are essential are now either in a small panel on the sides of the cabinet or, in some cases, on the upper surface. This makes for compactness, and some idea of the way in which this compact form has been followed may be gained by studying the two illustrations at the foot of pages 124 and 125. These views are of the Spencer-West "Teevy." This neat little receiver, finished in various colours is one of the few employing a 9in. tube. This is of the aluminised type and has a special plastic optical front which gives a certain amount of intensification and enlargement. Other portables have up to 14in. screens, but the "Teevy" appears to be the smallest of the portables. It is, of course, ideal for the nursery or for a person who is bed-ridden.

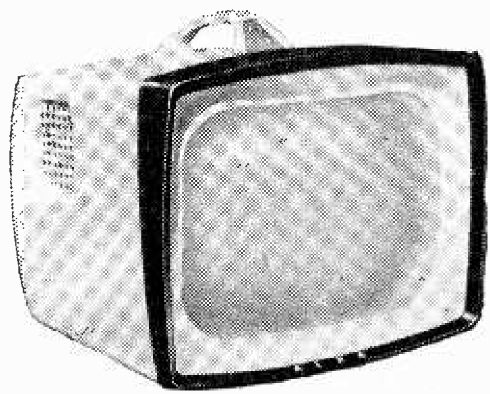
By way of comparison we give on the next page a picture of one of the latest American portables, in which it will be seen that, due to the use of the new very wide angle tubes, the depth of the set has been reduced until it is now less than the width. This makes the receiver neater than many portable radio sets and is no doubt a pointer to the future.

Use of Portables

Many visitors to the exhibition queried the use of the portable and thought it was not wanted. There is, however, a very wide field of interest in this particular type of set. Apart from the use in "fixed" positions in the home, such as the nursery or kitchen, there are times when a person is confined to bed and would be well enough to see a programme but unable to get up to see the normal domestic receiver. The portable would be ideal in such a case. There is also an element of intimacy in viewing by way of a portable which is sadly lacking in the modern big-screen set. Some viewers maintain that the big screen is a retrograde step, and that they preferred the early days when there was only the 9in. screen. In a large room, with the modern aluminised tube and all room lights on, one views a picture which is obviously a picture—that is, something mechanical or automatic. By contrast, a darkened or semi-darkened room, with a 9in tube viewed close-up, gives the viewer a feeling that he is part of the action or scene being viewed and it is far more intimate. Does this aspect of viewing, coupled with the production of portables, indicate that the large-scale production of small tubes will be resumed?

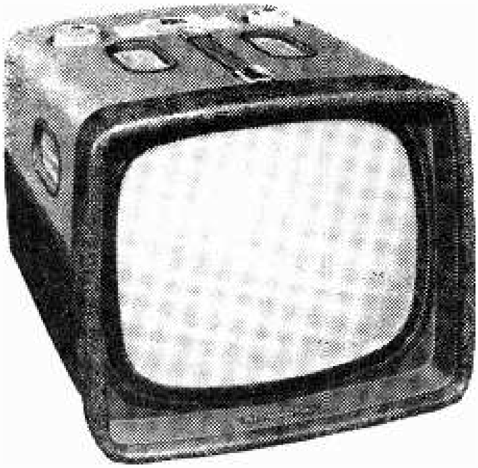
Projection Receivers

The projection receivers this year were almost conspicuous by their absence. Two years ago the portable was not on show, but the majority of firms displayed projection models. This year there were, so far as we could see, no purely domestic type projection sets. Those which were on view were either designed for club or similar uses, or for schools. Probably this is on account of the fact that the screen is a difficulty. If the screen



This Alba receiver illustrates perfectly the main trend at this year's show. Portability, the screen occupying the full front area, and attractive lines.

is part of a compact cabinet design suitable for the home, it becomes very little larger than the modern 21in. direct-viewed tube which is, of



Another attractive portable, by H.M.V. This has a telescopic aerial at the rear, but in other respects is very similar in appearance to other portables. The tube is of the H.M.V. electrostatic type.

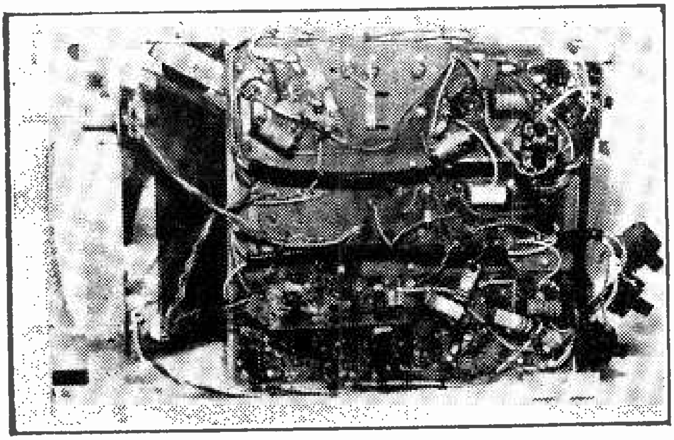
course, very much brighter and can be viewed from practically any angle. Where a large picture, say 4ft. × 3ft. is required, such as in a club or hotel lounge then there may be some excuses for the projection set, and both Peto Scott and Valradio had receivers of this pattern. As may be seen from the illustration on the next page, the active part of the Valradio set is quite neat, and may easily be moved into position, whilst the screen is of a portable type. It thus forms a useful combination for occasional use, such as demonstrations, or for assistance in an "overflow" audience at public gatherings, etc.

Remote Controls

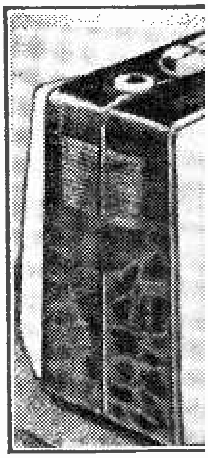
The operation of the receiver from the actual viewing point does not seem to have received much attention from the designers. It might be argued that once set up there should be no need to make any adjustments, but this is a very debatable point. For one thing, it may be found desirable to make three or four changes of station during an evening's viewing, whilst adjustments of contrast may also become necessary due to some atmospheric or power supply fluctuations. Philco have, however, tackled this problem and the results are to be found in their Philcomatic Unit. They claim that this is the only Armchair Channel selector in the country. This has a motor-operated unit which turns the channel selector to the desired position, merely by pressing a button. At the moment, however, there does not appear to be any fully-remote control device, that is, one which, in addition to channel selection, also has volume and contrast controls. The latter should not be difficult to arrange on a plug-in basis, and from the circuit point of view they could be placed at some point in the circuit where long leads would not have any deleterious effect.

Cleaning the Screen

Another point which does not appear to have received the attention it deserves is the removal of the protective front for cleaning. If a receiver has been in operation for a long period, it will accumulate a heavy layer of dirt as a result of the electrostatic action of the tube face. In a room where fires of the ordinary coal type are in constant use this film will include soot and become so thick that the picture will be almost obscured. Much depends, of course, upon the fitment used between the protective glass and the tube. Some makers use an air-tight mask, whilst others just have the tube pushed up against the



Some idea of the compactness of the portable receiver may be gained from this illustration of the underside of chassis of the Spencer-West portable. This has a 9in. tube and is probably the smallest commercially-produced portable.



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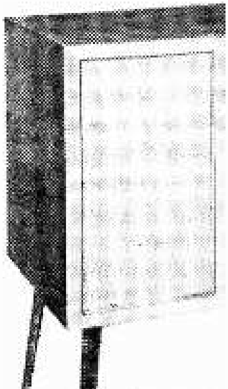

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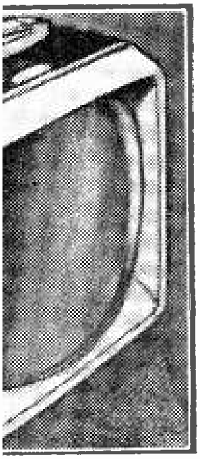
mask, which is fixed to the front of the cabinet. One particularly good device is found in the Philco, where the tube mounting is completely independent of the chassis. The screen, mask and tube are, therefore, easily removable from the front, which not only facilitates cleaning, but also simplifies the work of the service engineer. A hinged screen should not be difficult to arrange, and would simplify cleaning.



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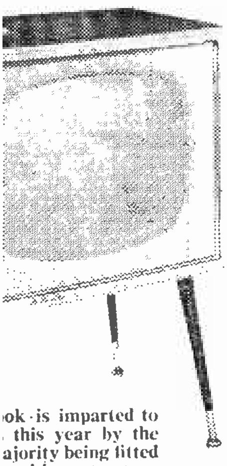

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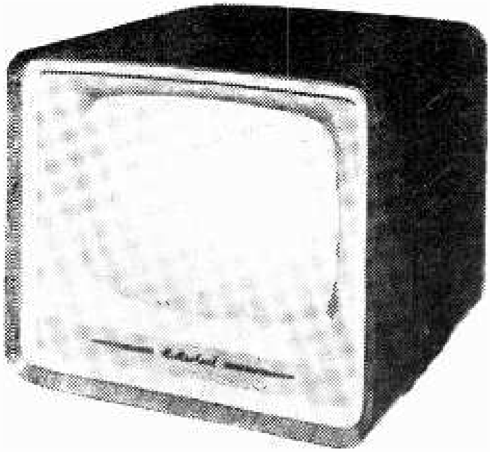
Accessibility

The service engineer often finds it necessary to remove the receiver completely from its cabinet before any attempt can be made at tracing a fault. In some makes of table model the bottom of the cabinet takes the form of a slotted wooden member, whilst in others it consists of a cardboard or composition panel held in position by a screw at each corner. With this type of receiver the set may be laid on its side, the panel removed and the circuit thus becomes accessible. Again, Philco have gone one better and one screw only has to be removed to allow a panel to fall, revealing the essential parts of the circuit. This panel is at the side of the cabinet, so that, in the case of the larger models on legs, servicing is made very easy.

Spot-wobble

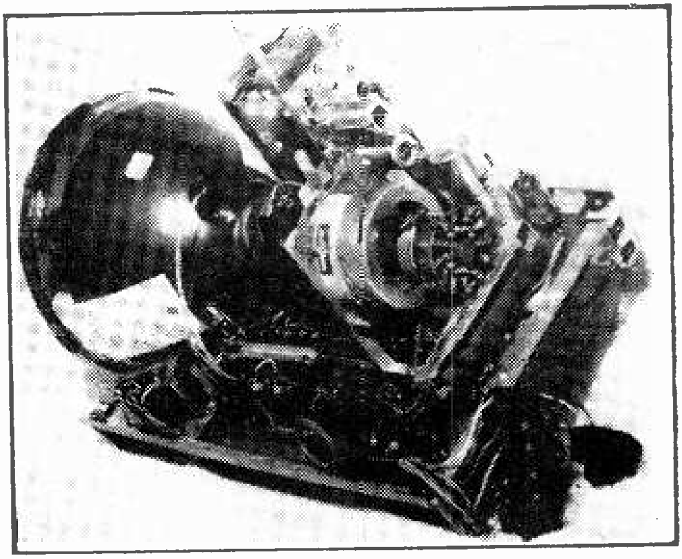
Again this year, Ekco appear to be the only firm who are using the spot-wobble feature. This circuit arrangement is, of course, quite a point of debate among designers, some of whom contend that the same result is obtained in effect, by defocusing. For the benefit of those who are not familiar with this device it consists of a special oscillator circuit and a pair of coils arranged round the neck of the tube, by means of which the spot is caused to travel across the tube more or less in the form of a sine wave, instead of in a straight line. By this means the line structure is broken up and one can view the picture much closer without the ruled line effect. The special oscillator is brought into circuit as required by means of a switch.



McMichael are responsible for this receiver which, whilst very similar to others, has a slightly larger front than the screen area.

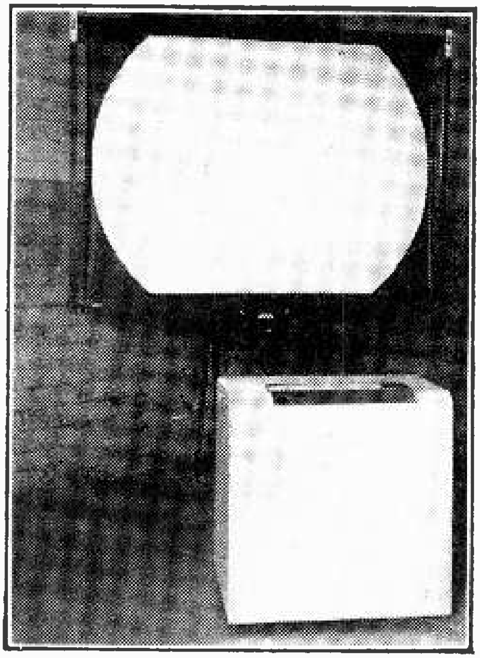
Plug-in Components

Another useful idea seen in one or two sets particularly the Philco, is the fitting of plug-in essential components. The line-transformer, for instance, is quite a common source of trouble, and if it has to be replaced it means that besides five or six leads, a valve also has to be wired in place. The usual EHT rectifier is, of course, usually of



Another view of the Spencer-West Portable, showing the compact layout without any real overcrowding.

the wire-ended type and connected direct across two points on the line transformer. In the Philco, however, if there is trouble in this part of the circuit all the serviceman has to do is to pull out the existing transformer on which the rectifier



One of the very few projection receivers, this is the Valradio, which has a large separate screen with its own stand, and which may be folded away for storage when not in use.

is mounted, and plug-in a new one complete with valve. The work of only a moment, and all connections, including the essential lead to the C.R.T. are in position. No risk of corona and no time wasted. This is an idea which could also be applied to several other essential parts of the circuit in a modern set.

Circuitry

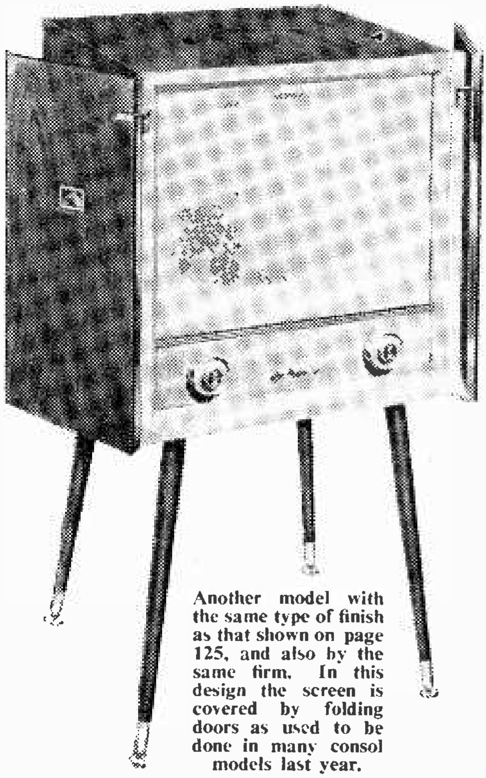
As already mentioned, so far as we could trace there was nothing new from the circuit point of view. Flywheel sync. and other features are more or less standardised in the fringe area models and various interesting ways of arriving at the required balanced pulses are employed. The result, however, is the same in every case, but beyond this nothing fresh has come up in the last year. Although not exactly a circuit detail, it is noted that there are more sets employing the electrostatic tube this year, and from the advantages which it gives, this type of tube may become very much more popular.

Printed circuits formed a very large part of the exhibited sets, the degree to which this feature had been incorporated varying from make to make and from set to set. It did not appear that a single manufacturer had produced an "all-transistor" set, or even one in which the vision and sound strips were transistorised. In the majority of cases transistors and printed circuits were used only in small sections of the set, and whilst the result of using these features is not revealed by any difference in the picture, the reliability may easily be improved.

The ultra-wide angle tube is not yet commercially available in this country, but we show on the centre pages a picture of a set which has made its appearance in the U.S.A. from which it will be seen that the width of the set is now considerably greater than its depth. This is a step towards the "flat tube," but whilst it is a great improvement it unfortunately calls for a number of new additional components, as well as changes in circuit design to obtain the increased power which is called for. Scanning coils are only one of the items which need re-designing, but it is hoped to see these on the market in the New Year. At the moment no details are obtainable, but hints of an even shorter tube than that referred to were given by one tube manufacturer.

Aerials

Some very interesting aerials made their appearance, notably the Golden V. This Belling & Lee product consists of two arms which are extendable and adjustable as to angle and cover BBC, I.T.A. and the F.M. bands. A somewhat similar type of aerial is fitted to the Ferguson set, whilst other models had fold-away aerials of various designs. The carrying handle formed part of the aerial in some receivers, whilst in others it was tucked away at the back.



Another model with the same type of finish as that shown on page 125, and also by the same firm. In this design the screen is covered by folding doors as used to be done in many consol models last year.

SIMPLIFIED TV SERVICING

TESTING A FAULTY SET WITH ONLY AN OHM-METER OR VOLT-METER

MANY readers it is noticed, from queries sent in, possess a volt-ohmmeter, and wish to carry out service work on their receiver, but do not possess the knowledge of where and how to start. In this article, it is proposed to give a number of typical faults and how to find them, with the aid only of a volt-ohmmeter. As many different types of receivers, each type having the same class of fault, will be given it should be emphasised that a service sheet of the type concerned is very necessary, to save time and needless tracking of wiring.

Example No. 1: An Early Type A.C./D.C. 9in. Set. Fault: No Sound, No Vision, No Raster.

This type of set will have a live chassis. Check that the chassis itself is on the earthing side of the mains. A small neon pocket tester is very handy to check this. The first thing is to check the fuses if fitted, then see that the mains power is getting to the set. In all cases it will be found that the on-and-off switch is in circuit directly after the fuses, and from there it goes to a mains dropping resistor, which lowers the mains volts to the correct value for the valve heater circuit. From a tapping on this dropping resistor a lead goes to a metal rectifier (in the type concerned). The valve heaters may all be in series, or in a series-parallel arrangement, depending on the type of valves used. Now for checking so far. Check on the set side of metal rectifier for H.T. volts. These will vary according to the set and mains supply, which is usually about 230-250 volts. If H.T. volts are low, say about 120-150 volts, then the metal rectifier is under suspicion. A leakage on the H.T. side of the set will be shown by overheating of the metal rectifier. The valves can be separately checked, or, if the meter is an A.C. type, a reading can be taken of the heater circuits at different points, working from mains end to the chassis end. If all valves can be seen alight, then this check is not necessary. If in this case H.T. is OK, and all valves alight, then we proceed to the next step. We now check anode, screen and cathode voltages on the valves and compare with the values given on the service sheet. Care should be taken in doing this. Connect negative lead of voltmeter to chassis, and only use a thin connecter when measuring voltages. This is to prevent accidentally shorting of valve pins, especially on B7G and B9A bases. If these are near enough correct, then check the voltages on the C.R.T. In the case of a triode tube, there should be correct heater volts and volts on grid, variable according to position of brilliance control and cathode volts, variable in most of these types by the position of the contrast control. The grid will generally vary between 0 and 90 volts and the cathode between 80 and 120 volts. If the readings are found OK, then check for EHT on tube.

The set we have in mind uses fly-back EHT and an EHT rectifier valve of either the wire-ended type, or, if in an earlier model, a plug-in type. If the flyback is working correctly, the EHT rectifier should light after a few minutes of switching on. Should this not be so, then either the valve has an open circuit filament or the flyback is not working. If the valve lights and there is still no raster, then with a long screwdriver with a good insulated handle see if it is possible to draw a spark either from the EHT connection on the tube, or from the filament of the EHT rectifier. If no EHT is present, then it will be due either to the EHT rectifier having little or no emission, or the trouble lies in the line output circuit. Now, although manufacturers give resistance values for various sections of the transformer, this is not really a good enough test, as shorting can occur in the transformer due to the high voltages that appear across certain sections. In trouble of this kind have the line oscillator valve and the line output valve checked on a valve tester or by substitution before condemning the transformer. All components in the circuit, such as line hold control, focus control (if fitted) and width control, should be checked for continuity and contact of moving arm. If an efficiency diode is used, this also should be checked for emission, as low emission here will prevent line output valve working correctly. Frame coils and line coils on neck of tube should be checked for resistance as on the service sheet.

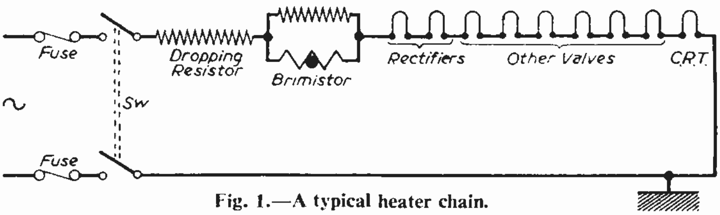


Fig. 1.—A typical heater chain.

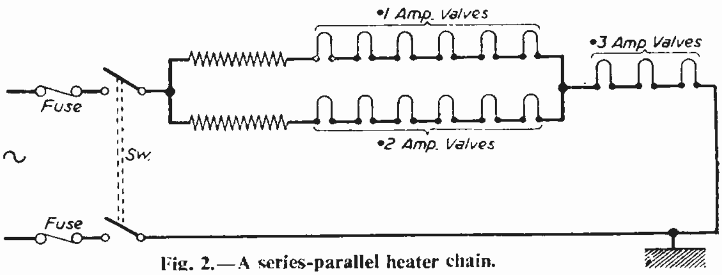


Fig. 2.—A series-parallel heater chain.

For the purpose of this checking, we will now presume that the fault was due to a faulty EHT rectifier and we now have a raster but no vision or sound. It is now quite safe to make a deduction that the fault is common to both. In the set under test, only the first two valves V1 and V2 are common to both sound and vision, so the fault should be there, or in the aerial input circuit. These valves should be checked or changed. If the set is a T.R.F., there are generally 4 or 5 valves of the same type in the vision strip.

Changing these over if one is faulty will bring in sound, but may not give vision. If this is so, then you know that one of these valves is faulty. We will suppose this is the case and sound is OK and vision still not there, you already having changed the faulty valve for a good one. We must now check the remaining vision valves up to and including the vision demodulator and the vision amplifier. These valves should be tested or changed. Vision demodulators may either be valves of the double diode type or a crystal. If the latter have to be changed, be careful that the heat of the soldering iron is kept away from them. Holding the connecting wire with a pair of pliers will do this satisfactorily.

The foregoing procedure will cover practically any television set that is dead; and in most cases the fault will be found in the early stages of this test, in which case the remainder of the checking need not be carried out.

The Cathode Ray Tube

This is one part that we have not yet considered in detail. A C.R.T. will not function correctly if the heater is shorted or open circuit, or if shorts occur between the electrodes, or if the tube is soft or gassy, or if any electrodes are disconnected inside the gun of the tube. Most of these faults in a C.R.T. can be located. A tube that presents a blank or nearly blank screen EHT being present and other voltages otherwise correct, time bases working etc., can reasonably be judged to be suffering from low emission or having gone soft. This latter, however, will generally show itself as a blue glow inside the gun. A C.R.T. with uncontrollable brilliance, other circuits having been checked, will probably have a leakage between electrodes, or may have an open circuit grid connection. Tubes that have a cathode-heater short or may be aged through long use, may have an extended life given them by using a booster transformer for the heater volts. This transformer isolates the heater circuit of the whole set from the cathode of the tube, and at the same time boosts the heater volts of tube up approximately 25 per cent.

Sets Using Valve Rectifiers A.C./D.C.

The procedure of checking will be the same as for sets using metal rectifiers, except that it must be considered that the heaters of these rectifying valves are in the heater chain. It will be generally found that these rectifiers are placed first in the chain from the mains dropping resistor (see Fig. 1). A point that should be watched is in sets with series-parallel heater chains (see Fig. 2). These are generally arranged so that valves with the same heater current consumption are in the same chain. Do not be misled here by noticing that some of the valves are lit up, and considering that they all will be. One section of the chain may be open circuit.

Example No. 2: Set with Time Base Fault Using Thyratron.

This will include sets using a T41 or a 6K25 valve as a line or frame time base oscillator. The symptoms are generally as follows: No line hold or frame hold, continually line tearing or frame slip, distortion or cramping of either line or frame, and, of course, no frame or line or a thin vertical or horizontal line. In most cases the trouble will be due to the valve, although components such as transformers and controls such as height and width controls must not be overlooked. It should be pointed out that neither a T41 or 6K25 can be tested on a valve tester. If in doubt, change the valve. Substitution could be employed, for instance, in the case of a set having bad frame with line OK, if both bases are using thyratrons. In this case a changeover will indicate the faulty valve. When the fault consists of insufficient height, check should be made of the frame output valve, as well as the frame output transformer. Sometimes this fault will occur at infrequent intervals. Search must then be made for coupling condensers going open circuit or low capacity, and also intermittent contact of controls.

(To be continued)

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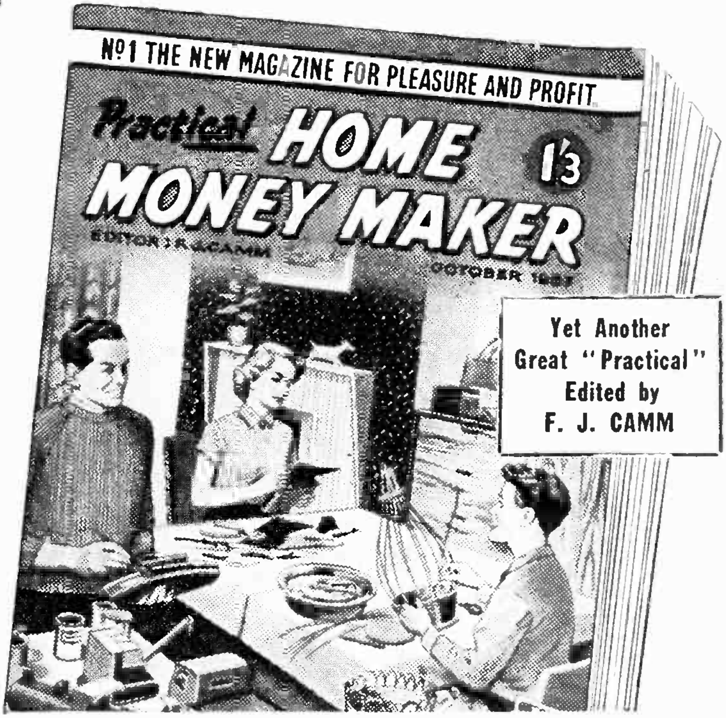

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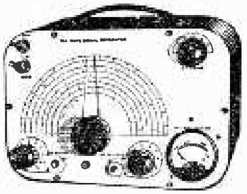

Coverage 120 Kc/s-230 Kc/s. 300 Kc/s-900 Kc/s. 900 Kc/s-2.75 Mc/s. 2.75 Mc/s.-8.5 Mc/s. 8 Mc/s-28 Mc/s. 16 Mc/s-56 Mc/s. 24 Mc/s-84 Mc/s. Metal case 10in. x 6½in. x 4¼in. Size of scale, 6½ x 3½in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent., 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. Grey hammer finished case and white panel. Accuracy plus or minus 2%, £4.19.6 or 34/- deposit and 3 monthly payments 25/-. P. & P. 4/6 extra.

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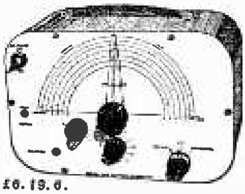

Coverage 7 Mc/s-210 Mc/s in five bands, all on fundamentals, slow-motion tuning, audio output, 8 vertical and horizontal bars, logging scale. In grey hammer finished case with carrying handle. Accuracy ± 1%. A.C. mains 200-250 v.

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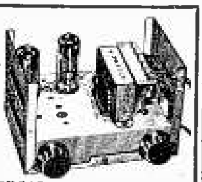

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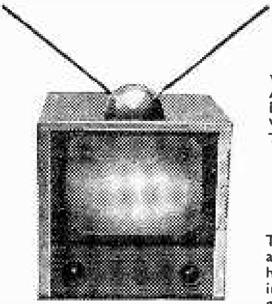

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6BW6	7/6	25Z4G	9/6	ECC85	9/6	GZ32	12/6	UF89	10/6
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6CH6	7/-	35L6GT	9/6	ECF82	11/-	KT44	6/6	UL84	11/6
6F1	15/-	35Z4GT	8/-	ECH35	9/6	KT61	14/6	UY21	15/6
6F6G	6/6	35Z5GT	9/-	ECH42	9/-	KT63	6/6	UY41	8/-
6F12	6/-	43	13/6	ECH81	8/-	KTW61	6/-	UY85	10/6
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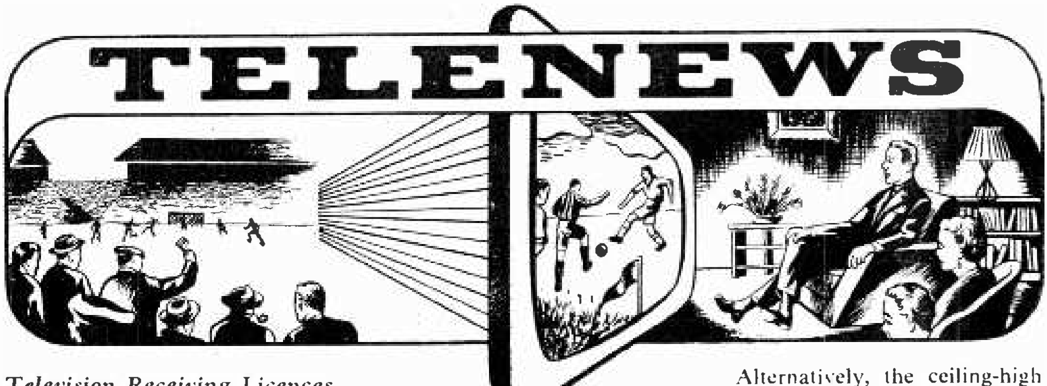


Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of July, 1957, in respect of receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London Postal	1,504,663
Home Counties	866,770
Midland	1,197,686
North Eastern	1,142,702
North Western	1,033,182
South Western	536,982
Wales and Border Counties ...	408,283
Total England and Wales ...	6,690,268
Scotland	510,279
Northern Ireland	69,201
Grand Total	7,269,748

The Growth of Television

AT the end of June, 1957, there were 7,169,509 television licences in force throughout the country, an increase of 203,253 over the total at the end of March, 1957. The increases during the three months concerned were as follows:

England (excluding Monmouthshire), from 6,108,104 to 6,274,430; Wales and Monmouthshire, from 316,372 to 326,603; Scotland, from 478,432 to 500,921; Northern Ireland, from 63,348 to 67,555.

BBC's Seventeenth Television Station

THE BBC's new television transmitting station at Rosemarkie, near Inverness, is the seventeenth BBC television station to be brought into operation.

The Rosemarkie station, which has a 350ft. aerial mast and is built on a commanding site some 680ft. above sea level, overlooking the Moray Firth, brings the BBC Television Service within reach of more than 100,000 people in an area which includes most of the counties of Nairn and Morayshire (where it links up with the service area of the BBC's television station at Meldrum), a substantial portion of Inverness-shire, including the Royal Burgh of Inverness, and the eastern coastal areas of Ross and Cromarty and of Sutherland. This increases the coverage of the BBC's Television Service in Scotland to 93 per cent. of the population.

The new station transmits on Channel 2 (vision 51.75 Mc/s, sound 48.25 Mc/s) with horizontal polarisation and maximum effective radiated power of 1.5 kW.

Silent Television

A NEW television receiver designed to be suspended from the ceiling and to beam a picture on to a 4ft. × 3ft. screen has been demonstrated by Hadley Telephone & Sound Systems, Ltd., of Smethwick, Birmingham.

The receiver—the Nera, made by P.A.M., Ltd., of Guildford—was demonstrated in conjunction with a new Hadley unit which is already being installed in several hospitals and enables the "sound" part of television programmes to be divorced from the picture and relayed to individual patients through headphones or pillowphone. This "silent picture" system overcomes the major problem of television in hospitals—that of providing ward viewing without disturbing patients who are resting or who are too ill to participate.

Alternatively, the ceiling-high projection set, with normal sound distribution and remote control, is suitable for installation in schools, public halls, canteens, hotels or elsewhere for large-audience viewing.

PO Radio Station Links BBC Welsh Transmitters

IN order to "skip" the Welsh mountains a Post Office radio station is being used to link the two BBC Welsh television transmitters. Signals from the Wenvoe transmitter near Cardiff are received at the P.O. microwave station at Mynydd Pencarreg, near Lampeter, and are relayed to the new BBC West Wales Television transmitter at Blaen Plwy, near Aberystwyth.

During the early stages of testing a "ghost" was seen on the picture transmissions, apparently caused by a cliff face on the 2,900 feet Brecon Beacons, situated some 6½ miles laterally from the direct path from Wenvoe. The unwanted image was eliminated by installing an aerial arranged so that it would not pick up reflections from the Brecon Beacons.

New Schools TV On Show For First Time

A FULL range of the latest large-screen television receivers specially designed to meet the recommendations of the Schools Broadcasting Council, was among exhibits being shown for the first time at this year's Visual Aids' Conference, at Bedford College, London, in July.

The new television sets—27in., 24in. and 21in. tube models—were among exhibits on the stand of Clarke & Smith Mfg.

Company Ltd., specialists in schools broadcast equipment, of Wallington, Surrey. It was the first time a full range of large-screen television receivers of this type has been shown in this country by a single manufacturer.

First Hungarian TV Projection Tube

THE Nagykanisza glass factory has produced Hungary's first television projection tube and it is expected that serial production will begin next year. It is stated that with the use of this tube TV pictures can be projected to the size of a film screen.

Wolsey Television Change Name

TO keep its title in line with certain extensions of activity which Wolsey are planning, it has been decided to change the name of the company to Wolsey Electronics Limited, and this change of name has now been entered on the Register of Companies. Whilst having no intention of reducing its activities in the television aerial field (in fact the company is planning for a further increase in aerial trade this year), Wolsey is finding that more efficient production in the large factory space now available, and the expansion of its technical engineering department enable it to plan electronic manufacture, chiefly in products closely associated with its present activities. It is understood that the first of the new lines will be an aerial amplifier and distributor, and that further new products may be expected within the next few months.

The First Television Engineers

MR. D. C. BIRKINSHAW, chairman of the Television Society Council, and Mr. T. H. Bridgewater, the honorary treasurer, have this year completed 25 years in the BBC television service. This may fairly establish their claim to the first television engineers in this country, as they joined the BBC in order to operate the first low definition 30 line television developed by the Baird Company.

Mr. Birkinshaw is now Superintendent Engineer Television, and Mr. Bridgewater is Superintendent Engineer of Television Outside Broadcasts.

BBC Rosemarkie Appointment

MR. M. CLOUCH has been appointed Engineer-in-Charge of the new television transmitting station at Rosemarkie, Inverness-shire.

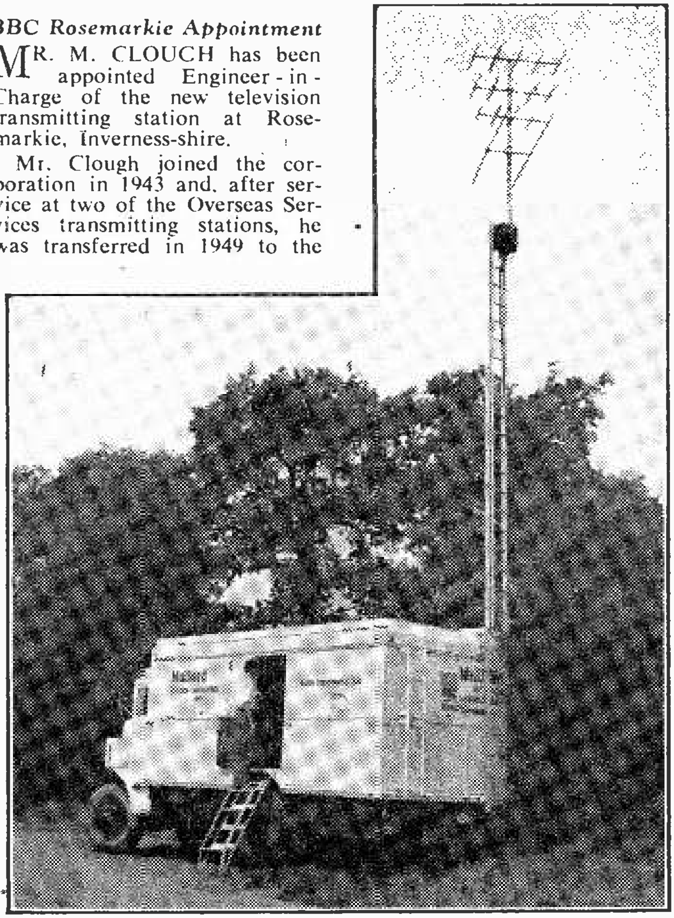
Mr. Clough joined the corporation in 1943 and, after service at two of the Overseas Services transmitting stations, he was transferred in 1949 to the Norwich station as senior maintenance engineer.

Later, in 1955, he spent some time as an assistant to the Superintendent Engineer, Transmitters before joining the staff of the Meldrum Television Station where he remained until taking up his present appointment.

New Antiference Factory

ON Wednesday, 7th August, 1957, Sir Gerard Spencer Summers, M.P., officially opened the new Antiference factory on the Bicester Road, Aylesbury, with a golden key modelled into the shape of an "Antex" aerial.

This new factory is the largest of its kind in Europe and means greatly increased production of Antiference aerials and accessories during the coming season. Both the factory and offices are of the advanced modern design and every amenity has been provided for employees.



One of the Mullard laboratories on wheels now touring the continent to test out A.G.C. systems on the 625 line receivers etc.

New Marconi Telerecording Equipment for Czechoslovakia

THE new Marconi "fast-pull-down" telerecording equipment has been ordered by Kovo Prague on behalf of the Czechoslovakian Television Service for use in their Prague studios. Marconi equipment was chosen after Czech engineers had studied and compared the various systems available.

C.R.T. ISOLATION TRANSFORMER

Type A. Low leakage windings. Ratio 1 : 1.25 giving a 25% boost on secondary. 2 v., **10/6** ; 4 v., **10/6** ; 6.3 v., **10/6** ; 10.8 v., **10/6** ; 13.3 v., **10/6**. Ditto with mains primaries, **12/6** each.
Type B. Mains input 220/240 volts. Multi Output 2, 4, 6.3, 7.3, 10 and 13 volts. Input has two taps which increase output volts by 25% and 50% respectively. Low capacity, suitable for most Cathode Ray Tubes. With Tag Panel, **21/-** each.
Type C. Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 220/240 volts. Output 2-2¼-2½-3 volts at 2 amps. With Tag Panel, **17/6** each.
NOTE.—It is essential to use mains primary types with T.V. receivers having series-connected heaters.

TRIMMERS Ceramic. 30, 50, 70 pf., **9d.** : 100 pf., 150 pf., **1/3** ; 250 pf., **1/6** ; 500 pf., 750 pf., **1/9**.
RESISTORS. All values. 10 ohms to 10 meg., ¼ w., **4d.** ; ½ w., **6d.** ; 1 w., **8d.** ; 2 w., **1/-**.
HIGH STABILITY. ½ w., 1%, **2/-**. Preferred values 100 ohms to 10 meg.
WIRE-WOUND RESISTORS 25 ohms—10,000 ohms: 5 watt **1/3**; 10 watt **1/6**; 15 watt **2/-**
15,000 ohms—50,000 ohms, 5 w., **1/9** ; 10 w., **2/3**.

12/6 PURETONE RECORDING TAPE
1,200 ft. on standard 7" Plastic reels. Spools 5" metal, 1/6, 7" metal, 2/3.
FERROVOICE 1,200 ft. Plastic Tape 25/-

O/P TRANSFORMERS. Heavy Duty 50 mA., **4/6**. Multiratio, push-pull, **6/6**. Miniature, 384, etc., **4/6**.
L.F. CHOKES 15-10 H. 60/65 mA., **5/-** ; 10 H. 80 mA., **8/6** ; 10 H. 150 mA., **12/6**.
MAINS TRANS. 350-0-350, 80 mA., 6.3 v. tapped 4 v. 4 a., 5 v. tapped 4 v. 2 a., ditto 250-0-250, **22/6**. Bargain 300-0-300 65 mA., 6 v. 4 a., 4 v. 2 a., **15/-**.
HEATER TRANS. Tapped prim., 200/250 v. 6.3 v. 1½ amp., **7/6** ; tapped sec. 2, 4, 6.3 v., 1½ amp., **8/6** ; prim. 230 v. Sec. 6.3 v. 3 amp., **10/6**.
ALADDIN FORMERS and core, ¼in., **8d.** ; ⅜in., **10d.** 0.3in. **FORMERS 5937/8 and Cans TVI/2.** ⅜in. sq. x 2in. and ½in. sq. x 1½in., **2/-** ea., with cores.
TYANA.—Midget Soldering Iron 200/220 v. or 230/250 v., **16/9.** **Solon Instrument** Iron, **24/-**.
MAINS DROPPERS. 3in. x 1½in. Adj. Sliders, .3 amp. 750 ohms, **4/3.** 2 amp., 1,000 ohms, **4/3.**
LINE CORD. .3 amp., 60 ohms per foot, .2 amp., 100 ohms per foot, 2-way, **6d.** per foot. 3-way, **7d.** per foot.
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6AM6	8/6	7S7	8/6	ECL82	12/6	PEN25	6/6
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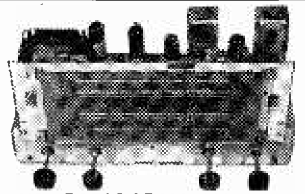
6J5	6/6	35Z4	10/6	EL84	10/6	UY41	8/6
6J6	7/6	80	8/6	EY51	11/6	U22	10/6
6J7	8/6	954	1/6	EZ40	10/6	U25	11/6
6K6	6/6	EA50	1/6				
6K7	5/6	EABC80	8/6	EZ81	11/6	X79	10/6



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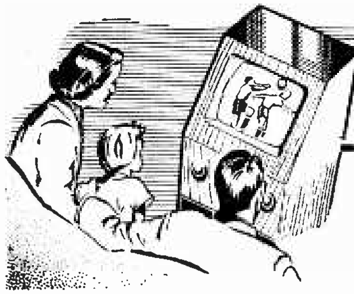


UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

NEW technical tricks and gimmicks are the order of the day, especially in the engineering department of the I.T.A. All kinds of ingenious gadgets have been evolved which ensure the correct timing of programmes, record details of breakdowns, correct film speed variations, enable producers to cut, instruct and direct while the programme is on, and so forth. A.T.V. is probably the most go-ahead in evolving these aids to smooth presentation, most of which are not seen by the viewers, nor do they make any direct impact on the production methods. The programmes have not acquired any particular kind of new look, but some of the headaches and worries of organisation and presentation have been reduced.

MAN AND MUSIC

SPIKE MILLIGAN'S recent goon show on the BBC made use of playback—and also of film, trick photography, inlay, back-projection and the whole bag of tricks in putting over his ideas of Man and Music through the ages. He also revived a gimmick of the music hall of the roaring 'twenties, when he roped that genial musical director, Eric Robinson, into the action of this crazy piece of hellzapoppin humour. His contribution to the merriment was in first-class "straight man" style, reminiscent of the days of Jimmy Sale, Horace Sheldon, Pat Thayer, Kennedy Russell, Jimmy Glover, Tommy Thurban and other personalities of the conductors' chair in the greatest days of the music hall. The art of the top-line music hall pit-orchestra conductor was in his perfect control of the orchestra, following the artiste on the stage and always subservient to him. As a stooge to the comic's wisecracks, he was always ready to play his part—but never to cap his jokes. The musical comedy or operetta conductor, however, conducted both his orchestra and the vocalists on the stage: the dancers in interpolated ballet had to keep time with the orchestra—not vice versa.

VICTORIA REGINA

I DON'T know how many plays and films have been written about Queen Victoria. In the silent days of the cinema there was *Sixty Years a Queen*, made by Will Barker and G. B. Samuelson, in the grounds of what is now the BBC TV film studios at Ealing. Later on, Housman's play *Victoria Regina* had a good run at a West-End theatre, followed up by Anna Neagle's two highly successful films *Victoria the Great* and *Sixty Glorious Years*. The recent TV production of Housman's play was adapted by William Redmond, and an excellent job he made of it. Dorothy Tutin gave an entirely new and original interpretation of the part of the Queen, which I found most interesting. Her best scenes, however, were those which came just after the announcement of Princess Victoria's accession to the throne, when she assumes regal authority over the wishes of her mother, the Duchess of Kent—beautifully played by Lucie Mannheim. This version dealt mainly with early incidents in the life of Queen Victoria: I expect we shall be seeing a lot more of her long reign in due course on TV. After all, we have been having rather a lot of plays about the Prince Regent, in which he has been given a variety of characters by different authors, some not very sympathetic. Most of these historical biographies make good TV material. Apart from the handling of the actors from the producer's point of view, the TV cameraman always seem to do their best work on costume plays of this type. I wonder why?

MONDAY DATE

MONDAY is a good evening on which to have a slick comedy show. Jimmy Grafton, writer of comedy material and sketches for a number of leading TV variety comedians, turned in a most entertaining half hour's entertainment in *Monday Date*, in which Dicky Valentine once more proved that he can do a lot more than croon "pop" songs into a microphone, as did Shani Wallis, who is rapidly ascending to the top star class. Kenneth Connor and Irene Handl, together again, were a first-class comedy team who put over Jimmy Grafton's sketches with a fine sense of timing, and the dance numbers of Philip Casson added verve and gloss. A lot of hard work goes into these half-hour shows and much credit is due to the lively direction of Kenneth Carter. One of the sketches in this show made use of the dumbshow type of humour, with musical background, much favoured at one time by circus clowns. Done well, this type of humour always scores big laughs. Hal Monty featured musical dumb shows a year or so ago with great effect, and Aurther Haynes varied the formula, to the "dumb reaction to voice off" routine. The scene in which music was produced from iron railings and a tennis racquet was in the true clown style. The *Monday Date* show is definitely a date that viewers should book.

FEATURE FILMS

DO old feature films make good modern television? Apparently, they do, according to the increasing numbers which have been shown both on the BBC and the Commercial channels. In the second quarter of this year, no less than 39 full length feature films were shown on British Television (32 being on I.T.A.) compared with 25 that were put on in the first three months of the year. The films are all pretty old, of course, as the industry has imposed a ban upon the televising of films less than five years old. As a matter of fact, some of the films date back to 1935 or earlier, though a few were released in about 1950. It is interesting to note the 39 films included 30 British, eight American and one French film. There is obviously no need for a British film quota to be applied to old films for television!

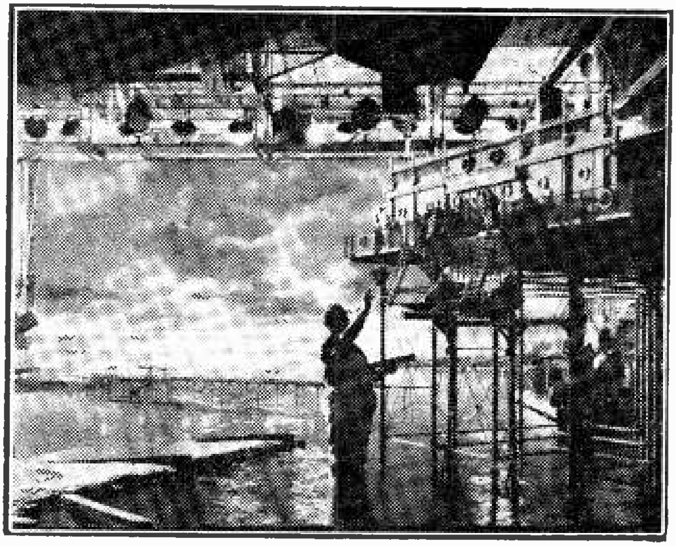
PLUSHY OLD FILMS

OLD films which are of the "costume" type naturally date the least. A costume film starring Madeline Carroll and Clive Brook, *The Dictator*, made in about 1935, was shown on AR-TV recently and stood up remarkably well to the test of time. A somewhat naïve story set in the royal palace at Copenhagen about 200 years ago, it was chiefly remarkable for its "lush" mounting, with huge spectacular settings and magnificent costumes. Photographically, it was excellent, and the performances of Madeline Carroll, Clive Brook and Emlyn Williams—all looking extremely youthful—were excellent. The whole production had a very expensive look about it, and I am told that it cost about £98,000 to make in 1935. The same standard of production today could not be turned out for less than £500,000.

In another category altogether was the Marx Brothers film, *Love Happy*, shown by the BBC. The Marx Brothers are rather an acquired taste, like the goons; you either hate them or love them. I must say that I have always enjoyed the slick, crazy antics of this great comedy team. Groucho, the brother with the big cigar, was not so prominent as usual in this film —the main gags and musical items being brilliantly carried out by Harpo, the dumb one, and Beppo, the Italian-looking member of the team. So far as I am concerened, they can put on Marx Brothers films regularly —especially *Horse Feathers*, my favourite one, and follow them up with *Hellzapoppin*, with Olson and Johnson, *A Fire Has Been Arranged*, with Flanagan and Allen and *Alibi Ike*, with Joe E. Brown. All these are veteran films of the "goonatic" type which don't date and should still be good for a laugh.

MODELS

THE glossy and lavish production qualities of *The Dictator* caused me to think about the various ways now available to television producers for achieving spectacular effects without the necessity for building huge sets. The BBC make occasional use of the systems of "inlay" and "overlay," in which walls and ceilings from still photographs can be added on to small set sections of normal size. It isn't used very often, however, though one or other system achieved a big success as a magical aid to a conjurer in a recent series. Models are used only occasionally and have only been moderately successful. The film people use models a great deal, and their success is largely dependent upon the selection of the right scale and the use of high-speed "slow motion" cameras. For shipwrecks, explosions at sea and the like, scales of ½in. to 2in. to the foot are often used, floating the model ships on tanks 40 or 50 feet square and with waves created by powerful fans blowing upon the surface of the water. The scales are varied, of course, according to the requirements of foreground and set pieces. With the film camera turning at three or four times its normal speed—anything from 72 to 100 pictures per second—some quite astonishing results can be obtained when the pictures are reproduced at normal speed. It is an expensive process, however, requiring constant adjustment and experiment, retakes and lots of light—not to mention plenty of "know-how" on the part of the photographer. Nevertheless, considering the value to dramatic productions of well-executed model work, I would have thought it worth while for both BBC and I.T.A. to constitute small photographic model departments which specialised in this work. Many of the photographed effects, intended for specific plays, could later be put into stock for library use on other TV productions at later dates. There is no doubt that many model shots could be used again and again.



A painter touches up a large scale (2in. to 1ft.) model of a seaside pier. Behind it is a smaller scale (½in. to 1ft.) model, and the background is a night sky of clouds painted on canvas.

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2A3	12/6	6C5	6/6	6SS7	7/6	12K8GT	14/-	61SPT	15/-	DF96	9/6	ECH81	8/-	HVR2	20/-	PY81	9/-	UY85	10/6
2A7	10/6	6C6	6/6	6U4GT	14/-	12Q7GT	8/6	72	4/6	DH63	8/6	ECL80	9/-	HVR2A	6/-	PY82	7/6	V1507	5/-
2C26	4/-	6C8	8/-	6U5G	7/6	12SA7	8/6	77	8/-	DH76	8/6	EF36	6/-	KL35	8/6	PY83	9/6	VLS492A	£3
2D13C	7/6	6C9	12/6	6U7	8/6	12SC7	7/6	78	8/6	DH77	8/6	EF37A	9/-	KT2	5/-	QP21	7/-	VMP4G	15/-
2X2	4/6	6C10	12/6	6V6G	7/-	12SG7	7/6	80	8/6	DK32	15/-	EF39	6/-	KT33C	10/-	QP25	15/-	VP2(7)	12/6
3A4	7/-	6CH6	7/6	6V6GT	7/-	12SH7	5/6	83	8/6	DK91	8/6	EF40	12/6	KT44	7/-	QS150/15		VP4(7)	15/-
3A5	7/-	6D6	6/6	6X4	7/-	12SJ7	8/-	85A2	15/-	DK92	10/-	EF41	9/6	KT63	6/6		10/6	VP13C	7/-
3B7	8/6	6E5	12/6	6X5GT	6/6	12SK7	6/-	150B2	15/-	DK96	9/6	EF42	12/6	KTW61	6/6	QVO4/7		VP23	6/6
3D5	5/-	6F1	15/-	6Z4/84	12/6	12SQ7	8/6	807	6/6	DL2	15/-	EF50(A)	7/-	KTW62	8/-		15/-	VP41	7/6
3Q4	9/-	6F6G	6/6	6Z5	12/6	12SR7	8/6	866A	12/6	DL33	9/6	EF50(E)	5/-	KTW63	8/-	R12	14/-	VR105/30	
3Q5GT	9/6	6F6GT	8/-	6/30L2	12/6	12U5G	7/6	956	3/-	DL92	8/-	EF54	5/-	KTZ41	6/-	SD6	12/7		9/-
3S4	8/-	6F8	10/6	7A7	12/6	12Y4	10/6	1203	7/-	DL94	9/-	EF73	10/6	KTZ63	10/6	SP4(7)	15/-	VR150/30	
3V4	9/-	6F12	9/-	7B7	8/-	14R7	10/6	4033L	12/6	DL96	9/6	EF80	8/6	L63	6/-	SP41	3/6		9/-
5U4	8/-	6F13	13/-	7C5	8/-	14S7	14/-	5763	12/6	DLS10	10/6	EF85	7/6	MH4	7/-	SP42	12/6	VT61A	5/-
5V4	12/6	6F16	9/6	7C6	8/-	19AQ5	11/-	7193	5/-	DM70	8/6	EF86	12/6	MHL4	7/6	SP61	3/6	VT501	5/-
5X4	10/-	6F17	12/6	7H7	8/-	19H1	10/-	7475	7/6	EA50	2/-	EF89	10/-	MHLD6	12/6	TP22	15/-	W76	8/6
5Y3	7/6	6F32	10/6	7Q7	9/-	20D1	12/7	9002	5/6	EA76	9/6	EF91	9/-	ML4	12/6	U16	12/-	X61	12/6
5Y4	10/-	6F33	7/6	7V7	8/6	20L1	13/6	9003	5/6	EABC80	7/6	EF92	6/6	ML6	6/6	U22	8/-	X65	12/6
5Z3	12/6	6G6	6/6	7Y4	8/-	25L6GT	9/-	9006	6/-	EAC91	7/6	EL32	5/6	MU14	8/6	U25	13/6	X66	12/6
5Z4G	10/-	6H6M	3/6	8D2	3/-	25Z4G	9/-	AC6PEN	6/6	EAF42	10/6	EL41	10/6	N78	12/6	U31	9/-	X79	12/6
6A8	10/-	6J5G	5/-	8D3	9/-	25Z5	10/6	AC/HL/		EB34	2/-	EL42	11/-	OA10	12/6	U50	7/6	XD(1.5)	4/-
6AB7	8/-	6J5GTG	5/6	9D2	3/6	25Z6G	9/6	DDD	15/-	EB41	8/6	EL81	15/-	OA70	5/-	U52	8/-	XFW10	6/6
6AB8	9/-	6J5GTM	6/-	10C1	15/-	28D7	7/-	AC/P4	8/-	EB91	6/6	EL84	10/6	OA71	5/-	U76	8/-	XFY12	6/6
6AC7	6/6	6J6	5/6	10C2	13/-	30	7/6	AP4	7/6	EBC33	7/6	EL91	5/-	OC72	30/-	U78	7/-	XH(1.5)	4/-
6AG5	6/6	6J7G	6/-	10F1	15/-	30C1	12/6	ATP4	3/6	EBC41	10/-	EM34	10/-	P61	3/6	U251	15/-	XSG(1.5)	4/-
6AG7	12/6	6J7GT	10/6	10F9	11/6	30F5	12/6	AZ31	12/6	EBF80	9/6	EM80	10/6			U404	10/6	Y63	7/6
6AJ8	8/-	6K7G	5/-	10F18	12/6	30FL1	12/6	B329	10/6	EBF89	9/6	EY51	10/6	PABC80		UABC80		Z63	10/6
6AK5	5/-	6K7GT	6/-	10LD3	8/6	30L1	12/6	BL63	7/6	EC52	5/6	EY86	10/6		15/-		10/6	Z66	20/-
6AK8	7/6	6K8G	8/-	10P13	17/6	30P4	15/-	CK505	6/6	EC54	6/-	EZ35	6/6	PCC84	8/-	UAF42	10/6	Z77	9/-
6AL5	6/6	6K8GT	11/-	11E3	15/-	30P12	13/6	CK506	6/6	EC70	12/6	EZ40	8/-	PCC85	12/6	UB41	12/7	Z719	12/6
6AM6	9/-	6LD3	10/-	12A6	6/6	30P16	10/6	CK523	6/6	ECC31	15/-	EZ41	10/6	PCF80	8/6	UBC41	8/6	Z729	12/6

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CORRESPONDENCE

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

THE EF50 CONVERTER

SIR,—Numerous queries concerning coil data for the EF50 converter of September, 1955, issue have been received, and to avoid further queries I give the following data:

	Channel 1	2	3	4	5
L 2 and 3 turns	11	10	9	8	7
T1 PRI turns	11	10	9	8	7
SEC ,,	3	2	2	2	2

Band III coils L1 and L4 should cover channels 8 and 10, with slight closing or opening respectively. L5 depends on the frequency difference between the Band III and Band I stations (143 Mc/s for 9 and 2). This will hold for Channel 8 and 1 or 10 and 3, but other variations will need some experiment with L5.—L. SHATWELL (Oldham).

SPECIAL NOTE

Will readers please note that we are unable to supply Service Sheets or Circuits of ex-government apparatus, or of proprietary makes of commercial receivers. We regret that we are also unable to publish letters from readers seeking a source of supply of such apparatus.

TUBE FAULTS

SIR,—I was very interested in your article in the September issue on tube faults, but I have one which I would like explained as several so-called engineers have looked at it and cannot offer an explanation. A typical week would be something like the following: Monday, perfect reception all the evening: Tuesday, switch on and there is a very faint picture for about $1\frac{1}{2}$ hours. Then, without touching it, it will suddenly flare up and die down to a normal picture for the rest of the evening. Wednesday, switch on, perfect. After an hour or so the opposite to Tuesday, that is, the picture will flare up and die down to an almost invisible image which cannot be brightened and we have to switch off for the rest of the evening. Thursday, jumpy. Sometimes bright, sometimes dark, but quite steady lock, which will be the opposite perhaps to the following night, when the picture cannot be locked no matter what you do. Brightness is probably quite even during this period. Saturday, there is probably nothing wrong, just like Monday. Brilliance components have all been replaced, together with lots of components here and there. Perhaps one of your experts can suggest something.—H. F. WATTS (N.W.).

AERIAL DEVICES

SIR,—I read with great interest your article on aerial devices published in the August issue. I found it, too, an interesting and informative one, but on reading through it I spotted a slight slip. I am not sure if the error lay with you or whether your article has been mutilated on its way to the press. The mistake is on page 5, with reference to working more than one set from one input. The value of R in Fig. 7 is given by the formula:

$$R = \frac{\text{Impedance of aerial}}{\frac{N-1}{N+1}}$$

N being the number of outlets required. Your example dealt with an aerial impedance of 75 ohms and three outlets. From the formula we have:

$$R = \frac{75}{\frac{3-1}{3+1}} = \frac{75}{\frac{2}{4}} = 150\Omega$$

If the number of outlets had been two, as seems to be the case in the example as shown, we have:

$$R = \frac{75}{\frac{2-1}{2+1}} = \frac{75}{\frac{1}{3}}$$

$= 225\Omega$ not 25Ω
—RONALD DIXON (Co. Durham).

DABBLERS

SIR,—I heartily agree with your article headed "Dabbling?" as expressed in "Televiews" in the August edition of PRACTICAL TELEVISION.

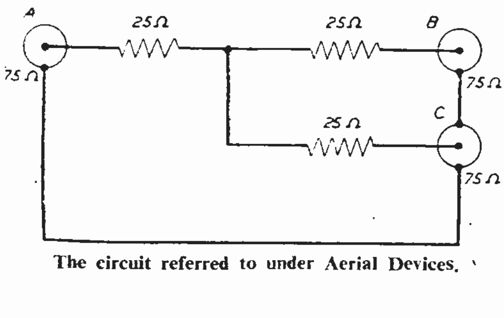
I am one of those amateurs who do spare time servicing and find your articles of great assistance.

I offered my services to two dealers in the past and was promptly given the "brush-off" on stating I was an amateur, yet I received a thorough training in radio theory and practice whilst serving with the R.A.F.

I recently obtained employment with a well-known firm of radio dealers and came in contact with many amateurs whose knowledge I found was as great as, if not greater than, the people I worked with.

I think the main reason why dealers have difficulty in obtaining labour is their attitude to applicants and that they offer no prospects such as superannuation benefits, etc. I know I much prefer working on my own in my spare time.—G. H. BROWN (N.W.1.).

SIR,—May I, through your correspondence column, reply to various letters that have appeared in the past. First, re "Anti-dabbler's" letter, I happen to be professionally employed in electronics, being also a ham and holding one of the coveted transmitting licences, but the term "dabblers" annoys



The circuit referred to under Aerial Devices.

me. With the coming of commercial radio and TV as we know it today, most of our type were dabblers at one time or another; even the much saluted man Marconi admitted once being an amateur. Many businesses have been built up by extortionate charges by the dealer, who has no knowledge, in a lot of cases, of the difference between a C.R.T. and a bicycle tube, but employs a number of engineers to carry out the work required. Another point I should like to ask: how many dealers, when holding closed agencies normally called the cream of the business, have ever been approached re the service side. The firm I work for hold many of these agencies and I cannot remember being approached. Whilst I have to cater for all aspects of electronics from deaf aids to cinema organs, I feel the choice of the public does not matter. If Mrs. Jones's son can repair TV sets, let him do so; if he makes a hash of it, and it is passed on to you, the only remedy is to point out to the customer that the set has been tampered with by a person with no knowledge, charge a fair price, do a good job and the reward will be a satisfied customer who will talk. To finish, most of the troubles today are to be found in two groups: bad workmanship and faulty valves. A normal failure is one of those things, except in the case of C.R.T.s. This is the "skeleton in the cupboard" to engineer and dealer; for the price they cost they should last for years. *How many do?* Anyway, we will wish the dealer, engineer and dabbler the best of luck, and I back up "Anti-dabbler's" statement—employ these dabblers part-time, for who knows, you may have another Marconi.—ENGINEER (Cornwall) (name and address supplied).

SIR.—With reference to "Anti-dabbler's" letter in your lasti ssue regarding amateurs who buy spares from dealers to carry out their own repairs, I had a faulty valve in my TV and after trying several shops I was curtly told by one dealer that he did not supply TV valves unless I had bought the set there. The same applies to servicing sets which haven't been sold by him. (TV is still a novelty here and some dealers are interested only in sales.) Surely this is a short-sighted spiteful type of policy which can only harm the dealer's reputation as we amateurs can obtain all we need in spares from the advertisements in your excellent magazines, provided we can wait a few days for return of the spares. However, there are dealers in this town who help the amateur, especially a recently established firm who have experience in TV and who gladly order valves, etc., from their other branches with the minimum of delay. Surely the radio and TV trade owes much to the keen amateur serviceman who has helped so much towards the advancement of radio and TV and whose only crime is to assist the public by offering to repair sets which have been rejected as unrepairable by certain dealers who fail to make an easy profit on same.—T. A. EVANS (Aberystwyth).

AERIAL AIDS

SIR.—I was interested in the recent article on Aerial Devices and would like to make a point regarding aerials for TV. When one looks round at some houses in this locality the roof bears an amazing array from the metal warehouse. There are multi-element Band I aerials and ditto for Band III and in some cases a horizontal dipole too. Surely, in these days of electronics engineers could do something to overcome the necessity for all the aerials. It seems to me that they spend so much unnecessary time in designing elaborate cabinets and other gadgets which are not really necessary and just leave things like aerials to take care of themselves. Given a single dipole for Band I, why can't some add on kind of protuberance be fitted to make it resonate to Band III, or a coil or something similar placed in the central junction box to take care of various stations. The lead in should be a single wire, not two lots of cable, and if an F.M. aerial is also needed surely this could also be taken care of in the same way. Come on, you backroom boffins, why not get down to this problem and let us get rid of these unsightly roof-top forests.—F. GREATOREX (Smethwick).

AN EXPENSIVE RECEIVER

SIR.—My experience with a well-known commercial receiver will, I am sure, interest others. Purchased nearly four years ago at over £80 this set has now had 10 new valves and three new tubes at a cost of over £60 for replacements. Is this a record? I might mention that this is the domestic receiver, and I have a home-built set which I use for messing around on, but I have never interfered with the commercial model and have always had it serviced by the maker's local agent and in some cases by the makers themselves. Of course, the usual "pass it on" excuse is made. "It's the valves, and we are only responsible for the circuit," and "The circuit is wrong, our valves are all right."—G. THURLONE (S.E.).

TUBE FAULTS

SIR.—I have been reading the article in the September issue on locating tube faults, by Mr. Peters, and must congratulate the author on producing a very clear article which fully describes as far as I know every fault that you are likely to encounter.

During the years I have been interested in TV I am now on my fourth tube, and have experienced in the death of these tubes a majority of the symptoms that the author describes. As all of us sooner or later run into these troubles, I would suggest that the article is worth filing for reference for future occasions.

A simple method that I use myself may be worth describing—that is, as a standard, I include an isolator transformer with boost for the tube heater. Initially this is connected properly for the right voltages. Cathode heater leaks are never noticed when they may occur but when the picture starts getting thin with glazed high lights and an easy positive, 20 per cent. boost is supplied, giving a few more months' life. When the effect of this is worn off, transferring the main tapping from 230-200 gives a further 15 per cent. boost and a few more months' life. The limit is then reached and replacement becomes necessary.—GEO. T. LAYTON (Eccles).

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

TUBE CONNECTIONS

Can you tell me the base connections for a Mullard MW22/1 (9in. tube) which has a side contact case.

I wish to use this tube in place of an MW22/14. Will this tube be suitable?—F. Thompson (Gillingham).

The MW22/1 C.R.T. is not wholly suitable as a replacement for an MW22/14.

The latter tube has an external conductive coating and an EHT requirement somewhat higher than the MW22/1.

Since you have not mentioned the type of receiver in use, we cannot offer definite advice. However, the tube connections are as follows:

Heaters 2 and 3, cathode 4, grid 6, 1st anode 7, pins 1, 5 and 8 are blank.

EKCO TSC91

Recently the set was not used for about five days. On switching the set on the house mains fuse "blew." On renewing fuse and again switching the set on the rectifier valve UU8 sparked internally and again the fuse "blew." Prior to this the set had been working daily and without any trouble. Could you and would you please, from the above information, tell me what you consider the fault, and how to rectify the fault.—S. C. Plucknett (Hornchurch).

Your trouble could be due to an H.T. short, to the UU8 valve itself, or to a short developing on the UU8 valveholder, which usually collects condensation after a period of disuse causing carbonisation across the pins.

If you remove the UU8 and have it tested, examine the valveholder carefully, and check the H.T. rail for a short circuit, you will probably be able to isolate your fault. It always pays to dry out an unused set with its back to the fire prior to switching on.

ULTRA W470

I wish to convert an Ultra W470 9in. consul model to receive Channel 9 and also install a 12in. tube. The latter operation seems to be straightforward, but I would like your advice on channel conversion as I have no details of the circuit.

Is it, for instance, a superhet circuit, and if so, what is its I.F. and the type of tuner unit most suitable?

Your observations on any possible snags on any of the above operations would be welcome.—P. A. Russell (Wembley).

In view of your situation, an add-on converter would not be suitable due to the risk of breakthrough and subsequent patterning. Therefore, a front end tuner unit is essential. The snag is that the I.F. of your receiver is 7.2Mc/s sound and 10.7Mc/s vision (vision alignment upper sideband). This means that the sound I.F. is somewhat outside the range of the average tuner such as the Unisal, Valradio or Brayhead, for example. However, we know of several W470 receivers which have been converted by slightly altering the I.F. alignment, bringing the sound I.F. up to 8 or 9Mc/s and the vision to 11 or 12Mc/s. In some cases a sound rejector has been found necessary. The tuner output should be injected into the anode circuit of V2, the oscillator valve (6F12) being removed with V1 and V2. The tuner unit should have 6.3v valves (ECC84 ECF80) parallel heaters and the lowest I.F. available. For example, the Unisal Type D, the Valradio TP13P, etc.

KBLVT50

Symptoms are dim or negative picture when brightness control is advanced, while curved lines about 2in. apart appear over the picture in a horizontal direction and picture appears out of focus.

Operating contrast control, without too much brightness, gives a rather poor picture.

I have an indoor type aerial.

I would be much obliged if you could give me a probable explanation of the cause.—Robert Anderson (Hamilton).

Your description seems to indicate that the tube is failing. This is extremely likely but it would be as well to check the setting of the ion trap magnet on the tube neck which may have slipped out of position.

PYE V14

My receiver has recently developed an irritating fault and I would be glad of any assistance you can give as all the normal tests have shown nothing either defective or shorting.

On switching on the volume comes through very well and then the screen shows a scramble of horizontal lines which sort themselves out into a picture as the line-whistle builds up. After a few moments' stability the picture folds up vertically and the line-whistle disappears; the filaments go dull for a while, sound remains constant, then the whole process repeats itself, sometimes the picture remains clear for an hour or so and then repeats the odd performance and sometimes no picture is stable for any length of time. The set is just 10 months old.—W. A. Morland (Newcastle).

If all the valve heaters are dull, suspect the thermistor wired between the PY82 valve bases.

If some of the valves are dull whilst others become brighter, suspect a heater-cathode short in one of the valves. It is possible also that the line oscillator PCF80 requires replacement. This is mounted on the top of the chassis, just to the right of the pre-set line-hold variable capacitor.

SOBELL T121

I have a Sobell TV model T121 about five years old. The wire wound ballast resistor went, and the service man could not get one so he bridged the old one with two resistors. He tried it, set worked, sound distorted when turned low; brightness control works only halfway on—advance it, picture goes away, but turns rastors fly-back lines on all the time. Adjustment of contrast makes it go out of focus, and now after two days the picture is hardly visible at all, and the man that mended set has gone to live elsewhere. I have tried to get a service sheet but without success. Will you please tell me how to correct these faults.—G. Madfield (Blackpool).

We would advise you to change the EY51 valve mounted on the line output transformer (right side rear).

We also suggest that you change the .01μF capacitor connected from the small metal rectifier (sound noise limiter) to the ECL80 sound output control grid.

BAIRD P167

I have built a converter advertised in your pages. The I.T.A. picture is quite good but is marred by a wavy pattern of interference and a tendency to tear. I shall try a break-through filter but I would also like to convert direct to I.F. and tap into the I.F. amplifying stages. Would you advise me which valve and which pin connections to modify? I notice that my hand capacitor on the converter tuning slug produces a perfect I.T.A. picture—can this effect be reproduced in some other way? Perhaps you would also be good enough to say if my receiver has L.T. and H.T. to spare for the two 8D3s, with safety?—Walter Broadfoot (Glasgow).

It would appear that the converter is incorrectly tuned, or the feeder is mismatched. If no improvement can be made, either shorten the length of co-axial connecting the converter to the receiver to a few inches or lengthen it to 52in. exactly. If good reception cannot be obtained, it would be better to obtain a tuner unit with an I.F. output of 9-13Mc/s and connect this to replace the 10F1 R.F. and 12AT7 F.C. valves.

The receiver is capable of supplying the extra load demanded by a converter. A tuner could be used, fitting being by two plugs in place of the V1 and V2 valves.

PETO SCOTT TV 1716T

Picture and sound are O.K., but there is background hum on the sound, the strength of which varies with the normal adjustment of the volume control. I have been told this is vision on sound: could you advise me regarding same?—T. G. Dagger (Nr. Chorley).

If the fine tuner will not minimise the hum, and it is at one end of its travel, adjust the oscillator coil core in the tuner unit. To do this place the receiver on its side, remove the bottom cover, and then the cover of the tuner unit. Set the fine tuner to the centre of its travel and then adjust the coil core with a bone knitting needle, suitably shaped, or other non-metallic trimming tool. If no improvement is possible and the hum definitely varies with the white picture content, install an aerial attenuator.

COSSOR No. 912

Suddenly the picture has gone—only a thin, white horizontal line across screen; sound is still O.K. Can you tell me where to look for the trouble?—H. E. Drew (S.E.24).

We would advise you to check the OM4 and 6V6G valves on the front right side as viewed from the rear. If the valves are in order, check the 5KΩ load resistor of the 6V6G and the associated 8 μF electrolytic capacitor feeding the frame scanning coils.

EKCO T221

Quite recently loss of sound and vision occurred. I tested valves with a small radiometer in mild way and found U301 was finished. I replaced same and set was O.K. on sound and vision, but, in the course of taking out valves, connection wire from transformer to valve 20P4 cap was corroded and I had to pull I am afraid too hard to release. In doing so the cap of the valve came adrift, although the valve in a sense was still good, but while set was on and trying to make a temporary connection of cap with an insulated screwdriver I made a short-circuit with driver from valve cap to chassis, or C250pF connection. Valves U25 and 20L1 went out. I replaced valves U25-20L1 and a new 20P4, all valves in the set now light up except the new U25. I have looked for loose connections in the circuit, but I was wondering if the transformer had finished owing to the short circuit. I would appreciate your views.—A. C. Bishop (N.19).

We would advise you to check for H.T. at the anode of the 20P4. If no H.T. is present, the transformer will have to be replaced, unless you can find the point of disconnection.

REGENTONE 15

After from 10 to 20 minutes after switching on a blank space appears across the centre of the picture. After a few seconds the picture becomes normal again, thereafter this goes on at short intervals, sometimes the picture going off completely. I have changed V9 (10C2) and V10 (ECL80); this has had no effect. Where the width line linearity controls are shown on the diagram there are only two wires and no controls. The set has been to a dealer's for repairs about 18 months ago, is it possible that they have removed these controls? And could you give me some indication of the present trouble?—R. G. Thomas (Maesteg).

If this trouble is not caused by a fault in the frame timebase section, often as the result of an intermittent defect in the frame amplifier valve itself, the possibility of an intermittent heater to cathode short in the picture tube should be examined. The tube is likely to be responsible if the symptom can be produced by gently tapping the neck of the tube while the set is operating.

(Continued on page 147)

SETS & COMPONENTS

VIBRAPACKS, 6v. D.C. to 250v. 80 mA., smoothed, cased, **22/6** (post 3/-); Carbon Potentiometers, ¾in. spindle, 20 k.-1 meg. range, **10/6** doz.; Indicator Units, new, with VCR97, 3 VR91, 2/CV18, 2/VR54, **24/-** (carr. 6/-); Responser, ZC8931, new, 190, 220 Mc/s., with valves, **15/-** (carr. 7/6); Brand new RF.26, 27, **25/-** (post 2/6); RF25, **10/6**; RF26/27 damaged dials, **15/-**. Metal Rectifiers: 240v., 100 mA., **4/-**; 500v., 300 mA., **10/-**; 240v., 30 mA., **3/6**; 1,000v., 30 mA., **7/6**; 6v., 13a., **25/-**; R1155 S.M. Tuning Drives, "N" type, brand new, **10/6**; Chokes, L.F., 10H, 120 mA., screened, **7/6**; 10H, 200 mA., **8/6**; 5H, 200 mA., **4/6**; Switches, wafer, 1p 6w 5b., 1p 11w 2b, 6p 2w 4b, **3/6**; Stud Muirhead type 1p 24w 2b, **7/6**. Transformers: "C" core: 230v. in.; outputs: 315-0-315v., 60 mA., 5v. 2a., 6.3v., 1.5a., **25/-** (p.p. 3/-); 285/315v., 360 mA., 790/850v., 480 mA., **40/-** (carr. 7/6); Potentiometers, w.w. wound 20 k., 3¼in. dia., ceramic, **4/6**. Power Units: input A.C. 200/250v. Outputs: 300v., 80 mA., D.C. and 6.3v., 3 a A.C., smoothed, filtered, fused, new, **35/-**. Meters: ex-eqt. 500 uA. 2in. Rd. Pr., **12/6**; Plugs and Sockets (Jones) with covers, 6 or 8 way, pair, **2/-**; 5 pin B/Lee spigoted, pair, **1/6**. List and enquiries s.a.e., please! Terms: c.w.o.; postage extra; immediate despatch. W. A. BENSON, 136, Rathbone Rd., Liverpool, 15.

GUARANTEED TELEVISION, 12in. 5-Channel models, first-class picture, **£26** each, carriage paid. THE GRAMOPHONE SHOP 19-21, Brockley Rise, London, S.E.23.

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PYE V.T.7

My set has been working satisfactorily though not quite as bright as originally. Last night during satisfactory viewing for two hours the picture suddenly changed to multi-vision. In other words the screen was showing half the object on each side and two objects left and right of the centre. The set then lost the horizontal hold and would not hold until the horizontal hold control was turned fully anti-clockwise, when the picture would just hold but still multi-vision. The horizontal hold has been critical for some time as slight movement of the control in either direction would lose hold. The sound is normal and adjustment of all external auxiliary controls made no difference to the multi-vision.—H. J. McNeill (Cottesmore).

We would advise you to change the ECL80 valve mounted behind the line output transformer section on the left side of the chassis.

VIEWMASTER

Would you please advise me on my Viewmaster, which has been working four years. I cleaned out the set and tube. When I connected again I had a fault. Brilliance will not turn off, and I have no volts on K, but Brilliance control works. Other volts seem to be O.K. I wonder if I have got some part crossed when cleaning, as it was O.K. before. Tube is MW 31-16 and run off a 6 volt transformer 230 P.R. I would like to know if a one to one transformer is better run off old tapping.—W. Loryman (Leeds).

The effect you describe may be caused by the lead from the cathode of the C.R.T. to the junction of R.23 and R.24 being broken or disconnected.

It is also possible that the connection from the top of R.23 to the anode of V.5 may also be broken and we suggest that these points be checked.

EKCOVISION TYPE T.C.138

This set was working perfectly when I was living in the Band I, Channel 1 area. I have now moved into the Band I, Channel 3 area, and wish to convert my set to suit. Can you please inform me if it is possible to obtain a converter that will convert my particular set from Band I, Channel 1 to Band I, Channel 3, without altering the set too much as I may only be in this area for a short period. Also, if these converters are obtainable, where I can obtain one. —P. Butler (c/o G.P.O.).

Your receiver is capable of being tuned to any of the Band I channels. The only adjustments necessary are to the brass cores protruding beneath the chassis at the front end of the right side R.F. chassis and the concentric trimmer mounted inside the coil can on the top of the same unit to the right of the second valve up. Unscrew the cores beneath the chassis several turns each, then unscrew the concentric trimmer until the Channel 3 sound is heard. Adjust brass cores for optimum results.

EHT RECTIFIER

In your reply to a query of mine you stated that the EHT rectifier in my set is an EY51. On removing the wax and removing the valve, I see that it is a Mazda U25. As I had already purchased an EY51 I fitted that in its place. I should be pleased if you would inform me whether or not I should have done that, and also what are the characteristics of the two valves.

I have since been told that a U25 valve has no equivalent, but the EY51 seems to function quite well. I should value your opinion on the matter.—Alan H. McDonna (Bolton).

We would advise you that the EY51 is the correct valve to fit unless the line output transformer has at some time been changed for a type requiring a U25. Since the EY51 is working well, we would suggest you leave this in position as even if it is not intended for use with the transformer, no possible harm can result and it will certainly last longer.

McMICHAEL C.R.52

The insulation of the lead to the C.R.T. caught fire. I also found that the lead to the tube had become disconnected from the EHT transformer, and I am at a loss where this goes to. Would be pleased if you could help me.—J. H. Harvey (Fulwell).

We would advise you that the lead in question, i.e., that from the C.R.T. anode, goes to the double wire end of the EY51. Either of the two points of contact may be used but, of course, not both. Make the connection with a well rounded blob of solder—no sharp edges.

PYE MODEL VT4

What is the procedure to clean rear of front Perspex and face of tube ?

From six months of new, till now (21 months) bloom and dirt streaks round edges get worse.—F. J. Young (Eastbourne).

To clean the C.R.T. screen in the VT4, remove the back, unscrew the 2 x 2BA bolts holding the rear chassis flange down and slide out chassis to extent of leads.

Turn set on its knobless side, remove bottom and bracket holding loudspeaker. Slacken clip retaining Perspex screen and peel off sticky tape.

Slide Perspex downwards with flat of hand and proceed with cleaning in a dust free atmosphere to avoid re-entry of bits of fluff, etc., upon reassembly.

QUERIES COUPON

This coupon is available until OCTOBER 21st, 1957, and must accompany all Queries sent in accord with the notice on page 143.

PRACTICAL TELEVISION, OCTOBER, 1957

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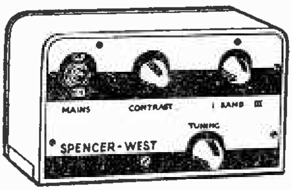

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